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Adaptive Functioning Deficits and Internalizing Problems in Young Children with Autism Spectrum Disorders

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Adaptive Functioning Deficits and Internalizing Problems in Young Children with Autism
Spectrum Disorders

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A dissertation submitted in partial fulfillment of the requirements for the degree of

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In

Clinical Psychology

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Dedication

I dedicate this manuscript to the many fantastic people who supported me throughout this process. To Tessa Dover, you cheered me on after long days of writing and long days of procrastinating. Thank you for the years of love and support throughout this and so many other challenges in graduate school. To my friends, thank you for taking this journey with me. I value your encouragement and commiseration more than you know. Lastly, thank you to my mom, dad, Katelynn, Iris, and Kathy, who always offered perspective when it was so needed. I simply could not have done this without you.

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Abstract

The current study assessed whether deficits in adaptive functioning skills mediated the association between diagnostic status and internalizing symptoms in young children with and without an autism spectrum disorder (ASD) diagnosis. Participants included 70 children, 26 with ASD and 44 who were typically developing (TD), between the ages of 3:0 and 6:11 years. Parent reports of children's adaptive functioning skills were collected for the following constructs: functional communication, social skills, self-help skills, and independence. Additionally, parent and teacher reports of children's internalizing symptoms were obtained. Results indicated that diagnostic status significantly predicted parent reported internalizing symptoms such that the ASD group evidenced higher internalization compared to the TD control group ($B = 7.55$, $t = 2.28$, $p = 0.03$). Further, diagnostic status also significantly predicted adaptive functioning skills such that children with ASD evidenced lower scores across all adaptive functioning metrics. Next, none of the adaptive functioning scales significantly predicted parent report of children's internalizing symptoms, however social skills and independence neared significance ($p = 0.07$ and 0.06 respectively). In terms of the mediational relations among these variables, the association between diagnostic status and internalizing symptoms was partially accounted for by children's social skills (CI: 0.64 – 13.85) and independence (CI: 1.32 – 18.11). The other two metrics of adaptive functioning skills did not produce a significant indirect effect. Children with ASD evidenced high rates of parent reported internalizing symptoms as well as lower levels of adaptive functioning skills. Further, results indicated that lower social skills and independence significantly mediated the relation between diagnostic status and internalizing symptoms. These results highlight the need for additional research assessing the associated impairment of adaptive functioning deficits in children with ASD. Additionally, this study underscores the importance of effective social skill and independence interventions for children on the spectrum. Such interventions may serve to attenuate the risk of subsequent internalizing symptoms in youth with ASD.

Keywords: autism spectrum disorder; internalizing symptoms; adaptive functioning skills; social skills; independence

Chapter 1: Introduction and Literature Review

Autism spectrum disorder (ASD) is a neurodevelopmental disorder that is characterized by three core deficit areas: communication, socialization, and restricted or repetitive interests or behaviors. While these deficits are relatively ubiquitous across the spectrum, ASD presentations vary widely in the degree of intellectual impairment and the severity of ASD symptoms (Bitsika, Sharpley, & Orapeleng, 2008; Kjellmer, Hedvall, Fernell, Gillberg, & Norrelgen, 2012). This diverse range in presentation in children with ASD results in similarly diverse outcomes (Rojahn, Wilkins, Matson, & Boisjoli, 2010; Wilkins & Matson, 2009). One such outcome common in children with ASD with average intellectual functioning and low symptom severity is co-occurring internalizing problems (Leyfer et al., 2006; Green, Golchrist, Burton, & Cox, 2000; McPheeter, Davis, Navarre, & Scott, 2011).

Children with ASD frequently experience co-occurring internalizing problems such as depressive, anxiety, and somatic symptoms in addition to their ASD symptoms and deficits. Children with ASD and average intellectual functioning appear to be at greater risk for developing internalizing problems than children with ASD and below average intelligence due to their heightened insight into their impairments and deficits (DeLong & Dwyer, 1988; Estes, Dawson, Sterling, & Munson, 2007; Mazurek & Kanne, 2010). Although limited research has examined outcomes of internalizing problems in children with ASD, preliminary findings have associated internalization in children with ASD and average intellectual functioning with high levels of aggression and poorer social relationships than children on the spectrum who do not exhibit additional internalizing problems (Kim et al., 2000). The maladaptive trajectory of children with ASD and average intellectual functioning and internalizing problems likely mirrors that of children with typical development (TD) who experience internalizing problems, which

includes outcomes such as worse overall mental health and peer relationships, higher rates for high school noncompletion, fewer employment opportunities, and earlier adult mortality compared to TD children without internalizing problems (Bayer et al., 2011; Campbell, 1995; Duchesne et al., 2008; Kim et al., 2000). The outcomes associated with internalizing problems in children with ASD are likely exacerbated further by these children's ASD symptoms and deficits. It is important to explore factors associated with elevated internalizing problems in children with ASD, specifically those with ASD and average intellectual functioning, in order to detail and clinically address the mechanisms through which these additional internalizing symptoms arise in these children.

Adaptive functioning deficits in children with ASD may provide a possible explanation for the elevated internalizing symptoms seen in these children. Adaptive functioning is broadly defined as an individual's ability to successfully interact with their environment and to care for themselves. The components of adaptive functioning are typically conceptualized as falling into three broad categories: conceptual skills such as functional communication and independence, social skills such as an individual's interpersonal skills and self-esteem, and practical skills such as self-help and daily living skills (Flynn & Healy, 2012; Perry, Flanagan, Dunn Geier, & Freeman, 2009). Significant research has shown that children with ASD exhibit deficits in the areas of functional communication and interpersonal skills (Carpentieri & Morgan, 1996; Freeman et al., 1991; Freeman, Ritvo, Yokota, Childs, & Pollard, 1988; Green et al., 2000; Liss, Harle et al., 2001; Mahan & Matson, 2011; Perry et al., 2009). These adaptive functioning deficits are subsumed within the ASD core deficit areas of communication and socialization. These deficits therefore, represent diagnostic features of ASD and are anticipated impairments in these children. However, additional research has found deficits in self-help skill and

independence in children with ASD as well (Flynn & Healy, 2012; Liss, Harle et al., 2001).

These deficits indicate that children with ASD exhibit adaptive functioning impairments beyond what can be explained by the core diagnostic deficit areas of ASD alone. Further, the pattern of adaptive functioning impairment varies based on the child's level of intellectual functioning (Carpentieri & Morgan, 1996; Freeman et al., 1991; Freeman et al., 1988; Green et al., 2000; Liss, Fein et al., 2001; Mahan & Matson, 2011; Perry et al., 2009).

Previous research has shown that TD children's adaptive functioning skill deficits parallel their relative cognitive ability. This pattern is seen in children with TD as well as children with ASD and below average intellectual functioning (Carpentieri & Morgan, 1996; Mahan & Matson, 2011; Perry et al., 2009). However, children with ASD and average intellectual functioning exhibit markedly lower adaptive functioning than expected relative to their cognitive ability (Carpentieri & Morgan, 1996; Freeman et al., 1991; Freeman et al., 1988; Green et al., 2000; Liss, Fein et al., 2001; Mahan & Matson, 2011; Perry et al., 2009). Further, children with fewer and less severe ASD symptoms similarly exhibit lower than anticipated adaptive functioning skills (de Bildt, Sytema, Kraijer, Sparrow, & Minderaa, 2005; Klin et al., 2007; Liss, Harle et al., 2001). This discrepancy between cognitive ability and adaptive functioning skills in children with ASD with average intellectual functioning may be associated with the elevated internalizing symptoms seen in this group. Children with ASD and average intellect are particularly aware of their deficits, the norms of their peers, and the stigmatizing nature of their impairments (DeLong & Dwyer, 1988; Estes et al, 2007; Mazurek & Kanne, 2010). This awareness results in markedly increased emotional distress in these children. Awareness of their adaptive functioning deficits would also logically result in elevated internalizing problems in children with ASD and average intellectual functioning. Preliminary

research supports this notion: following a independence and self-help skills intervention, children with ASD endorsed lower levels of anxiety indicating an association between certain adaptive functioning deficits and internalizing symptoms in children with ASD and average intellectual functioning (Drahota, Wood, Sze, & Van Dyke, 2011).

The proposed study aims to explore the nature of the associations between adaptive functioning deficits and internalizing symptoms in children with ASD and average intellectual functioning. Children with both TD and ASD between the ages of 3:0 and 6:11 will be assessed for ASD symptom severity, adaptive functioning skills, and internalizing problems. First, I will verify whether a positive association exists between diagnostic status (ASD vs. TD) and internalizing problems. Then I will assess whether adaptive functioning deficits provide a potential explanation for this relation. This research will help clarify whether adaptive functioning deficits may be a risk factor for subsequent internalizing problems in young children with ASD and average intellectual functioning. Additionally, the results of this study may help health professionals identify children who might benefit from targeted interventions that disrupt the mechanisms by which internalizing symptoms arise in children with ASD. The following sections provide an overview of ASD, definitions of the internalization and adaptive functioning constructs, and reviews of the empirical literature that relate to the current topic.

Autism Spectrum Disorders

Overview

ASD represents a spectrum of neurodevelopmental disorders that vary broadly in their clinical presentation. As outlined in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association [APA], 2013), the ASD spectrum contains a range of clinical presentations defined by two core deficits: 1) deficits in social communication and social

interaction and 2) patterns restricted interests or repetitive behaviors. Prior to May 2013, the ASD spectrum was comprised of five pervasive developmental disorders (PDDs) as outlined in the DSM-IV-TR (2000): autistic disorder, Asperger's syndrome, Rett syndrome, childhood disintegrative disorder (CDD), and pervasive developmental disorder not otherwise specified (PDD-NOS). The changes made in DSM-5 attempt to create a unifying diagnosis for the previously subdivided PDDs based primarily on symptom severity and degree of impairment.

Differential Diagnosis

Due to the transition to DSM-5, the current study will include participants diagnosed with autistic disorder, Asperger's disorder, and PDD NOS (as defined by the DSM-IV-TR) as well as ASD (as defined by the DSM-5) within the ASD group. I will review the diagnostic criteria for all four diagnoses below.

Autistic disorder. Prior to the DSM-5 Autistic disorder (typically referred to as autism) represented the greatest PDD symptom severity and was characterized by deficits in three core areas: socialization, communication and restricted and repetitive interests or behaviors. Social impairment was marked by decreased social interest such as irregular eye contact or lack of seeking to share enjoyment, lack of appropriate peer relationships, or lack of social or emotional reciprocity. Communication deficits included delayed or absent language, stereotyped or repetitive language, lack of varied spontaneous play, or deficits in the ability to initiate or maintain a conversation. Lastly, restricted or repetitive interests or behaviors included patterns of intense restricted interest, preoccupation with parts of objects, stereotyped and repetitive motor movements (e.g. hand flapping), or inflexible adherence to routines. Symptoms or deficits in at least one of the core areas must onset prior to age three (APA, 2000).

Asperger's disorder. Similar to classic autism, Asperger's disorder was characterized by social impairment as well as restricted or repetitive interests or behaviors. However, children with Asperger's disorder did not exhibit delayed communication or language development or decreased cognitive functioning (APA, 2000). Due to the symptom presentation in Asperger's disorder, it has commonly been conceptualized as a form of less impairing autism.

PDD NOS. The PDD NOS diagnosis included children with deficits or impairment in the three core ASD domains who did not meet full criteria for a specific PDD. These caveats included subthreshold or atypical symptom presentations or an onset of these symptoms after age three (APA, 2000).

Autism spectrum disorders. Autism spectrum disorders' (ASD) diagnostic criteria, as defined by the DSM-5, has collapsed the differential diagnosis of the PDDs from DSM-IV-TR into one unifying diagnosis. There are now two main symptom clusters required to meet the ASD diagnostic criteria. The child must exhibit deficits in social communication or social interaction. This can be manifest as deficient social-emotional reciprocity, abnormal nonverbal communication behaviors, or difficulty developing or maintaining relationships. Additionally, children must demonstrate patterns of restricted interests or repetitive behaviors such as stereotyped motor movements or speech, inflexible adherence to routines, ritualized verbal or nonverbal behaviors, or patterns of interest that are abnormal in intensity or focus. These two symptom clusters must be manifest by the age of three and symptoms must result in impaired everyday functioning (APA, 2013).

Epidemiology

According to the most recent report from the Center for Disease Control and Prevention (CDC), the rates of ASD diagnoses are continuing to rise. As of data collected in 2008, the

incidence rate of ASD is estimated to be 1 in 88 children. However, the CDC found significantly higher rates of ASD in males (1 in 54) than in females (1 in 252) (CDC, 2012). The prevalence rate as of the 2008 data estimates 11.4 per 1,000 children are diagnosed with ASD.

