The Relationship between Reciprocal Social Impairments and Psychopathology in Children with Intellectual Disability

THESIS

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Abstract

Reciprocal Social Impairments (RSI) are deficits in social skills consistent with autism spectrum disorders (ASD). RSI are diagnostically relevant to ASD, but also occur throughout the population, including among those with intellectual disability (ID). Both ID and ASD are associated with increased symptoms of psychopathology. This study’s objective was to investigate whether increased RSI among those with mild or moderate ID were related to increased symptom severity of other forms of psychopathology (specifically, Attention Deficit/Hyperactivity Disorder [ADHD], Oppositional Defiant Disorder [ODD], Anxiety Disorders, and Depressive Disorders, as measured by the Child Symptom Inventory-4 [CSI-4]). An exploratory objective of this study was to assess the association between the Social Responsiveness Scale (SRS) scores and social skills measured by the Adaptive Behavior Assessment System-II (ABAS-II) and psychopathology. Three hundred twelve packets were distributed to area school districts or directly to parents of eligible children in response to flyers. Sixty-seven were returned, for a response rate of 21%. However, only 37 children (28 boys and 9 girls, mean age of 11.7 years) met eligibility requirements and had usable data on all rating scales. Results from the hierarchical multiple regression indicated that RSI were unrelated to ODD, Anxiety, and Depressive Disorders. However, increased RSI were associated with increased severity of ADHD symptoms, after controlling for adaptive behavior and
previous diagnoses of ADHD and/or ASD ($\beta = 0.45, p = .028$). Consistent with previous research, the SRS subscales showed moderate correlations with the ABAS-II (range $.30$ to $.61$). Using multiple regression, the SRS subscales were unrelated to ODD, Anxiety, and Depressive Disorders, similar to the total score. The subscales were associated with increased ADHD symptom severity ($R^2 = .55, p < .001$), with Autistic Mannerisms as the only significant predictor ($b$-weight $= 0.59, p < .001$). The study found that increased RSI were related to increased ADHD symptom severity, but not to symptoms of ODD, Anxiety, and Depressive Disorders. One possible explanation of these results is that social competence is so much lower for individuals with ID that any increase in RSI is no more impairing. Future research on the construct of RSI and its relationship to social competence and psychopathology is warranted, especially since the results of this study differed from previous studies among those without ID.
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List of Abbreviations

The Adaptive Behavior Assessment System-II .......................................................... ABAS-II
American Association on Intellectual and Developmental Disabilities .................. AAIDD
American Psychiatric Association ........................................................................APA
Attention Deficit/Hyperactivity Disorder .............................................................. ADHD
Autism Diagnostic Observation Schedule ........................................................... ADOS
Autism Spectrum Disorders .................................................................................. ASD
Behavioral Assessment System for Children—2nd edition ..................................... BASC-2
Child and Adolescent Psychiatric Assessment – Parent Version ......................... CAPA
Child Behavior Checklist ...................................................................................... CBCL
Children’s Social Behavior Questionnaire ............................................................. CSBQ
Children’s Symptom Inventory-4 .......................................................................... CSI-4
Chronic Multiple Tic Disorder ............................................................................... CMTD
Conduct Disorder ................................................................................................. CD
Developmental Disabilities ..................................................................................... DD
Diagnosis .................................................................................................................. Dx
Diagnostic Assessment for the Severely Handicapped-II ....................................... DASH-II
Diagnostic Interview Schedule for Children – Parent Version .............................. DISC-IV-P

Full-Scale Intelligence ........................................................................................................F IQ

General Adaptive Composite ...............................................................................................GAC

Generalized Anxiety Disorder ...........................................................................................GAD

Intellectual Disability .........................................................................................................ID


Major Depressive Disorder .................................................................................................MDD

Matson Evaluation of Social Skills for Individuals with Severe Retardation ..........MESSIER

Pervasive Developmental Disorders ....................................................................................PDD

Pervasive Developmental Disorder in Mentally Retarded Persons .......................PDD-MRS

Pervasive Developmental Disorder – Not Otherwise Specified .........................PDD-NOS

Post-Traumatic Stress Disorder .........................................................................................PTSD

Obsessive-Compulsive Disorder .........................................................................................OCD

Odds Ratio ..........................................................................................................................OR

Oppositional Defiant Disorder .........................................................................................ODD

Reciprocal Social Impairments .........................................................................................RSI

Severe Mood Dysregulation ...............................................................................................SMD

Social and Communication Disorders Checklist .........................................................SCDC

Social Communication Questionnaire .................................................................................SCQ

Social Responsiveness Scale .............................................................................................SRS

Verbal Intelligence ...............................................................................................................VIQ
Chapter 1: Introduction

Individuals with developmental disabilities (DD) are at heightened risk for psychiatric disorders. Two of the most common DD are Intellectual Disability (ID) and Autism Spectrum Disorders (ASD), both of which are associated with higher rates of psychopathology. Deficits in social skills and social competence are at the heart of how we define ID and ASD. The current study examined the relationship between psychopathology and reciprocal social impairments (RSI), a specific type of social skill deficit consistent with ASD.