Comparatively, in 2006 the estimate was 9.0 per 1,000 children and in 2002, 6.4 per 1,000 children (CDC, 2012). Additionally, ASD is reported across all ethnicities and socioeconomic groups. These data suggest that the incidence rate of ASD is continuing to rise across all sampled groups. However there is some debate as to whether this reflects actual increases in cases or merely changes in diagnostic procedures and increased public awareness of the disorder (Russell, Kelly, & Golding, 2010).

Etiology

The increased prevalence of ASD in recent years has sparked significant research investigating the etiology of the disorder. Most researchers speculate that ASD develops out of a genetic predisposition to the disorder that is triggered by an environmental event, commonly referred to as the diathesis stress model (Bishop & Lord, 2006; Newschaffer et al., 2007; Russell et al., 2010). Researchers have shown that ASD is genetically heritable through monozygotic twin studies noting the increased prevalence of ASD in families previously exhibiting the disorder (Bailey et al., 1995). Additionally, siblings of children with ASD are at an increased risk for an ASD diagnosis or subthreshold symptoms, further indicating certain genetic predispositions to ASD (Constantino et al. 2013; Piven, Palmer, Jacobi, Childress, & Arndt, 1997). However, a subset of children with ASD seems to develop the disorder in the absence of a genetic predisposition. This sporadic development of ASD is attributable to spontaneous gene mutation (Neale et al., 2012; O’Roak et al., 2012). In an effort to isolate relevant gene mutations that result in ASD presentations, researchers are beginning to investigate the effects of hundreds

of genes and thousands of gene combinations that may contribute to the etiology of ASD (Benayed et al., 2005; Ramoz et al., 2006, Sakurai, Cai, Grice & Buxbaum, 2011; Skaar et al., 2005; Ylisaukko-oja et al., 2005). Genetic events such as de novo mutations, single-nucleotide polymorphisms, copy number variations, and larger chromosomal abnormalities are also being explored (Sakurai et al., 2011). Additionally, researchers have explored a range of environmental factors that may be associated with the development of ASD symptoms such as family socioeconomic status, ethnicity, maternal age, and pre- and perinatal environmental features (Burd, Severud, Kerbeshian, 1999; Croen, Grether, & Selvin, 2002; Newschaffer et al., 2007; Wing, 1980). No environmental factors or genetic mutations alone accounts for all ASD diagnoses. It appears that children with ASD, through diverse and heterogeneous etiologies, develop the marked deficits inherent to the disorder, which manifest in their social, communication, and behavioral presentations.

Adaptive Functioning

With the passing of the Rehabilitation Act of 1971, specifically Public Law 94-112, the conceptualization of an individual's global functioning was changed to include measures of adaptive functioning skills. Previously, an individual's global functioning was evaluated predominately based on their intellectual functioning measured via intelligence testing (Tassé, 2009). Children with certain diagnoses including those with intellectual disabilities were excluded from public education (West, 2000). With the passing of the Individuals with Disabilities Education Act (IDEA), all children became eligible for public education in the least restrictive and optimally supportive environment to meet their needs (Crockett & Kauffman, 1999; IDEA, 2004). Further, a child's adaptive functioning skills were included in the assessment of eligibility for necessary special education services (IDEA, 2004; Reva & Bardos,

2011). As defined by the American Association on Intellectual and Developmental Disabilities (AAIDD, 2013), adaptive functioning is comprised of three domains: conceptual skills, social skills, and practical skills. Conceptual skills include communication through verbal language as well as reading and writing skills. Numerical skills such as mathematics, counting money, and telling time are also considered conceptual skills. Lastly, the AAIDD includes self-direction, or the ability to act with autonomy and independence, under conceptual skills domain. The social skills domain is made up of an individual's social problem solving and interpersonal skills. This domain also includes an individual's self-esteem, their relative gullibility or naïveté, and their ability to follow rules or laws and avoid victimization. The last domain, practical skills, includes activities of personal care and hygiene (commonly referred to as activities of daily living), occupational skills, the ability to utilize transportation, and manage and follow schedules and routines. Additionally, general safety skills, functionally using money, and operating the telephone are all also included within the practical skills domain. Together these three domains make up the broader construct of adaptive functioning skills (AAIDD).

Development of Adaptive Functioning

Individuals with TD demonstrate adaptive functioning levels that reflect their level of intellectual functioning. Individuals' ability to functionally engage in their environment is relatively predicted by and dependent on their intellectual functioning. Due to the normative intellectual functioning exhibited by TD children, it is not surprising that they also demonstrate normative adaptive functioning skills (Luckasson et al., 2002). Within TD populations, adaptive functioning is not yoked to intellectual functioning: the vast majority of TD adults exhibit perfect adaptive functioning regardless of their level of normative intellectual functioning. Therefore, due to the frequency of perfect adaptive functioning skills in most individuals, any deficits

within this construct are notable as significant deviations from typical functioning (Tassé et al., 2012).

During development, children with TD exhibit a predictable parallel pattern of intellectual and adaptive functioning development. As the individual matures and progresses cognitively, they will also exhibit increasingly complex adaptive functioning skills proportionately across all domains of the construct (Luckasson et al., 2002). For example, within the practical skills domain of adaptive functioning, an individual would be expected to perform certain self-help tasks proficiently in accordance with their current developmental level. By two years of age children are typically able to feed themselves with a spoon. By five years of age children can typically get dressed independently with minimal assistance. By 12 years of age children are able to do chores around the house such as washing the dishes. These self-care tasks are graduated such that as the child develops increasingly advanced cognitive functioning, their relative adaptive functioning skills also increase (Luckasson et al., 2002). Although it is rare for an individual with TD to show marked deficits in adaptive functioning skills, researchers have examined some environmental factors in childhood that predict delayed or deficient adaptive functioning development. One study found that high rates of parental depression were associated with decreased rates of adaptive functioning in children raised in such families (Beardslee, Schultz & Selman, 1987). Another study found children with poor self-regulation skills exhibited decreased adaptive functioning skills across all components of the construct (Buckner, Mezzacappa, & Beardslee, 2009). The same study also found an association between the adaptive functioning deficits in children from low-income families (Buckner et al., 2009). There is limited research examining the deviant development of adaptive functioning skills, perhaps due to the relatively minor deficits reported and the infrequency with which these deficits cause

functional impairment. However, numerous studies have demonstrated that adaptive functioning skills can fail to develop or decline due to a congenital or acquired neurological abnormality such as intellectual disability, Down's syndrome, brain aneurysm, or traumatic brain injury (Fay et al., 2009; Libb, Myers, Graham, & Bell, 1983; O'Toole, Borden & Miller, 2006; Soenen, Van Berckelaer-Onnes, & Scholte, 2009).

Patterns of Adaptive Functioning Deficits

Within clinical populations in which intellectual deficits are exhibited, individuals typically demonstrate a parallel yet depressed pattern of intellectual and adaptive functioning. For example, Down's syndrome can present as a range of intellectual functioning levels and research has shown that these individual's adaptive functioning parallels their relative level of intellectual functioning (Libb et al., 1983). Similarly, researchers have shown that individuals with mild intellectual disabilities, as well as individuals with cerebral palsy who exhibit intellectual disabilities, demonstrate proportionally decreased adaptive functioning skills as well (Soenen et al., 2009; Tripathi, 2006). It appears that individuals whom exhibit intellectual functioning deficits as a result of an intellectual or developmental disability typically express proportional adaptive functioning deficits. However, this pattern differs when examining the adaptive functioning of individuals with ASD and average intellectual functioning.

Adaptive Functioning Deficits in ASD

Intellectual functioning and ASD symptom severity predict deficit pattern of adaptive functioning. Unlike the pattern of intellectual and adaptive functioning deficits exhibited in other developmental disabilities, individuals with ASD and average intellectual functioning exhibit a distinctive pattern of adaptive functioning deficits. Individuals with ASD and average intellectual functioning, exhibit markedly lower levels of adaptive functioning than

would be anticipated from their cognitive functioning level (Carpentieri & Morgan, 1996; Freeman et al., 1991; Freeman et al., 1988; Green et al., 2000; Liss, Harle et al., 2001; Mahan & Matson, 2011; Perry et al., 2009). This pattern of disproportionately impaired adaptive functioning is unique to individuals with ASD and average intellectual functioning compared to those with below average intellectual functioning as well as youth with other developmental and intellectual impairments.

In addition to intellectual functioning, researchers have examined what other factors affect an individual with ASD's subsequent adaptive functioning deficits. Relative ASD symptom severity has been associated with an individual's level of adaptive functioning (De Bildt et al., 2005; Klin et al., 2007; Liss, Harle et al., 2001). Individuals with ASD with severe symptom presentations, exhibit adaptive functioning deficits comparable to their symptom profile. However, those with ASD and less severe symptoms, exhibit greater adaptive functioning impairments than would be anticipated from their symptom presentation (De Bildt et al., 2005; Klin et al., 2007; Liss, Harle et al., 2001). Individuals with ASD and either low symptom severity and high intellectual function exhibit more pronounced adaptive functioning deficits compared to individuals with ASD and significant symptom impairment or marked intellectual impairment. These deficits are surprising given their relatively mild ASD presentation. The counter intuitive relations between ASD symptom severity, level of intellectual functioning, and level of adaptive functioning in individuals with ASD has sparked considerable research in the field. The rigidity of the social and communication deficits in children with ASD has emerged as the leading hypothesis explaining these relations.

Interpersonal skills and functional communication deficits in ASD. The adaptive functioning deficits seen in children with ASD and average intellectual functioning are

hypothesized to relate to the rigidity of their core ASD deficits in the areas of socialization and communication. These deficits preclude children with ASD and average intelligence from developing typical adaptive functioning skills in these areas (Bolte & Poustka, 2002).

Researcher have found that higher IQ scores in children with ASD were not related to changes in their adaptive functioning skills, specifically in the areas of interpersonal skills and functional communication, whereas higher IQ scores in children with intellectual disabilities were associated with gains in adaptive functioning skills (Platt, Kamphaus, Cole, & Smith, 1991; Volkmar, Sparrow, Goudreau, Cicchetti, & Cohen, 1987). Heightened IQ in children with intellectual disabilities gives them a necessary boost to engage more constructively and independently in a variety of contexts. However, in children with ASD, their core social and communication deficits preclude them from improving their adaptive functioning skills, specifically their interpersonal and functional communication skills, as readily as children with intellectual disabilities without these rigid core deficits (Bolte & Poustka, 2002). The discrepancy between intellectual functioning and adaptive functioning (specifically in the areas of interpersonal skills and functional communication) is most pronounced in individuals with ASD and average intellectual functioning compared to those with on the spectrum with intellectual impairments. There is some evidence that the scope of adaptive functioning deficits in children with ASD is limited to the core ASD deficits of communication and socialization (Volkmar et al., 1987). However, recent research has highlighted deficits in other adaptive functioning skills outside the immediate purview of the ASD diagnosis including self-help skills and independence.

Self-help skill deficits in ASD. Apart from their interpersonal and functional communication impairments, researchers are beginning to examine other adaptive functioning

skill deficits in children with ASD. Not immediately accounted for by the core social and communication deficits of ASD, self-help skills are often an area of deficiency for these children (Flynn & Healy, 2012; Liss, Fein et al., 2001). Self-help skills or daily living skills are comprised of daily self-care activities such as self-feeding, personal hygiene, dressing and undressing, as well as more complex behaviors such as buying groceries, operating the telephone, and utilizing public transportation (McDowell & Claire, 1996). These tasks often represent societal expectations, which may or may not align with the goals of the individual child. For example, cleaning up after one's self may be the behavioral expectation, however a given child may have little concern as to whether they clean up a mess or not. Therefore, self-help skills could be thought of as supported by the individual's social awareness and investment in social expectation. Self-help skills are subsumed within the AAIDD's definition of practical skills, a component of adaptive functioning (AAIDD, 2013). Whereas no research to date has examined the outcomes associated with self-help deficits in children with ASD, a previous study showed that improving self-help skills in individuals with intellectual disabilities by fostering independence and self-reliance was predictive of positive outcomes such as increased residential and employment autonomy (Woolf, Woolf, & Oakland, 2010). These positive outcomes suggest the importance of targeting self-help skills in individuals with intellectual disabilities.

Additional research is necessary to assess a similar trajectory following a targeted self-help skills intervention for children with ASD. Further, no research to date has examined self-help skill deficits in children with ASD and average intellectual functioning versus a TD comparison group. In addition to self-help skill deficits, independence represents a related deficit area beyond the core social and communication deficits in children with ASD that may additionally contribute to their functional impairment.

Independence deficits in ASD. Preliminary research suggests that individuals with ASD may exhibit deficits in independence and autonomy in addition to their other adaptive functioning skill deficits (Drahota, Wood, Sze, & Van Dyke, 2011; Gaus, 2011; Lopata et al., 2012). Independence is included in the conceptual skills component of adaptive functioning and refers to an individual's ability to be self-directed and autonomous in order to independently meet his or her own needs (AAIDD, 2013). Independence therefore requires both the determination of a goal and the skills necessary to complete it. Depending on the goal, the required skills might include executive functions such as planning, delaying gratification or regulating emotions. Researchers have shown that independence is a deficit area in both children and adults with ASD (Gaus, 2011; Lopata et al., 2012). Notably, deficits in independence may predispose individuals with ASD to exhibit greater challenges in other adaptive functioning skill areas due to both the broad base deficits underlying the skill as well as the downstream effects of poor self-direction and initiation. Self-help skills in particular require a certain level of independence and autonomy in order to engage in activities such as self-hygiene or the independent utilization of public transportation. Therefore when individuals exhibit poor independence skills, it may significantly impact their overall functionality. A study targeting both independence and self-help skills in school-aged children with ASD through cognitive behavioral therapy (CBT) produced positive behavioral and mental health outcomes (Drahota et al., 2011). Although there is some preliminary research examining independence in children with ASD, no prior studies have assessed independence in children with ASD and average intellectual functioning compared to a TD control group. The current study will examine whether the adaptive functioning deficits of interpersonal skills, functional communication, self-

help skills, and independence exhibited in children with ASD and average intellect predict their relative internalizing symptoms.

Internalizing Symptoms

Internalization in children typically refers to symptoms of anxiety, depression, or somatization (Achenbach, 1978; Dingle et al., 2011). Internalizing symptoms manifest internally and are expressions of negative affect directed toward the self. These symptoms are often contrasted with externalizing symptoms, which are manifest externally and are other-directed (Achenbach, 1978). Symptoms of internalization are thought to predominantly develop in school-age children and continue into adolescence (Copeland, Shanahan, Costello, & Angold, 2009). However, researchers have demonstrated that internalizing symptoms can manifest as early as the preschool years (Sterba, Prinstein, & Cox, 2007). Internalizing symptoms that persist into adulthood can ultimately meet diagnostic criteria for psychiatric anxiety, mood, or somatoform disorders, develop into suicidal behaviors, and require psychiatric hospitalization (Liu, Chen, & Lewis, 2011). Additionally, childhood internalization is associated with other negative outcomes in adulthood. Children with internalizing symptoms report worse overall mental health, poorer peer relationships, higher rates of high school noncompletion, fewer employment opportunities, and earlier mortality in adulthood than individuals without childhood internalizing symptoms (Bayer et al., 2011; Campbell, 1995; Duchesne et al., 2008).

Researchers demonstrated in a 40 year longitudinal study that 70% of adolescents who endorsed internalizing symptoms at age 13-15 years maintained significant internalizing symptoms into adulthood (Colman, Wadsworth, Croudace & Jones, 2007). Additionally, the childhood presentation of a specific subtype of internalizing symptoms, for example anxiety symptoms, predisposes the individual to develop a different subtype of internalizing symptoms as an adult,

for example depressive symptoms (Pine, Cohen, Gurley, Brook, & Ma, 1998). Due to the poor prognostic outcomes associated with internalizing symptoms in childhood, it is important to understand the mechanisms by which these symptoms develop in different populations in order to effectively intervene.

Subtypes of Internalizing Symptoms

I will briefly describe the three subtypes of internalizing symptoms most commonly occurring in young children: anxiety, depression, and somatization. The broad clinical presentation of each symptom cluster within children with TD will be discussed as well as their reported prevalence within TD samples.

Anxiety symptoms. Anxiety symptoms refer to uncontrollable worry and apprehension that are disproportionate in intensity or duration to the proximal cause (APA, 2000). Of all psychiatric disorders, children experience anxiety disorders most frequently with estimates ranging from 5% to 20% (Costello & Angold, 1995). Researchers have found in older, broader age-range samples (9 to 13 years and 7 to 16 years respectively), that rates of anxiety symptoms are as follows: separation anxiety 0.3 - 3.5%, simple phobias 0.3 – 5.8%, social phobia 0.6 – 4.7%, overanxious disorder 1.4 – 1.6%, generalized anxiety disorder 1.7 – 2.1%, and obsessive-compulsive disorder 0.2% (Costello & Angold, 1995; Steinhausen et al., 1998). Only one study to my knowledge examined the prevalence of anxiety disorders within a narrow age range of very young children. Keenan and colleagues (1997) reported the 6-month prevalence of anxiety disorders in 5-year-old children. They found the following rates: separation anxiety 2.3%, simple phobias 11.5%, social phobias 4.6%, and overanxious disorder 1.1%. They reported the prevalence of any internalizing disorder in their sample at 14.9%. Researchers have noted that prevalence rates of anxiety in young children from narrow age range samples (e.g. 5-7 years)

exceed rates reported by older children from broader age ranges (e.g. 7-16 years; Bolton et al., 2006). These findings suggest that anxiety disorders manifest relatively frequently in early childhood and whereas some individual's symptoms may attenuate, those whose persist may maintain into adolescence and adulthood. No research to date has examined the prevalence of anxiety symptoms in TD children under the age of 5.

Depressive symptoms. Depressive symptoms are characterized by a sad mood or loss of interest or pleasure in previously enjoyed activities (APA, 2000). The mean age of onset for depressive symptoms is 14.9 years, yet there is evidence that children as young as 3 years old present with depressive symptoms (Copeland et al., 2009; Lewinsohn, Clarke, Seeley, & Rohde, 1994). The manifestation of depressive symptoms in young children may present somewhat differently than depressive symptoms in adults (Bhardwaj & Goodyet, 2009). Instead of demonstrating a markedly depressed mood, children with depressive symptoms may appear irritable. Further, their mood may be more reactive and less intractable than adult depressive symptoms; their mood may temporarily improve with positive experiences. Children with depressive symptoms may express suicidal ideation but suicidal plans are simplistic or unrealistic. Lastly, childhood depressive symptoms typically do not include psychotic features but when present auditory hallucinations are most common (Ryan et al., 1987). Although prevalence rates of major depressive disorder in preschool children have not been widely studied, some limited research has compared preschool rates to rates in childhood and adolescence. Researchers found a 1% prevalence in preschool children, 2% in school-aged children, and 5-8% in adolescents (Birmaher & Brent, 1998; Jellinek & Snyder, 1998). However, subthreshold depressive symptoms present in an additional 5-10% of children across each age group (Bhardwaj & Goodyet, 2009). Researchers believe that the prevalence of depressive symptoms

in children is increasing and that the relative age of onset is becoming younger (Gershon, Hamovit, Guroff, & Nurnberger, 1987; Kovacs & Gatsonis, 1994). Additionally, rates of depressive symptoms in children ages 5 and 6 have been shown to predict depressive symptoms at a four year follow up (Ialongo, Edelsohn, Werthamer-Larsson, Crockett & Kellam, 1993). These results suggest that depressive symptoms manifesting in early childhood are becoming increasingly prevalent and these symptoms may remain stable as the child matures.

Somatic symptoms. Somatic symptoms are characterized by physical complaints that have no underlying physical cause and are believed to be psychologically generated (APA, 2000). Common somatic symptoms include headaches, nausea, and stomachaches but can also include symptoms such as dizziness, chest pain, back pain, or fatigue (Chapman, 2005). Somatic symptoms are typically reported between 20 to 40% for children under 10 years old and increase to 55% for children under 15 years old (Bass & Murphy, 1995; Domènech-Llaberia et al., 2004). Additionally, somatic symptoms have not been studied in children under 5 years old, making the determination of an accurate age of onset especially difficult (Domènech-Llaberia et al., 2004). Researchers speculate that somatic symptoms typically onset during early childhood and while some individual's symptoms abate, others' symptoms are maintained into adolescence and adulthood (Chapman, 2005). Additionally, individuals who suffered from somatic symptoms as children are more likely to develop a somatoform disorders as adults (Larsson, 1991; Lipowski, 1988). Additionally, the presence of childhood somatic symptoms increases the individual's risk for developing any psychiatric disorder later in adulthood (Lipowski, 1988). Somatic complaints comprise a significant clinical issue that affects many young children and may additionally predispose them to other psychological issues as they mature.

Internalizing Symptoms in ASD

Children with ASD frequently experience co-occurring internalizing symptoms such as anxiety, depressive, or somatic symptoms. Rates of co-occurring internalizing symptoms in children with ASD are reported to range from 40 to 80% (Leyfer et al., 2006; Green et al., 2000; McPheeter et al., 2011). Reported rates vary depending on a given study's age range, inclusion criteria, and method of referral. Of the three main symptom clusters of internalizing problems, depression and anxiety symptoms occur most frequently in children with ASD (Zahn-Waxler, Klimes-Dougan, & Slattery, 2000). A recent study reported the percentages of co-occurring anxiety or depression endorsed at syndromal or subsyndromal levels in an ASD sample (mean age: 9.2 years): 24% indicated symptoms of depression, 5% generalized anxiety, 19% separation anxiety, and 10% social phobia (Leyfer et al., 2006). Due to the high frequency of depression and anxiety symptoms in children with ASD, it is important to explore the factors that influence these associations.

In addition to symptoms of anxiety and depression, somatic symptoms also occur in children with ASD; however, there is limited research examining these symptoms. Only two studies have explored the frequency of somatic symptoms within children with ASD (Park et al., 2012; Whitely, 2003). Park et al. (2012) reported 13% of four to 15-year-old children with ASD (mean age = 5.36 years) endorsed somatic complaints. However, researchers failed to provide prevalence rates for their sibling control group for comparison. Similarly, Whitely (2003) reported high rates of somatization for a myriad of somatic problems in children with ASD (mean age: 7.67 years). However, no control group was included for comparison in this study. Methodological limitations of these studies preclude researchers from reliably determining prevalence rates of somatization in children with ASD. However, based on these preliminary

findings and the frequent co-occurrence of other internalizing problems in children with ASD, it is important to further explore the nature of somatization in these children. The prevalence of internalizing symptoms in children ASD has prompted researchers to explore the specific risk factors for developing these symptoms. Exhibiting symptoms of ASD with average intellectual functioning appears to be one such risk factor for developing additional internalizing symptoms.

Children with ASD and average intellectual functioning are at greater risk for internalizing problems. Due to the frequent co-occurrence of internalizing problems in children with ASD, researchers are beginning to explore which ASD subtypes are most prone to developing these symptoms. A robust body of research has shown that individuals with ASD and average intellectual functioning are at greater risk for developing internalizing problems than those with ASD and intellectual impairments (DeLong & Dwyer, 1988; Estes et al., 2007; Mazurek & Kanne, 2010). Greater insight regarding their ASD symptoms may be more distressing to children with ASD and average intellect versus those with intellectual impairments and more likely to result in a range of subsequent internalizing problems (Bellini, 2004; Hedley & Young, 2006). Due to the high prevalence of internalizing symptoms in children with ASD and specifically those with average intelligence, researchers are beginning to examine the negative outcomes that are uniquely associated with internalizing symptoms across the spectrum of ASD.

Only one prior study specifically addressed the negative outcomes associated with internalizing problems in the lives of children with ASD, specifically those with average intellectual functioning. In a longitudinal study, researchers showed that children with ASD and average intelligence exhibited more aggression and had poorer relationships with their peers, parents, and teachers when they also exhibited elevated internalizing problems than children with

ASD and average intellect without additional internalizing problems (Kim et al., 2000). The authors further suggested that while not yet widely empirically supported, the presence of internalizing symptoms in children with ASD may mirror poor prognostic outcomes faced by children with TD and internalizing symptoms. These outcomes include worse overall mental health, increased risk for other psychiatric conditions, and poorer peer relationships in adulthood (Bayer et al., 2011; Campbell, 1995; Duchesne et al., 2008). Additionally, the maladaptive trajectory of internalizing symptoms in young children would likely be exacerbated further by the ASD symptomatology in children with ASD and average intellectual functioning. In order to intervene prior to the development of internalizing symptoms in these children, it is important to understand the mechanism by which these symptoms develop. In the current study I will investigate whether adaptive functioning deficits explain the relation between ASD with average intellectual functioning and internalizing problems. The empirical support for these relations is detailed below including the numerated hypotheses of the current study.