Intellectual Disability

ID is diagnosed based on a person’s level of functioning. The American Association on Intellectual and Developmental Disabilities (AAIDD; Schalock et al., 2010) and the Diagnostic and Statistical Manual, Fourth Edition, Text Revision (DSM-IV-TR) of the American Psychiatric Association (APA, 2000) define ID as significant deficits in intellectual and adaptive functioning that are present during the developmental period. Adaptive behavior represents learned skills that a person needs to function effectively within one’s environment relative to one’s peers. According to the AAIDD, adaptive behavior domains include conceptual, social, and practical skills (Schalock et al., 2010).
At the core of ID are deficits in social competence. Social competence, as defined here, is an overall judgment of a person’s ability to perform social tasks (Lecavalier & Butter, 2010) and participate responsibly on behalf of oneself and others within one’s social environment (Gresham & Elliot, 1987). Social competence is composed of multiple social skills, or situationally specific behaviors relevant to social outcomes especially among peers, related to how well a person can meet daily functioning and environmental demands (Gresham & Elliot, 1987). Individuals with ID often have deficits in these social skills.

**Autism Spectrum Disorders**

ASD are defined by qualitative impairments in social interaction and communication, and by the presence of restrictive and repetitive behaviors and interests present during the developmental period (APA, 2000). When diagnosing ASD, a clinician considers all the characteristics of ASD, but the most distinctive and consistent trait is impaired social interaction and related deficits in social competence. Social interaction begins with joint attention, that is, the ability to coordinate one’s verbal and nonverbal behavior in a socially appropriate way with another person (Gerhardt & Mayville, 2010). Joint attention is especially difficult for individuals with ASD. It is even part of the diagnostic algorithm for Modules 1 and 2 of the Autism Diagnostic Observation Schedule (ADOS; Gotham, Risi, Pickles, & Lord, 2007). Because of limitations in joint attention, social interaction, and social skills, individuals with ASD also exhibit low social competence, with possible social skill deficits in either or both verbal and nonverbal domains (Gerhardt & Mayville, 2010).
Co-occurring Intellectual Disabilities and Autism Spectrum Disorders

A person may be diagnosed with both ASD and ID. ASD core and associated features vary based on a person’s level of functioning, especially in the presence of ID (Lecavalier, Snow, & Norris, 2011). Additionally, those with ID are more likely to screen positive for an ASD than those without ID. For example, Dekker and Koot (2003a) found that children with an IQ less than 60 were 4.7 times more likely to screen positive on the Pervasive Developmental Disorder in Mentally Retarded Persons (PDD-MRS) than individuals with an IQ between 60 and 80. However, prevalence rates for ASD among those with ID vary across studies (c.f. Lecavalier et al., 2011). Similarly, rates of ID among those with ASD also vary. Although initial reviews of the prevalence rate for ID among those with ASD was greater than 75% (Fombonne, 1999; Edelson, 2006), these rates should be interpreted with caution. A more recent epidemiological study using DSM-IV criteria for ASD and sound assessments of intelligence found much lower co-occurring rates. Excluding those with nonASD pervasive developmental disorders (PDD), only 22.7% of those with ASD also had ID (Chakrabarti & Fombonne, 2001). Most children with autism (69%) had ID but rates were much lower for other ASD (7.5% for PDD-NOS and 0% for Asperger’s).

Psychopathology

Definition. Psychopathology can encompass two related types of clinical problems (a) behavior problems such as self-injury and stereotypy and (b) psychiatric disorders such as conduct, mood, or anxiety disorders. Behavior problems are often studied with empirically-derived categories, such as internalizing or externalizing
symptoms. The current diagnostic system, the DSM-IV-TR (APA, 2000), is one way of regrouping psychiatric syndromes. In this study, the DSM-IV-TR nosology will be used to define psychopathology and group symptom domains, but it is the severity of symptoms, as opposed to a clinical diagnosis, that will be examined.

**Prevalence of psychopathology among those with ID.** Children with ID have a higher prevalence of psychiatric problems than their typically-developing peers (Whitaker & Read, 2006). A longitudinal study of 578 children and adolescents with ID in Australia found that rates of psychopathology decreased as the children aged, but the decrease was only from 41% to 31% over the 14-year follow-up period; many individuals continued to have elevated scores, albeit just below the cut-off for “caseness” (Einfeld et al., 2006).