Current Study

Adaptive Functioning Deficits Predict Elevated Internalizing Problems in Children with ASD and Average Intellectual Functioning

The failure to acquire new adaptive functioning skills at a developmentally appropriate rate results in greater functional impairment for children as they mature. Additionally, deficits in adaptive functioning closely translate to an individual's potential opportunities and more broadly their quality of life (Williams et al., 2006). Children with ASD and average intellectual functioning, compared to children with intellectual disabilities with or without ASD, are particularly aware of their deficits, the relative norms of their peers, and the stigmatizing nature of their impairments. This awareness results in dramatically increased emotional distress in

children with ASD and average intellectual functioning (DeLong & Dwyer, 1988; Estes et al., 2007; Mazurek & Kanne, 2010). Further, children with ASD and average intelligence are prone to develop co-occurring internalizing problems due to their elevated awareness of their own symptoms and deficits and the resulting emotional distress this awareness likely engenders. Researchers maintain that the discrepancy in intellectual functioning between children on the autism spectrum accounts for the varied prevalence of internalizing symptoms based on intellectual ability (Bellini, 2004; Hedley & Young, 2006). Similar to other behavioral or social deficits, children with ASD and average intellectual functioning may exhibit an awareness of their adaptive functioning deficits that could result in increased internalizing problems as well. Only one study to my knowledge has directly examined the relation between adaptive functioning skill deficits and internalizing problems broadly in children with ASD (age range: 7 – 11 years, mean = 9.2 years). In this study researchers delivered a CBT treatment targeted to improve the self-help skills and independence of children with ASD. Following the intervention, children in the treatment group endorsed decreased levels of anxiety compared to the waitlist control group (Drahota et al., 2011). These results suggest an association between deficits in independence and self-help skills and subsequent anxiety in children with ASD. It appears that components of adaptive functioning, when deficient, relate to certain elevated internalizing symptoms in children with ASD. Further research is needed to assess the relations between deficits in other adaptive functioning domains and additional internalizing symptoms in children with ASD and average intellectual functioning.

Hypotheses

I examined young children's adaptive functioning skills, specifically measures of interpersonal skills, functional communication, self-help skills and independence, in relation to

developmental status (ASD versus TD) and internalizing symptoms, specifically a composite measure assessing children's anxiety, depressive, and somatic symptoms.

Hypothesis 1. In this study I evaluated whether child developmental status (ASD versus TD) predicted children's overall internalizing symptoms. Several previous studies have shown that children with ASD, particularly those with average intellectual functioning, exhibit rates of internalizing symptoms greater than those reported by children with TD (Green et al., 2000; Leyfer et al., 2006; McPheeter et al., 2011). Given the current sample, all children within the ASD group exhibited average or above intellect as defined by high levels of verbal functioning. Researchers assert that increased intellectual functioning in children with ASD and average intellect results in greater self- and social-awareness resulting in elevated internalization symptoms within this group (Bellini, 2004; DeLong & Dwyer, 1988; Estes et al., 2007; Hedley & Young, 2006). No prior studies to my knowledge have examined the prevalence of broadband internalizing symptoms in such young children with ASD and average intellectual functioning. Due to this lack of research with young children on the spectrum, I assessed both parent and teacher report of children's internalizing symptoms in order to isolate the best reporter of these problems. I hypothesized that children in the proposed ASD sample will exhibit elevated rates of internalizing symptoms as assessed through the internalizing symptom composite as measured by both the parent and teacher report.

Hypothesis 2. I assessed whether child developmental status predicted adaptive functioning skills. Significant previous research has reported adaptive functioning skill deficits in children with ASD (Carpentieri & Morgan, 1996; Freeman et al., 1988; Freeman et al., 1991; Green et al., 2000; Liss, Harle et al., 2011; Mahan & Matson, 2011; Perry et al., 2009). However, adaptive functioning deficits within social and communication domains are somewhat explained

by the core ASD deficits and do not represent new phenotypic information about additional deficits in this population (Bolte & Poustka, 2002; Volkmar et al., 1987). Researchers are beginning to examine other adaptive functioning domains that may be deficient in children with ASD. Specifically, self-help skills appear to be a problematic area for these children (Flynn & Healy, 2012; Liss, Fein et al., 2001). Additionally, children with ASD show a related deficit in independence (Drahota, Wood, Sze, & Van Dyke, 2011; Gaus, 2011; Lopata et al., 2012). Although limited research has investigated self-help skills and independence specifically within children with ASD and average intellectual functioning, several studies suggest that these children tend to exhibit greater adaptive functioning deficits than children with ASD and intellectual impairments (Carpentieri & Morgan, 1996; Freeman et al., 1991; Freeman et al., 1988; Green et al., 2000; Liss, Harle et al., 2001; Mahan & Matson, 2011; Perry et al., 2009). Therefore, it was hypothesized that children with ASD and average intellect would exhibit decreased interpersonal and functional communication skills consistent with an ASD diagnosis as well as decreased self-help skills and independence consistent with previous findings compared to the TD group.

Hypothesis 3. I examined whether adaptive functioning would predict levels of internalizing symptoms. One previous study has examined the relation between adaptive functioning deficits and internalizing symptoms in children with ASD. Drahota et al. (2011) reported that by fostering self-help skills and independence in children with ASD, these children subsequently reported decreased rates of anxiety compared to baseline. These results suggest an association between adaptive functioning deficits and certain elevated internalizing symptoms within children with ASD. Therefore, I hypothesized that lower rates of adaptive functioning

skills would predict higher rates of internalizing symptoms, as indexed by the internalizing symptoms composite.

Hypothesis 4. I assessed whether the relation between developmental status and internalizing symptoms would be mediated by children's adaptive functioning skills. The mediation model of these associations is shown in Figure 1. Specifically, I hypothesized that children in the ASD group will report elevated internalizing symptoms, which would be explained by their deficient adaptive functioning skills, specifically in the areas of interpersonal skills, functional communication skills, self-help skills, and independence.

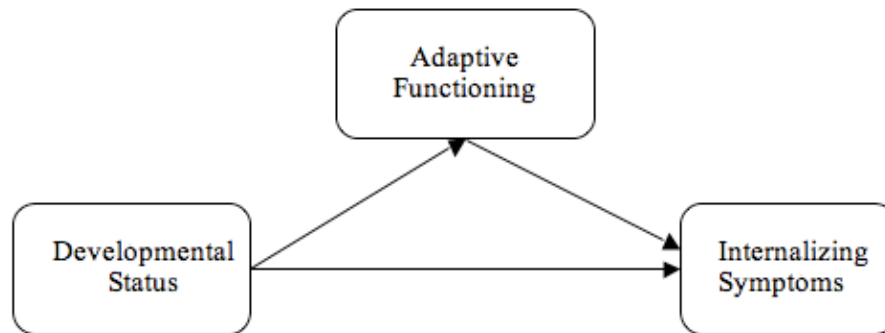


Figure 1. Proposed model of the mediation effects of adaptive functioning skills on the relation between developmental status and internalizing symptom.

Only one study to my knowledge has examined the relation between adaptive functioning and internalizing symptoms in children with ASD (Drahota et al., 2011). This study examined self-help and independence as predictors of anxiety symptoms in children with ASD and average intellectual functioning. Following a CBT intervention targeting self-help skills and independence, Drahota and colleagues (2011) reported decreased rates on anxiety in the children with ASD and average intelligence. Based on the above empirical support, I hypothesized that adaptive functioning skills (interpersonal skills, functional communication skills, self-help skills,

and independence) would all be predictive of internalizing symptoms due to the propensity for children with ASD and average intellectual functioning to internalize the emotional distress resulting from their deficits (Bellini, 2004; DeLong & Dwyer, 1988; Estes et al., 2007; Hedley & Young, 2006; Mazurek & Kanne, 2010). More specifically, I expected that the ASD group would exhibit elevated internalizing symptoms, which would be explained by their adaptive functioning deficits.

Chapter 2: Method

Participants

The current study took place in part of a larger study examining the self-regulation of children with ASD and TD. Pertaining to the current study, 70 children ages 3:0 to 6:11 years, one parent or legal guardian and the child's most recent teacher participated. Forty-four children comprised the TD group whereas 26 children made up the ASD group. The ASD group was defined by a diagnosis of autism spectrum disorder, autistic disorder, Asperger's disorder, or PDD-NOS. The groups did not vary significantly based on child age, sex, or ethnicity. However, significant group differences were noted in terms of children's average verbal ability. Children with TD indexed significantly higher average verbal ability scores than children with ASD. Pertaining to family characteristics, the two groups did not differ in terms of average family income. However, children in the ASD group had significantly more instances of reported maternal depression compared to the TD group (see Table 1).

Procedures

Recruitment. Participants were recruited through a variety of methods. Members of the research team left flyers with contact information at public and private schools, mental health centers, hospitals, autism clinics, libraries, and community centers in the greater Seattle area. In addition, research team members set up informational tables at select locations to speak with parents about participating in the study. We also advertised for the study in local magazines (e.g. *Parent Map*, *Seattle Child*) and on autism listservs (e.g. www.seattleasperger.org, www.feetwa.org). All recruitment materials provided general information and enrollment criteria for the study as well as contact information for the enrollment coordinator who facilitated

Table 1
Demographic Characteristics by Group

Variable	TD (<i>n</i> = 44)	ASD (<i>n</i> = 26)	<i>t</i> / <i>X</i> ²
<i>Child Variables</i>			
Average age in months (<i>SD</i>)	55.75 (13.13)	58.12 (15.12)	-0.69
Average verbal ability	112.48 (11.23)	99.20 (10.79)	4.79***
Average VMA	5:23 (1:34)	4:74 (1:37)	1.45
Sex, N (% male)	25 (55.6%)	20 (44.4%)	2.88
Ethnicity, N (%)			7.46
Caucasian	37 (84.10%)	16 (61.54%)	
African American	3 (6.82%)	4 (15.38%)	
Asian American	4 (9.10%)	2 (7.69%)	
Multiethnic	0 (0%)	1 (3.85%)	
<i>Family Variables</i>			
Maternal history of depression	6 (13.6%)	11 (42.3%)	8.05**
Average annual income (<i>SD</i>)	\$148, 540 (\$110, 027)	\$110,285 (\$62,969)	1.47

Note. Verbal ability = Verbal Reasoning Cluster Standard Score from the DAS-II; VMA = verbal mental age.

p* < .05, *p* < .01, ****p* < .001

scheduling the family for the enrollment visit.

Enrollment visit. The enrollment visit took place at either the child's home or a local library if the parent preferred. The enrollment visit lasted between 60 to 90 minutes and was conducted by a graduate level research assistant with the help of an undergraduate research assistant. Parental consent and child assent were obtained at the beginning of the visit. Additionally, parents of children with ASD were asked to sign a medical release in order for researchers to confirm the child's ASD diagnosis. All parents were also asked to sign a teacher information release to allow researchers to contact the child's teacher to request they complete several questionnaires regarding the child's behavior in the classroom setting. The parents completed with the undergraduate research assistant a packet of questionnaires including demographic information about themselves and their child as well as several screener questionnaires. Parents were asked to complete the Social Communication Questionnaire -

Current Form (SCQ; Rutter et al., 2003) to verify developmental diagnosis. Children with TD were required to score 15 or below to qualify for inclusion in the study. During the enrollment visit the child completed a series of tasks including the Differential Abilities Scale – Version II (DAS-II; Elliot, 2007) to measure the child’s verbal intelligence quotient (IQ) and to assess whether they met the verbal requirements necessary to complete the study. Children who scored above 85 on the DAS-II and who met criteria on the SCQ were eligible to enroll in the remainder of the study.

In addition to the questionnaires listed above, the parent also completed two additional questionnaires pertinent to the current study. First, the Adaptive Behavior Assessment System – II (ABAS-II; Harrison & Oakland, 2003) was completed by the parent at the enrollment visit to assess components of the child’s adaptive functioning skills. Specifically, from the ABAS-II the parent completed the Home Living and Self-Direction subscales to assess the child’s self-help skills and independence respectively. Additionally, the parent also completed the Behavior Assessment System for Children – 2, Parent Report (BASC-P2; Reynolds & Kamphaus, 2004) to assess the child’s level of internalizing symptoms as well as measures of their interpersonal skills and functional communication. The Internalizing Problems composite and the Social Skills and Functional Communication subscales were used in the present study.

University visit. The university visit lasted between 90 to 120 minutes. The child and one of their parents or a legal guardian came into the developmental research laboratory and completed a battery of self-regulation, attention, and emotion tasks. These tasks were audio and video recorded for later data coding. At the completion of the visit, parents received \$50 and a \$5 coffee card as a thank you for their participation. Each child received a small toy worth approximately \$5 and stickers throughout the assessments.

Teacher Questionnaires. Graduate research assistants mailed a packet of questionnaires to the child's most recent teacher to assess their skills and behaviors within the school setting. In total the questionnaires required approximately 30 minutes to complete. Pertinent to the current study, the teacher completed the Behavior Assessment System for Children – 2, Teacher Report (BASCT-2; Reynolds & Kamphaus, 2004) to assess the child's level of internalizing symptoms. The Internalizing Problems composite was used in the current study. A self-addressed and stamped envelope was included with the questionnaire packet for the teacher to return the testing materials in. Upon receipt of the completed questionnaires, the teacher was mailed \$25 and a \$5 coffee card.

Measures

Demographic variables. Parents completed a demographic questionnaire assessing a host of child and family characteristics including child age, gender, and pre- and perinatal incidents as part of the larger self-regulation study. Correlational analyses were conducted to examine potential covariates.

ASD symptomatology. To assess the presence of ASD symptoms in the TD group, parents completed the Social Communication Questionnaire - Current Form (SCQ; Rutter et al., 2003) as a screener of ASD symptoms. The SCQ, previously called the Autism Screening Questionnaire, is a 40-items questionnaire that assesses the three core deficits areas in ASD as defined by the DSM-IV-TR: communication, socialization, and restrictive interest or repetitive behaviors. These core deficit areas are represented in the three domains measured by the SCQ. The communication domain assesses the child's verbal and nonverbal communication skills (e.g., "Does her/his facial expression usually seem appropriate to the particular situation, as far as you can tell?"). The social interaction domain assesses the child's social and interpersonal

skills (“Does she/he have any particular friends or best friend?”). Lastly, the restricted, repetitive, and stereotyped pattern of behavior domain assesses the presence of behavioral symptoms common in children with ASD (e.g., “Does she/he ever have any special interests that are unusual in their intensity but otherwise appropriate for her/his age and peer group [e.g., trains or dinosaurs]?”). The SCQ was designed as an ASD screener and informs clinicians as to whether or not further assessment of children’s ASD symptomatology is necessary (Allen, Silove, Williams, & Hutchins, 2007). The SCQ was intended to be used with children 4 years old and above with a mental age of at least 2 years. However, it has since been validated as an accurate screening tool for children as young as 3 years old (Allen et al., 2007). Each item uses a forced choice yes/no format indicating a score of 0 for “no” responses and 1 for “yes” responses. The questionnaire took approximately 10 minutes to complete by the child’s parent or primary caregiver.

The current study utilized a cutoff score of 15 for children in the TD group. The SCQ’s sensitivity and specificity at this cutoff is 85% and 75% respectively (Berument, Rutter, Lord, Pickles, & Bailey, 1999). Additionally, the SCQ has high internal consistency with α ranging from .84 to .93 (Rutter et al., 2003) and discriminant validity between PDD and non-PDD diagnoses of 0.88 (Berument et al., 1999). In the current sample the internal consistency of the SCQ was 0.67.

Verbal abilities. Children’s verbal abilities were assessed using the Differential Abilities Scale - Version II (DAS-II; Elliott, 2007). This assessment was used as a screener to ensure the child had the minimal verbal abilities necessary to complete the study (e.g. follow two-step directions). Additionally, the DAS-II was used for calculating verbal mental age, which was used as a control variable in later statistical analyses. The DAS-II is an assessment of children’s

cognitive abilities between the ages of 2:6 and 17:11 years. The present study utilized the DAS-II Early Years cognitive battery, specifically the verbal reasoning cluster, which assess the child's knowledge of verbal concepts (Honaker, Gozal, Bennett, Capdevila, & Spruyt, 2009). This cluster includes two subtests: The Verbal Reasoning subtests, an assessment of receptive language abilities, and the Naming Vocabulary subtest, an assessment of expressive language abilities. The sum of the two subtest scores is converted into a T score with a mean of 100 and a standard deviation of 15. Children are required to score 85 or above to participate in the larger study.

Adaptive functioning. Children's adaptive functioning skills were assessed using subscales and composite scores from two different questionnaires. First, measures of children's overall adaptive functioning, interpersonal skills and functional communication were assessed using the Behavior Assessment System for Children – 2, Parent Report, Preschool Version and Elementary Version (BASC-2 PRS; Reynolds & Kamphaus, 2004). All items were scored on a 4-point Likert scale of frequency ranging from 0 (*never*) to 3 (*almost always*). In the current study, I used two subscales from the Adaptive Scales index: Social Skills comprised of 9 items on the Preschool Version and 8 items on the Elementary Version, and Functional Communication comprised of 11 items on the Preschool Version and 12 items on the Elementary Version. The Social Skills subscale evidenced an internal consistency of 0.89 and the Functional Communication subscale produced an internal consistency of 0.84.

In addition to the above measures of adaptive functioning, children's self-help skills and independence were assessed using the Adaptive Behavior Assessment System – II (ABAS-II; Harrison & Oakland, 2003). Both the Parent/Primary Caregiver Form (ages 0-5) and the Parent Form (ages 5-21) will be used in the current study. Both test forms contain 10 skill areas

assessing various adaptive functioning components. For the current study, two skill areas were administered: Home Living to assess children's self-help skills and Self-Direction to assess children's relative independence. Both of the skill areas were comprised of 25 items each across both test forms. All items are scored using a 4-point Likert scale on frequency of the behavior from 0 (*is not able*) to 3 (*always when needed*). The Home Living subscale evidenced an internal consistency of 0.90 and the Self-Direction subscale produced an internal consistency of 0.88.

Internalizing symptoms. Children's internalizing symptoms were assessed using the Behavioral Assessment System for Children – 2, Preschool Version and Elementary Version, Teacher Rating Scales and Parent Rating Scales (BASC-2 TRS; BASC-2 PRS; Reynolds & Kamphaus, 2004). In the current study I used the Internalizing Composite score for both the PRS (Preschool Version: 37 items; Elementary Version: 40 items) and the TRS (Preschool Version: 28 items; Elementary Version: 27 items). The BASC-2 TRS and PRS is scored on a 4-point Likert scale of frequency ranging from 0 (*never*) to 3 (*almost always*). The teacher report of internalizing symptoms evidenced an internal consistency of 0.84 and the parent report of internalizing symptoms produced an internal consistency of 0.89.

Chapter 3: Results

Power Analysis

To determine adequate sample size for the current study, an a priori power analysis was completed using the statistical software G*Power (Faul, Erdfelder, Buchner, & Lang, 2009).

The power analysis utilized a multiple regression design with three predictor variables: developmental status, adaptive functioning, and internalizing symptoms. However, given prior research, I anticipated controlling for child gender, verbal mental age, and socioeconomic status in order to isolate the individual contributions of the variables of interest (Bellini, 2004; Buckner et al., 2009; Estes et al., 2007; Hedley & Young, 2006). All six variables (developmental status, adaptive functioning, internalizing symptoms, gender, verbal mental age, and socioeconomic status) were entered as predictors in the subsequent power analysis. Cohen's f^2 effect size was set at .15, a conservative effect size, because the only prior study examining adaptive functioning and internalizing symptoms in children with ASD and average intellectual functioning reported between small and medium effect sizes (Drahota et al., 2011). The alpha level was set at .05 and the power level was set at .80. Based on these criteria, a minimum of 77 participants would be necessary in order for the analyses to be adequately powered. Analyses in the current study may have been somewhat underpowered ($N = 70$) to detect statistically significant effects.

Data Entry and Preparation

Data will be entered and analyzed using the Statistical Package for the Social Sciences (SPSS) Version 20 software. The following control variables were anticipated and were entered as follows. Family income was entered as a continuous variable in terms of number of dollars. Child gender will be entered as a dummy coded categorical predictor (0 = *female* and 1 = *male*).

Lastly, children's verbal mental age will be calculated using their DAS-II (Elliott, 2007) standard score and the following formula:

$$\frac{(((\text{Child_AgeYears} * 365.25) + (\text{Child_AgeMonths} * 30)) / 365) * .01 * \text{STANDARD SCORE}}{\text{SCORE}} = \text{VMA expressed in years.}$$

Verbal mental age was entered as a continuous variable. The variables of interest were entered as follows. Developmental status was entered as a dummy coded categorical variable (-1 = *ASD* and 1 = *TD*). The four measures of adaptive functioning (interpersonal skills, functional communication, self-help skills, and independence) were all entered as continuous variables. Similarly, the internalizing symptoms composite was also entered as continuous variable.

Data Screening

Prior to statistical analyses, the data was screened for missingness and assessed for violations of the assumptions of multiple regression. Pertaining to missingness, parent participants evidenced 2.04% missing data across all study materials whereas six teachers failed to return their packet of assessments (8.57%). Neither the parent nor teacher non-response rate differed by group. As a result, cases with missing data were omitted pairwise when analyses utilized variables. Pertaining to the assumptions of multiple regression the following potential violations were assessed: linearity, homoscedasticity, independence, normality, and multicollinearity.

Linearity. The assumption of linearity requires that the relation between the independent variable (IV) and the dependent variable (DV) be linear. In order to assess this assumption, the data was examined graphically and a best-fit line was imposed to assure that the data does not follow a quadratic or cubic trajectory. Additionally, a graph of the residuals and the predicted values were plotted on a scatter plot to assess the linearity of the relations between the variables.

The data points appeared randomly and evenly dispersed around zero such that I concluded the assumption had been met.

Homoscedasticity. The assumption of homoscedasticity refers to the variance of the residuals being constant across all values of the IV (Field, 2009). Homoscedasticity of the residuals was assessed by creating graphical partial plots. Upon evaluation, the data appeared evenly diffuse around the line with no obvious outliers. Therefore the data was determined to meet the assumption of homoscedasticity.

Independence. The assumption of independence maintains that a given residual from one observation is not related to the residual of another observation. To test the serial dependence between residuals, I conducted the Durbin-Watson test (Field, 2009). Values less than 1 or greater than 3 are indicative of residual dependence. The Durbin-Watson test yielded a statistic of 2.02 indicating a high likelihood of residual independence.

Normality. The normality assumption states that the distribution of residuals within the data should follow a normal distribution (Field, 2009). To assess normality, I visually inspected the data graphically with both a histogram and a probability-probability plot (P-P plot). The histogram of the residuals appeared to be normally distributed in a bell-shaped curve and the P-P plot showed z scores plotted closely along the diagonal line with equal dispersion along all values of the variables. Therefore, I concluded that the residuals of the data were normally distributed.

Multicollinearity. Multicollinearity occurs when there is high covariance between two predictor variables (Field, 2009). This assumption was assessed through preliminary correlational analyses. As seen in Table 2, several adaptive functioning measures were highly correlated with one another (e.g., independence and self-help skills). However, due to the

theoretical justification that different adaptive functioning skills may represent unique constructs and potentially unique deficit areas in children with ASD, I decided not to combine any variables at this stage in order to adequately address this question. Prior to proceeding, other measures of multicollinearity were evaluated such as the VIF and tolerance statistic. Neither metric approached values indicative of multicollinearity (Field, 2009) suggesting that subsequent analyses will not be compromised by the inclusion of these variables within the same model.

Data Analytic Plan

I assessed the hypothesized relations between developmental status, adaptive functioning skills, and internalizing symptoms through two double mediation analyses using hierarchical multiple regression (Baron & Kenny, 1986; Preacher et al., 2007). However, prior to analyzing the complete models, each leg of the model was assessed individually.

Hierarchical multiple regression was utilized in order to assess the individual pathways of the more complex proposed model (Hypotheses 1 through 3). The following pathways were examined. 1. Internalizing symptoms were regressed on developmental status such that I compared the strength of the association between developmental status and both parent and teacher report of children's internalizing symptoms. However, in order to limit the risk of familywise error, only outcomes that yielded a significant direct effect were utilized in subsequent analyses. 2. The four measures of adaptive functioning skills were regressed on diagnostic status. 3. Social skills and functional communication were regressed on internalizing symptoms controlling for diagnostic status. 4. Self-help skills and independence were regressed on internalizing symptoms controlling for diagnostic status. Hypothesis 4 was evaluated both utilizing the hierarchical multiple regression described above as well as via the SPSS macro, Process.

In order to further assess the statistical significance of the indirect effects and to maximize statistical power, I used the resampling technique non-parametric bootstrapping within Process utilizing the simple mediation model provided in model 4 (Preacher et al., 2007). First, I assessed the relations between developmental status and internalizing symptoms as mediated independently by children's social skills and functional communication. These two adaptive functioning skills were analyzed together as they both relate to core deficit areas within the ASD diagnostic criteria and were highly correlated ($r = 0.75$). The second double mediation assessed the relations between developmental status and internalizing symptoms as mediated independently by children's self-help skills and independence. These two adaptive functioning constructs were analyzed together due to their effects falling outside the ASD diagnostic criteria and representing additional impairments. Self-help skills and independence were correlated $r = 0.65$. The double mediation models of these associations are shown in Figure 2 and 3.