Dekker and Koot (2003a) found 1-year prevalence rates of 39% for DSM-IV disorders as measured by the Diagnostic Interview Schedule for Children – Parent Version (DISC-IV-P) among 474 Dutch children with an IQ less than 80. The most common disorders were specific phobia (17.5%), attention deficit/hyperactivity disorder (ADHD; 14.8%), and oppositional defiant disorder (ODD; 13.9%). A longitudinal Dutch study also found that problem behaviors (not diagnosed psychiatric disorders) as assessed by the Child Behavior Checklist (CBCL) decreased as children with ID (978 children) and without ID (2,047 children) aged, though rates of change varied for specific behaviors (de Ruiter, Dekker, Verhulst & Koot, 2007).

Emerson (2003) administratively-defined ID based on UK Office for National Statistics data and found ID to be a significant risk factor for psychopathology. Children
with ID were more likely to have any psychiatric disorder (39%) compared to their typically-developing peers (8.1%; Odds Ratio [OR] = 7.3). Among the 264 children with ID, the most common disorders were ODD (13.3%), Hyperkinesis (ADHD equivalent in the International Classification of Diseases [ICD-10]; 8.7%), and a PDD (7.6%).

These results support the conclusion that individuals with ID, especially children, may be at an increased risk for comorbid psychopathology. However, results are equivocal. Although primarily a study of individuals with ASD, Simonoff and colleagues (2008) did not find a correlation between IQ and psychopathology among the half of their sample with co-occurring ID. Likewise, Witwer and Lecavalier (2010) found that rates of comorbid disorders among those with ASD were not statistically different between the 36 with co-occurring ID and the 22 without ID, excluding generalized anxiety disorder (GAD), which had lower rates among those with ID. Other studies have found prevalence rates for psychiatric disorders (not unspecified behavior problems) for adults with ID to be comparable to the general population (c.f. Whitaker & Read, 2006).

**Prevalence of psychopathology among those with ASD.** Rates of comorbid psychopathology among children with ASD are also greater than their typically-developing peers. Simonoff and colleagues (2008) reported a 3-month-prevalence rate of DSM-IV disorders, as assessed by the Child and Adolescent Psychiatric Assessment – Parent Version (CAPA), of 70% among their sample of 112 children with ASD. The most common disorders were Social Anxiety Disorder (29.2%), ADHD (28.2%), and ODD (28.1%). Of those diagnosed with ADHD, 84% received an additional diagnosis.
Leyfer and colleagues (2006) found that 72% of 109 children with autism had at least one comorbid psychiatric condition, but most met criteria for multiple diagnoses. In another study of 89 individuals with PDD-NOS, 80.9% exhibited psychiatric disorders as assessed by the DISC-IV-P, with 44.7% having ADHD and 54.3% having two or more comorbid disorders (de Bruin, Ferdinand, Meester, de Nijs, & Verheij, 2007). Clearly, individuals with ASD are at an increased risk for comorbid psychiatric diagnoses.

Other studies of psychopathology among individuals with ASD have examined symptom severity in addition to or instead of prevalence rates. Both parents and teachers rated preschool boys with ASD and both school-age boys and girls with ASD as exhibiting more severe psychiatric symptoms than community groups from regular and special education (Gadow, DeVincent, Pomeroy, & Azizian, 2004; Gadow, DeVincent, Pomeroy, & Azizian, 2005). Gadow, DeVincent, and Schneider (2009) compared 66 children with ADHD-only, 88 with ADHD and comorbid ASD, and 66 with ADHD and comorbid chronic multiple tic disorder (CMTD). Again, both parents and teachers rated the comorbid ASD group as having more severe psychiatric symptoms than the ADHD-only group.

It is noteworthy that Dekker and Koot (2003a), Emerson (2003), Gadow and colleagues (2005), and Simonoff and colleagues (2008) found that two of the three most common psychiatric disorders among those with ID and ASD are shared. That is, in all four studies ADHD and ODD were two of the three most common comorbid conditions.
Reciprocal Social Impairments

Definition. RSI are deficits in a specific type of social skill – reciprocal social behavior. As described above, individuals with ID or ASD exhibit social skill deficits and lower social competence. Reciprocal social behavior encompasses verbal and nonverbal social skills (Gerhardt & Mayville, 2010) relevant to how a person engages in emotionally-appropriate social interaction (Constantino et al., 2000; Constantino & Gruber, 2005). Multiple steps are involved in social interaction, including the disposition to engage peers, the usage of appropriate language, and the recognition, interpretation, and appropriate response to social cues (Constantino et al., 2000). Thus an example of appropriate reciprocal social behavior would include seeking out conversations with peers, maintaining appropriate personal space, following the flow of the conversation, and responding appropriately (i.e., with comments relevant to the topic and with appropriate self-confidence in delivery). Individuals with deficits in reciprocal social behavior (e.g. RSI) may lack awareness of others’ perceptions with whom they are communicating or they may not recognize others reactions to their social behavior. This can lead to additional deficits in social competence.