Nonparametric bootstrapping estimates the hypothesized indirect effects using 10,000 samples with a 95% confidence interval (Preacher et al., 2007). The confidence intervals were consulted to determine whether the indirect effect of developmental status on the internalizing symptoms composite through the given adaptive functioning skill were significant.

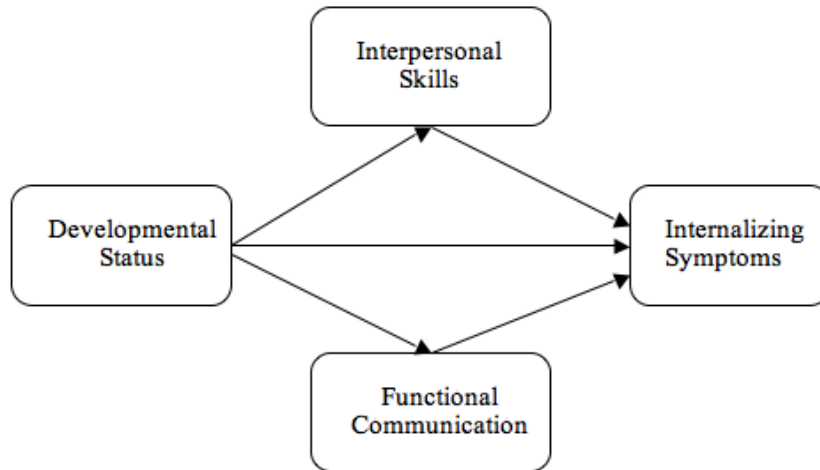


Figure 2. Proposed model of mediational relations between developmental status and internalizing symptoms through interpersonal skills and functional communication.

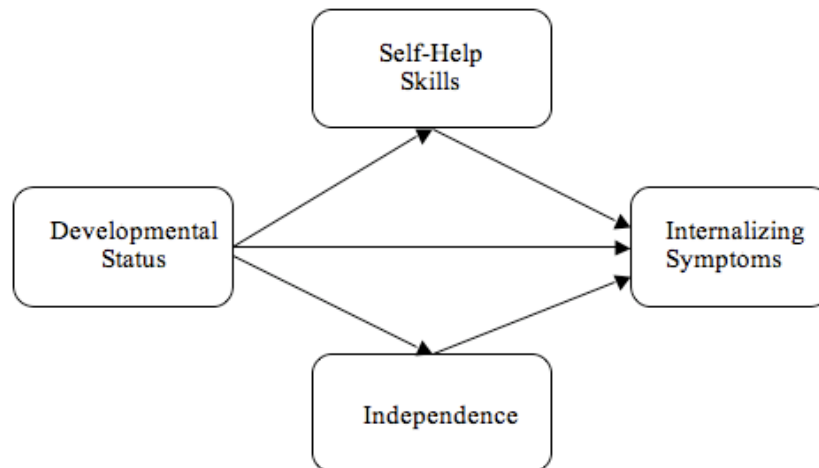


Figure 3. Proposed model of mediational relations between developmental status and internalizing symptoms through self-help skills and independence.

Descriptive Analyses

In order to illustrate the similarities and differences between the TD and ASD group in terms of study variables, the means, standard deviations, t statistic, and effect sizes are reported

in Table 2. As noted, The TD and ASD group differed significantly on every measure of adaptive functioning. Further, the magnitude of this effect was large across all four measures of adaptive functioning. Pertaining to internalizing symptoms, the groups did not differ significantly on this metric based on either teacher or parent report.

Table 2

Variable	Means (<i>SD</i>)			<i>t</i>	<i>d</i>
	Total (<i>n</i> = 70)	TD (<i>n</i> = 44)	ASD (<i>n</i> = 26)		
<i>Adaptive functioning measures</i>					
Functional communication	47.38 (10.71)	51.57 (7.74)	39.71 (11.27)	4.60***	1.61
Social skills	48.03 (11.19)	53.18 (8.84)	38.58 (8.66)	6.56***	1.55
Self-help skills	7.59 (3.86)	9.07 (3.87)	5.42 (2.66)	3.74***	0.95
Independence	8.27 (4.05)	10.18 (3.60)	5.46 (2.89)	5.57***	1.41
Internalizing symptoms, TR	51.92 (13.30)	50.15 (9.28)	55.09 (18.26)	-1.44	0.37
Internalizing symptoms, PR	52.03 (13.63)	49.30 (10.13)	56.84 (17.46)	-1.98	0.69

Note. Internalizing symptoms, TR = teacher report of internalizing symptoms on the BASC-II; internalizing symptoms, PR = parent report of internalizing symptoms on the BASC-II.
p* < .05, *p* < .01, ****p* < .001

Next, correlational analyses were conducted to evaluate potential covariates between study variables and demographic control variables (see Table 3). While no control variables were significantly correlated with the main outcome variables, teacher and parent report of children's internalizing symptoms, several other significant relations were found. Children's chronological

Table 3
Bivariate Correlations among Study and Control Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	
<i>Study Variables</i>														
1. Status	-													
Adaptive functioning measures														
2. Functional communication	-0.53***	-												
3. Social skills	-0.63***	0.75***	-											
4. Self-help skills	-0.47***	0.47***	0.65***	-										
5. Independence	-0.58***	0.54***	0.71***	0.85***	-									
6. Internalizing Symptoms, TR	.18	-0.06	-0.17	-0.10	-0.22	-								
7. Internalizing Symptoms, PR	0.27*	-0.13	-0.30*	-0.13	-0.27*	0.60***	-							
<i>Control Variables</i>														
8. Chronological age	0.08	-0.29*	-0.24	-0.31*	-0.28*	0.15	-0.70	-						
9. VMA	-0.18	-0.06	-0.02	-0.20	-0.12	0.08	-0.12	0.90***	-					
10. Sex	0.20	-0.21	-0.28*	-0.21	-0.20	-0.08	0.00	0.10	0.04	-				
11. Ethnicity	0.22	-0.14	-0.20	-0.12	-0.17	0.14	0.24	0.07	0.08	-0.04	-			
12. Family's annual income	-0.19	0.14	0.10	0.03	0.01	-0.15	-0.13	-0.13	-0.10	-0.00	-0.14	-		
13. Maternal history of depression	0.44**	-0.40*	-0.31	-0.13	-0.16	0.06	0.24	-0.13	-0.16	0.19	0.35*	-0.16	-	

Note. $N = 70$. Internalizing symptoms, TR = teacher report of children's internalizing symptoms on BASC-II; internalizing symptoms, PR = parent report of children's internalizing symptoms on the BASC-II; VMA = verbal mental age.

* $p < .05$, ** $p < .01$, *** $p < .001$

age was significant and negatively correlated with their functional communication skills such that as age increases, functional communication decreases. This relation may be the result of the relatively low functional communication skills in the ASD group (see Table 2). Therefore, age was entered as a control variable in all analyses utilizing functional communication as the outcome. Additionally, the child's sex was significantly correlated with their social skills such that boys were rated as exhibiting worse social skills than girls. Therefore, sex was controlled for in analyses utilizing social skills as the outcome variable.

Tests of Hypotheses:

Hypothesis 1: Direct effect of diagnostic status on internalizing symptoms. A linear regression was conducted to assess the direct effect of diagnostic status on teacher and parent report of children's internalizing symptoms. Results indicated that status did not significantly predict teacher report of internalizing symptoms. However, parent report of children's internalization was significantly predicted by children's diagnostic status such that children with ASD exhibited higher rates of parent-reported internalizing symptoms than their TD peers. In order to minimize familywise error and given the non-significant finding for teacher reported symptoms, I exclusively used parent-report of children's internalizing symptoms in all other analyses utilizing internalization as an outcome variable. Given these findings Hypothesis 1 was partially supported. Results of these analyses are provided in Table 4.

Hypothesis 2: Diagnostic status predicts adaptive functioning skills. Next, I assessed the relations between diagnostic status and the four measures of adaptive functioning skills utilizing linear regression analyses. Four unique analyses were conducted to assess this hypothesis. Diagnostic status significantly predicted all four measures of adaptive functioning

Table 4
Results of Direct Effect Regression Analyses

Predictor	Outcome			
	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
	<i>Internalizing Symptoms, TR</i>			
Constant	50.15	2.06	24.35	0.00
Status	4.94	3.44	1.44	0.16
	<i>Internalizing Symptoms, PR</i>			
Predictor	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Constant	49.30	2.00	24.72	0.00
Status	7.55	3.31	2.28	0.03

Note. $N = 64$ for analyses involving internalizing symptoms, TR; $N = 70$ for analyses involving internalizing symptoms, PR; internalizing symptoms, TR = teacher report of children's internalizing symptoms on the BASC-II; internalizing symptoms, PR = parent report of children's internalizing symptoms on the BASC-II; status = developmental status.

skills, both within and beyond the ASD diagnostic criteria. Results indicated that children with ASD exhibited poorer social skills, functional communication, self-help skills, and independence than their TD peers. Therefore, Hypothesis 2 (the alpha pathway of the larger model) was supported. Results of these analyses are displayed in Table 5.

Table 5
Results of Alpha Pathway Regression Analyses

Predictor	Outcome			
	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
	<i>Social Skills</i>			
Constant	53.18	1.32	40.20	0.00
Status	-14.59	2.23	-6.56	0.00
	<i>Functional Communication</i>			
Constant	62.93	4.49	14.03	0.00
Age (covariate)	-0.20	0.08	-2.67	0.01
Status	-11.55	2.22	-5.20	0.00
	<i>Self-Help Skills</i>			
Constant	9.56	0.76	12.68	0.00
Sex (covariate)	-0.87	0.92	-0.94	0.35
Status	-3.47	0.90	-3.87	0.00
	<i>Independence</i>			
Constant	10.18	0.54	18.84	0.00
Status	-4.72	0.85	-5.57	0.00

Note. $N = 70$; Status = developmental status.

Hypothesis 3: Adaptive functioning skills predict internalizing symptoms. I then assessed the relation between the four measures of adaptive functioning and parent-report of children's internalizing symptoms utilizing hierarchical multiple regression. Two separate analyses were conducted in order to assess these relations: one examining each pair of adaptive functioning deficits. In the first set of analyses, I controlled for diagnostic status in step one and regressed internalizing symptoms on social skills and functional communications in step two. Results indicated that social skills did not significantly predict children's internalizing symptoms after controlling for diagnostic status. However, this effect was trending toward significance ($p = 0.07$). Further, functional communication also did not significantly predict internalizing symptoms when controlling for diagnostic status.

Next, controlling for diagnostic status in step one, internalizing symptoms were regressed on self-help skills and independence in step two. Results indicated that neither measure of adaptive functioning significantly predicted children's internalizing symptoms when controlling for diagnostic status. However, children's independence did approach significance ($p = 0.06$). Given these findings, Hypothesis 3 (the beta pathway for the larger model) was not supported. Both social skills and independence approached significance such that poor social skills and low levels of independence were associated with higher levels of internalizing symptoms. However, neither of these relations met the threshold for statistical significant. The results of these analyses are displayed in Table 6.

Given my a priori hypotheses of the mediational relations among my study variables and several beta pathways trending toward significance, I proceeded with the proposed analyses of assessing the mediational relations of these variables. It should noted, therefore, that non-significant beta pathways were included in subsequent analyses of the larger model. This

decision was made in order to fully assess the theoretical hypothesis of adaptive functioning deficits partially mediating the link between diagnostic status and internalizing symptoms in young children. While support for each beta pathway was not found, the trending significance of social skills and independence predicting internalizing symptoms coupled with the established support for the other pathways suggests that the model was accurately specified. Thus, further analyses were completed to fully assess the presence of a significant indirect effect of each hypothesized mediating variable.

Table 6
Results of Beta Pathway Regression Analyses

		Outcome			
Predictor		<i>Internalizing Symptoms, PR</i>			
		<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Step 1	Constant	49.30	2.00	24.69	0.00
	Status	8.04	3.36	2.39	0.02
Step 2	Constant	57.31	10.66	5.38	0.00
	Status	5.15	4.30	1.20	0.24
	Social skills	-0.44	0.24	-1.86	0.07
	Functional Communication	0.30	0.23	1.31	0.20
		<i>Internalizing Symptoms, PR</i>			
		<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Step 1	Constant	50.18	2.22	22.65	0.00
	Status	6.66	3.52	1.89	0.06
Step 2	Constant	56.31	5.76	9.77	0.00
	Status	3.22	4.20	0.77	0.45
	Self-help skills	1.23	0.84	1.46	0.15
	Independence	-1.69	0.87	-1.96	0.06

Note. $N = 70$; Internalizing symptoms, PR = Parent report of children's internalizing symptoms on the BASC-II; status = developmental status.

Hypothesis 4: Indirect effect of diagnostic status on internalizing symptoms through adaptive functioning. Hypothesis 4 was partially evaluated utilizing the hierarchical multiple regression analyses previously presented above in Table 6. In the first run (internalizing symptoms regressed on social skills and functional communication controlling for diagnostic status), Hypothesis 4 was partially supported. Diagnostic status significantly predicted

internalizing symptoms in step one. However, following the inclusion of the two adaptive functioning measures, diagnostic status no longer significantly predicted the outcome variable suggesting a partial mediational relation of these variables. In the second run (internalizing symptoms regressed on self-help skills and independence controlling for diagnostic status), Hypothesis 4 was again partially supported. Diagnostic status approached significance ($p = 0.06$) when predicting internalizing symptoms in step one and became non-significant ($p = 0.45$) when the two adaptive functioning skills were included in the model in step two. While these findings are not indicative of significant mediation, they support the proposed model of the relations among my study variables. To further assess Hypothesis 4, I utilized the SPSS macro Process to assess the significance of the indirect effects of the mediating variables.

Within the Process macro, Model 4 was used to assess the mediational relations among relevant study variables. First, I assessed the mediational role of functional communication and social skills on the relation between diagnostic status and internalizing symptoms (refer to figure 2). The results of this analysis are presented in Table 7. The direct effect as well as the alpha and beta pathways were replications of findings previously detailed above. In order to assess whether functional communication and social skills significantly mediated the relation between the predictor and outcome variable, I assessed the confidence interval around the indirect effects. Functional communication did not significantly mediate the relation (CI: -11.14 – 1.48) between diagnostic status and internalizing symptoms. However, social skills significantly mediated this relation (CI: 0.64 – 13.85) such that children's social skills partially explained the link between diagnostic status and internalizing symptoms. This entire model, representing the adaptive functioning deficits inherent in the ASD symptom criteria, accounted for 13% of the total variance. This finding served to partially support Hypothesis 4.

Next, I assessed the mediational role of self-help skills and independence on the relation between diagnostic status and internalizing symptoms (see figure 3). The results of this analysis are also presented in Table 7. Again, the associations between X and Y as well as the alpha and beta pathways were duplications of previous analyses and were reported above. In order to assess the significance of the indirect effects of self-help skills and independence, the confidence intervals around these effects were examined. Self-help skills did not meet the threshold for statistically significant mediation (CI: -10.33 – 0.01). However, children's independence did significantly mediate the relation between the predictor and outcome variable such that children's independence skills partially explained the relation between diagnostic status and internalizing symptoms (CI: 1.32 – 18.11). The entire model, representing novel adaptive functioning deficits beyond those inherent in the ASD diagnosis, accounted for 11% of the total variance. This finding served to partially support Hypothesis 4.

Table 7
Results of Indirect Effect Models

Model 1				
<i>Total effect of status to internalizing symptoms</i>				
Predictor	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Constant	49.30	2.00	24.72	0.00
Status	7.55	3.31	2.28	0.03
<i>Direct effect of status on internalizing symptoms</i>				
Predictor	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Constant	57.311	10.65	5.38	0.00
Status	5.15	4.30	1.20	0.24
<i>Indirect effects</i>				
Mediator	<i>B</i>	Boot <i>SE</i>	Boot LLCI	Boot ULCI
Functional Communication	-3.55	3.07	-11.14	1.48
Social Skills	6.44	3.36	0.64	13.85
Model 2				
<i>Total effect of status on internalizing symptoms</i>				
Predictor	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Constant	49.30	2.00	24.72	0.00
Status	5.15	4.30	1.20	0.24
<i>Direct effect of status on internalizing symptoms</i>				
Predictor	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Constant	56.31	5.76	9.77	0.00
Status	3.22	4.20	0.77	0.45
<i>Indirect effects</i>				
Mediator	<i>B</i>	Boot <i>SE</i>	Boot LLCI	Boot ULCI
Self-help skill	-4.27	2.56	-10.33	0.01
Independence	7.70	4.20	1.32	18.11

Note. $N = 70$; status = developmental status.

Chapter 4: Discussion

In the current study I investigated the relations among developmental status, adaptive functioning skills, and internalizing symptoms in young children with ASD and TD. Specifically, I hypothesized that children with ASD would exhibit higher rates of internalizing symptoms compared to their TD peers. Further, I hypothesized that this association would be mediated by children's adaptive functioning skills, such that deficits in adaptive functioning would partially account for elevated rates of internalizing symptoms. I examined four measures of adaptive functioning to assess these relations: social skills and functional communication in order to examine the deficits inherent in the ASD diagnosis and self-help skills and independence in order to assess deficit areas beyond the ASD diagnostic criteria. Below I present the individual pathways of the larger model followed by a discussion of the model itself. Findings from the current study support prior research examining the internalizing symptoms of young children with ASD. Additionally, these results expand the current literature assessing the adaptive functioning profiles of youth with ASD and the links between those skills and their associated internalizing symptoms. Implications of study findings, strengths and limitations of this study, and directions for future research will be discussed.

Interpretation of Results

Direct effect of diagnostic status on internalizing symptoms. The foundational hypothesis of the current study asserted that children with ASD would exhibit higher rates of internalizing symptoms compared to their TD peers. This association was assessed both via parent and teacher report of internalizing symptoms. Previous research has indicated that parents may be more accurate reporters of children's internalizing symptoms than teachers (Hinshaw, Han, Erhardt, & Huber, 1992). However, few studies have previously examined these

symptoms in such young children (three to six years of age). Due to this limited research, little is known about the accuracy of parent versus teacher report of internalization prior to the age of six. Therefore, in the current study, both parent and teacher reports were evaluated as potential outcome measures for the larger model.

The association between diagnostic status and internalizing symptoms has been widely documented in previous literature strongly suggesting that children with ASD (particularly those with average or above average intellectual functioning), experience higher rates of internalizing symptoms compared to individuals who are not on of the autism spectrum or those with ASD and below average intellectual functioning (DeLong & Dwyer, 1988; Estes, Dawson, Sterling, & Munson, 2007; Mazurek & Kanne, 2010). When evaluated in the present study, this hypothesis was partially supported. I found that diagnostic status significantly predicted parent report of internalizing symptoms. However, the association was not statistically significant for teacher report of children's internalization. It may be that, in a school setting, teachers are less able to observe subtle signs of internalization such as low positive affect or anxiety as readily due to the busy nature of a classroom. In contrast, parents may be more acutely aware of their child's mood and level of discomfort and may be more able to accurately endorse subtle displays of internalizing symptoms in their children especially at such young ages when children may not accurately or explicitly report their symptoms.

Diagnostic status predicting adaptive functioning skills. Next, I hypothesized that children with ASD would exhibit greater deficits in adaptive functioning skills compared to their TD peers. Further, I proposed that these deficits would span both the ASD diagnostic criteria (social skills and functional communication) as well as represent deficit areas outside the diagnostic criteria (self-help skills and independence). Many prior studies have found that youth

with ASD exhibit adaptive functioning deficits in the areas of social skills and functional communication (Carpentieri & Morgan, 1996; Freeman et al., 1991; Freeman, Ritvo, Yokota, Childs, & Pollard, 1988; Green et al., 2000; Liss, Harle et al., 2001; Mahan & Matson, 2011; Perry et al., 2009). The current study also found support for this relation: diagnostic status significantly predicted both social skills and functional communication such that children with ASD indexed lower scores on these adaptive functioning constructs.

Adaptive functioning deficits outside the ASD diagnostic criteria have received less attention in prior research. However, findings of some studies suggest that children with ASD may also exhibit deficits in the areas of self-help skills and independence (Flynn & Healy, 2012; Liss, Harle et al., 2001). This association was also supported in the current study. I found that diagnostic status significantly predicted both self-help skills and independence such that children with ASD exhibited lower scores on these metrics than their TD peers. Therefore, the current study supports the previous literature identifying the breadth of adaptive functioning deficits implicated in ASD both within and beyond the diagnostic criteria itself.

Adaptive functioning predicting internalizing symptoms. Next, I hypothesized that greater deficits in adaptive functioning skills would predict higher rates of internalizing symptoms across both groups of children. Previous authors have suggested that children with ASD and average intellectual functioning may experience elevated rates of internalizing symptoms due to their increased insight and awareness of their own impairments compared to children with ASD and intellectual deficits (Bellini, 2004; Hedley & Young, 2006). This explanation is speculative and has not, to my knowledge, been empirically evaluated. However, one prior study assessed adaptive functioning deficits as a predictor of anxiety symptoms in children with ASD and average intellectual abilities. Researchers found that targeted

interventions improving these youths' self-help skills and independence resulted in a secondary reduction in anxiety symptoms (Drahota et al., 2011). One explanation for this reduction in internalizing symptoms post-intervention has been that these children exhibited fewer adaptive functioning deficits and experienced less distress as a result. In the present study this hypothesis was partially supported. Although none of the adaptive functioning metrics significantly predicted parent reports of internalizing symptoms, both social skills and independence neared significance ($p = 0.07$ and 0.06 respectively) such that lower adaptive functioning skills were associated with higher rates of internalizing symptoms. However these findings were not significant and should be interpreted cautiously. Nevertheless, they lend support to the broader theory that across diagnostic categories, deficits in specific adaptive functioning domains are associated with higher rates of subsequent distress and internalization.

Indirect effects model: Adaptive functioning mediates the relation between diagnostic status and internalizing symptoms. The overarching model examined in this study assessed the mediational role of adaptive functioning skills on the relation between diagnostic status and internalizing symptoms. While significant research supported the relation between diagnostic status and internalizing symptoms as well as diagnostic status and adaptive functioning deficits, only one prior study documented the relation between adaptive functioning and internalizing symptoms (Drahota et al., 2011). In the present study, partial support for the hypothesized mediation models was found. Social skills and independence yielded significant indirect effects suggesting that these adaptive functioning skills may partially account for the association between diagnostic status and internalizing symptoms. As noted above, the association between these adaptive functioning skills and the outcome variable, when assessed in hierarchal multiple regression, approached significance (the beta pathway of the larger model).

However, when evaluated with the more powerful statistical technique, Process, both social skills and independence evidenced significant indirect effects indicating significant partial mediation. In contrast, neither functional communication nor self-help skills produced a significant indirect effect.

There are several reasons to believe that the relation between diagnostic status and internalizing symptoms is partially accounted for by children's social skills deficits. Social skills may be a particularly salient and distressing deficit area for young children as they enter settings requiring more advanced social navigation for the first time. Young children with ASD and average intellectual functioning may experience distress due to their inability to socially engage as effectively as children without ASD. Further, deficits in social skills are likely more stigmatizing and obvious to children with ASD and average intellectual functioning compared to more subtle adaptive functioning deficits such as self-help skills, which may follow a more gradual developmental progression and appear less aberrant when delayed in young children.

In addition to children's social skill deficits, deficits in independence appeared to partially explain the association between diagnostic status and internalizing symptoms. During early childhood, children begin to independently navigate their environment and attempt to autonomously meet their own needs in and out of the home. Examples include independently brushing their teeth, picking out their own clothes, or exploring an unfamiliar waiting room. The development of independence results in greater agency to achieve personal goals and increased autonomy from a caregiver. With poor independence skills, children with ASD and average intellectual functioning often still fail to meet their needs without the assistance of others and are therefore more dependent on and sometimes frustrated by their environment when their goals are not attained. These children appear to exhibit greater challenges shifting from the external

support of a caregiver to increased self-direction and autonomy compared to their TD peers. This dependence is likely distressing to young children with ASD and average intellectual functioning, which may partially explain the elevated rates of internalizing symptoms seen in these children.

It is important to note that the mechanisms by which deficits in social skill versus independence precipitate internalizing symptoms in children with ASD may be distinct. First, the link between social skill deficits and internalization likely hinges on children's awareness or insight into their own social challenges. Without such awareness, these children likely would experience little distress regarding their poor relational skills. This theory has been posited by other researchers who suggest that higher IQ in youth with ASD is associated with greater awareness of their deficits and subsequently elevated internalizing symptoms (Bellini, 2004; Delong & Dwyer, 1988; Estes et al., 2007; Hedley & Young, 2006). Likely this awareness and subsequent distress would accrue over time and accumulate with the evolving social demands and increasing skills of their TD peers. In contrast, the link between independence deficits and internalizing symptoms may operate differently. Failing to independently meet one's own needs would likely directly result in heightened distress and negative emotional outcomes. This association may not require intermediary awareness of the child regarding the deficient nature of their skills as hypothesized in the association between social skill deficits and internalizing symptoms. Seemingly, immediate distress would follow the failure to meet one's goals regardless of awareness of one's independence deficits.

Whereas social skills and independence may require distinct levels of awareness to lead to internalizing symptoms, they share a core feature of frustrated agency resulting in consequent internalization. Whether it be successfully engaging in a social environment or independently

achieving one's own goals, when a child experiences failure to reach a desired outcome they likely experience a spike in negative affect, which may manifest in a variety of ways including internalizing symptoms. This pathway to internalizing symptoms in youth with ASD is especially interesting given that it spans the diagnostic criteria and beyond. Social skill deficits fall within the criteria for ASD, whereas independence skills represent deficits beyond the DSM classification of the disorder. Clearly internalizing symptoms represent an impairing equifinal outcome for youth with ASD and the mechanisms that lead to such symptoms are numerous and multifaceted. However, the present study highlights the importance of frustrated agency, or being able to adaptively and successfully engage in your environment, as one salient mechanism, which likely results in these symptoms.

While children with ASD evidenced lower scores on all four measures of adaptive functioning skills, self-help skills and functional communication did not significantly mediate the association between diagnostic status and internalizing symptoms. As discussed above, self-help skills require the alignment of the child's behavior with the societal expectations of taking care of themselves and their environment such as tidying up toys or clearing the table after a meal. It is conceivable that children with ASD have little stake in these goals especially at such a young age and are less receptive to the urgings to complete such tasks compared to neurotypical children. Further their decreased completion of these self-help tasks across contexts has little bearing on their own engagement in activities of their own choosing. Therefore, these deficits likely result in little frustration and minimal distress in these children.

Similarly, deficits in functional communication did not explain the relation between diagnostic status and internalizing symptoms. While the ability to communicate would logically impede children's ability to advocate for their needs, potentially young children with ASD have

few needs and interests that an attuned parent cannot predict and meet regardless of level of expressed functional language, especially at such a young age. Therefore one hypothesis for the lack of significant mediation may be that children on the spectrum simply have few needs unmet due to their inability to effectively ask for them. An alternative explanation may be that, especially given the current sample of children with ASD and their average intellectual and verbal functioning, it is likely that these children's deficits fail to rise to the level of a functional impairment and therefore have little impact on their ability to communicate effectively and advocate for their own needs.

Broadly speaking, adaptive functioning can be thought of as the degree to which an individual can effectively engage in their environment based on societal expectations for one's behavior. Based on the findings from the current study, it is plausible that when a behavioral expectation is incongruent with the goal of a child with ASD's distinct attainable goal, they experience little distress because their agency is not being impeded. However, when adaptive functioning deficits result in disrupted agency and the interference of goal attainment, these children experience greater distress, one such manifestation of which is likely increased internalizing symptoms.

Clinical Implications

Significant previous research has documented the elevated risk for comorbid internalizing symptoms in children with ASD and average intellectual functioning (DeLong & Dwyer, 1988; Estes et al., 2007; Mazurek & Kanne, 2010). Additionally, preliminary research suggests that this symptom profile is associated with particularly poor prognostic outcomes in youth on the spectrum (Kim et al., 2000). It is clinically important therefore to begin to clarify the mechanism by which children with ASD and average intellectual functioning develop comorbid internalizing

symptoms in order to effectively intervene. Findings from this study suggest that proximal deficits in children's social skills and independence may partially explain the elevated rates of internalizing symptoms seen in these young children.

Targeting social skill deficits has long been a standard of care for youth with ASD due to the inherent social deficits within the disorder (Cotugno, 2009; Williams White, Keonig, & Scahill, 2007). Interventions specifically addressing these challenges may have additional secondary benefits on subsequent internalizing symptoms in these children. Interventions that bolster children's ability to engage effectively and appropriately with social partners such as family members or peers may lessen children's experience of stigma and alienation in social settings. This shift from social rejection to social inclusion may be particularly meaningful for children with ASD and average intellectual functioning who are likely more accurately aware of their social presentation compared to children with ASD and intellectual impairments. Significant prior research has suggested that social skills interventions are effective for improving social adjustment as well as reducing anxiety and depressive symptoms in children with ASD (Hillier, Fish, Siegel, & Beversdorf, 2011; McGillivray & Evert, 2014; White et al., 2010). This avenue of intervention may be particularly important for youth with ASD and average intellectual functioning in order to buffer against the additional risk of internalizing symptoms on their developmental trajectory.

Less is known about treating self-initiation and independence deficits in youth with ASD. Whereas preliminary research has demonstrated the association between independence training and reduced anxiety symptoms (Drahota et al., 2011), additional studies are needed to experimentally evaluate whether improved independence directly results in widespread internalizing symptom relief beyond anxiety alone. Significant parenting and education

literature suggests that improved independence in youth is achieved by attaining the appropriate level of challenge coupled with dynamic support (Anghileri, 2006; Guschin, 2009; Pentimonti & Justice, 2010; Wood, Bruner, & Ross, 1976). This idea of scaffolding learning opportunities to encourage increasing independence may be particularly important for youth on the spectrum. By encouraging the independent completion of successively more complex objectives with appropriate support, youth will begin to function with increasing autonomy. While this gradual reduction in learning support is important for all children's development, intentionally fostering independence in children with ASD may help attenuate the risk of subsequent internalizing symptoms in these youth. Further, it is helpful for teachers and caregivers to be cognizant of the risk of providing intrusive support when that child is perceived to have broad-based deficits (such as those with ASD). Simply completing a task for a child with ASD may be viewed as helpful or time-efficient; however, over time it might inadvertently stifle the child's development of independence and self-direction. It is clinically important for parents and teachers to remain mindful of the goal of developing the autonomy and independence of a child with ASD by dynamically and deliberately supporting their development with appropriate scaffolding.

Finally, an important implication of the present study relates to the adaptive functioning profile of children with ASD. My findings support previous research indicating that children with ASD exhibit wide-ranging deficits beyond those merely accounted for by the ASD diagnosis alone. Specifically, children with ASD evidence greater deficits across all assessed adaptive functioning metrics including self-help skills and independence compared to their TD peers. While the present study cannot address the consequences of these deficit areas, it is likely that additional deficits in adaptability result in greater functional impairments for these children. Extra-diagnostic deficits therefore should be considered when clinically conceptualizing and

treating youth with ASD such as considering their overall level of functional impairment not just those deficits associated with social communication or repetitive behaviors.

Strengths and Limitations

This study evidenced a number of strengths as well as limitations. One strength was the nature of the current sample, which helps to clarify the presentation of adaptive functioning deficits and subsequent internalization in young children with ASD and average intellectual functioning. The inclusion of children as young as three in this study allowed for the evaluation of these symptoms from their onset. I hypothesize that studies examining these variables with an older age sample of youth with ASD, would find a comparable pattern of adaptive functioning deficits and internalizing symptoms. Additionally, I expect the gap between the functionality of the ASD and TD group to grow wider with age and result in subsequently increased internalizing symptoms in the ASD group. Future studies are needed to empirically assess these relations in older children on the spectrum. Further, by utilizing a sample of children with ASD and average intellectual functioning I was able to assess these relations as predicted by the hypothesized awareness of their deficits. Had I included an ASD group with below average intellectual functioning, I would expect those children to be buffered from the risk of increased internalizing symptoms due to their lack of insight into these deficits and the associated stigmatization. However, this model should be empirically tested with children on the spectrum across a wide array of intellectual abilities in order to evaluate this hypothesis.

Further, this study evidences several strengths in terms of its design and theoretical framework. First, the use of a TD control group allowed for the comparison of the clinical ASD sample against same-aged neurotypical peers. Additionally, the utilization of parent and teacher reports of children's internalizing symptoms represents a clear methodological strength by

allowing for the comparison of different respondent's symptom endorsement of the same child. This is especially valuable given the lack of research assessing internalizing symptoms in very young children with and without ASD. These results add to the literature regarding the onset and progression of internalizing symptoms in youth. Conceptually, while many studies have identified adaptive functioning deficits as an impairment area in youth with ASD, there is considerable debate in the literature regarding the extent of these deficits. This study adds to the existing body of knowledge by suggesting that young children with ASD exhibit broadband adaptive functioning deficits beyond those related to socialization and communication.

In addition to the above strengths, this study also evidences several limitations that should be considered. Given the a priori power analysis, it was estimated that a sample size of 77 participants would be necessary to detect a significant effect. The sample in the present study is comprised of 70 children with only 26 in the ASD group. It is likely that the analyses were somewhat underpowered to detect significant results and a Type II error may have occurred in some of the non-significant or trending analyses. For example, the association between independence and internalizing symptoms was likely underpowered when utilizing hierarchical multiple regression. This association approached significance ($p = 0.06$) and the model registered a significant indirect effect when evaluated using a different statistical technique suggesting that the original analysis would have reached significance with a larger sample.

A second limitation of the present study relates to the generalizability of the study findings. Participants were disproportionately Caucasian with a relatively high yearly family income. This limits my ability to extend the present findings to children from more diverse or disadvantages backgrounds. Additionally, there was a significant group difference in terms of rates of maternal depression: The ASD group indexed significantly more instances than the TD

group. However, 76% of parents in the entire sample declined to answer the maternal depression question on the demographic form. Due to the large amount of missing data for this item, interpretations about the links between diagnostic status, maternal depression, and children's internalizing symptoms cannot be made. Therefore, the history or presence of maternal depression may be a potential confound in the present study. Further the links between maternal depression and internalizing symptoms in youth with ASD may represent a meaningful area of future research.

Lastly, due to the cross-sectional nature of the study design, causation cannot be inferred from the study findings. The assumption that adaptive functioning deficits precede internalizing symptoms may represent a misspecification of the study variables and should be evaluated with future longitudinal designs. However, given the established empirical and theoretical support for the current modeling of these relations, it appears the direction of causation as discussed is likely accurate.

Conclusion and Future Research Directions

The current study's primary goal was to detail the associations among the following variables: diagnostic status, adaptive functioning skills, and internalizing symptoms in young children with and without ASD. The above findings add to the literature relating to the onset and profile of internalizing symptoms in very young children as well as the adaptive functioning skills and deficits in children with ASD. Additionally, the current study suggests that of the adaptive functioning skills assessed in this study, social skill and independence deficits may represent particularly salient impairments and potential mechanisms through which children with ASD develop increased internalizing symptoms. Whereas children with ASD exhibited worse adaptive functioning skills across all subtypes, social skills and independence appeared to be the

most damaging in terms of the associated risk of internalization compared to deficits in functional communication and self-help skills. Given these findings, future interventions studies should continue to target social skills particularly in youth with ASD and average and above average intellectual functioning as this avenue may represent a salient predictor of subsequent mental health problems. Further, additional studies are needed to determine the most effective methods through which independence deficits may be addressed in youth with ASD. Effective scaffolding strategies may improve self-initiation and autonomy in youth with ASD. Further research is necessary to determine the unique intervention characteristics required to efficiently and effectively foster independence in children across the autism spectrum. The elevated risk of internalizing symptoms in children with ASD and average intellectual functioning may be partially attenuated following the targeted treatment of social skill and independence deficits.

Methodologically, future studies should examine adaptive functioning deficits and internalizing symptoms in children with ASD utilizing a longitudinal design in order to assess the causative nature of these associations as symptoms manifest along the developmental timeline. Specifically, future studies should verify the directionality of social skill and independence deficits predicting internalizing symptoms as well as the links between adaptive functioning deficits more broadly and the impairments that they may individually predict. Such findings would clarify the mechanism through which children with ASD become at risk for comorbid diagnoses such as anxiety and depression as they mature. Additionally, it would be valuable to examine these relations within a more racially and economically diverse sample in order to improve the generalizability of the findings to children and families from varied backgrounds.

Finally, the theoretical assumption that children with ASD and average intellectual functioning, compared to those with intellectual impairments, experience increased distress and internalization due to greater awareness of their deficits should be empirically assessed. This was merely an assumption made in the present study, as it is in most research assessing children with ASD's risk for internalizing symptoms (e.g., DeLong & Dwyer, 1988; Estes et al., 2007). Utilizing experimental manipulation, a study assessing the accuracy of youth with ASD's self-perception of their deficits should be conducted to determine if such awareness varies by intellectual functioning. Such a study would aid in the establishment of empirical support for the currently latent variable of children's insight and awareness into their deficits. Additionally, this research would assist in modeling the mechanisms by which children with ASD and average intellectual functioning experience a relatively high degree of impairment and poor long-term outcomes despite their IQ and level of symptom severity.

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