At present, only one or two instruments appear to be specific to RSI, the Social Responsiveness Scale (SRS) and the Social and Communication Disorders Checklist (SCDC). RSI are a theoretical construct involving social skills deficits heavily weighted towards social interaction. Other measures of social skill deficits consistent with ASD, such as the Children’s Social Behavior Questionnaire (CSBQ), do not measure one empirically-derived construct alone (Hartman et al., 2006), and diagnostic measures of
autistic symptoms, such as the Social Communication Questionnaire (SCQ), do not strictly measure social behavior. The SRS and the SCDC have found social impairments within the general population (Constantino & Todd, 2003; Skuse et al., 2009) and have been able to distinguish between people with ASD and those without (Constantino & Gruber, 2005; Skuse et al., 2005). But the SCDC items are broader than the SRS and they tap into less specific social behaviors. When compared against each other, the SCDC had superior abilities when screening for nonspecific social deficits, but the SRS had greater abilities screening specifically for autism and had moderate correlations with other ASD-specific measures with which the SCDC had small or nonsignificant correlations (Bölte, Westerwald, Holtmann, Freitag, & Poustka, 2011). Thus the SRS appears to be the best instrument at measuring RSI as a unitary construct.

Previous studies of social competence measures have found that how an investigator quantifies social competence and social skills impacts the results of a study (Gresham & Reschly, 1987). Social skills specific to reciprocal social behaviors include many aspects of social interaction such that one could argue these behaviors reflect several different types of social skills as opposed to one construct. But, as a critical component of ASD, they should be viewed together. Although RSI are not a measure of social competence, previous evaluations of the SRS have found moderate to strong relationships with more global measures. For example, among preschoolers with or without an ASD, it was inversely related to the Vineland-II Adaptive Behavior Composite \( r = -0.86 \); Pine, Luby, Abbacchi, & Constantino, 2006). Among typically-developing children, the SRS was inversely related to the Adaptive Behavior Assessment
System-II (ABAS-II) GAC ($r = -0.63$), Conceptual ($r = -0.63$), Social ($r = -0.61$), and Practical ($r = -0.55$) domains (Kenworthy, Case, Harms, Martin, & Wallace, 2010). However, there was no statistically significant correlation between the SRS and the ABAS-II for children with ASD in the Kenworthy et al. (2010) study after controlling for IQ.

Statistical examinations of ASD traits have supported social impairment as one of the core deficits, regardless of whether one finds a single-factor (e.g. Constantino, Gruber, Davis, Hayes, Passanante, Przybeck, 2004), two-factor (e.g. Gotham et al., 2007), or three-factor (e.g. Lecavalier, Gadow, DeVincent, Houts, & Edwards, 2009) structure to ASD. RSI are at the core of ASD. Some have argued that specific patterns of social behavior deficits can distinguish between different types of ASD (Constantino & Gruber, 2005; Hartman, Luteijn, Serra, & Minderaa, 2006) and between ASD and nonASD among typically-developing children (Hartman et al., 2006; Constantino, Davis, et al., 2003; Skuse, Mandy, & Scourfield, 2005) and among those with ID (de Bildt, Serra, Luteijn, Kraijer, Sytema, & Minderaa, 2005). Although RSI are diagnostically relevant to ASD, they are not exclusive to ASD. Mild social communication deficits are believed to be common and continuously distributed within the general population (Constantino et al., 2000; Constantino & Todd, 2003; Skuse et al., 2009). RSI occur among those with ID, those with psychopathology, and within the general population.

**Relation between psychopathology and RSI among those without Intellectual Disability.** The relationship between RSI and psychopathology is of importance, since
individuals with psychopathology also exhibit social impairments including RSI. As
discussed above, individuals with ASD are at an increased risk for psychopathology,
which may be related to increased severity in RSI.

ADHD is a key disorder in which the investigation of RSI is relevant. Children
with ADHD demonstrate poor social skills. For example, when Mikami (2010) reviewed
the literature on friendships among those with ADHD, she found that children with
ADHD have less stable friendships, and some with ADHD and conduct problems have no
friends. Although Mikami (2010) viewed friendships as separate from social skills, the
reciprocity involved in friendship requires appropriate reciprocal social behavior. One
would theorize that RSI would be elevated among those with ADHD. Indeed, that is
what researchers have found. In a sample of 946 twins with ADHD, Reiersen,
Constantino, Volk, and Todd (2007) found that RSI, as measured by the SRS, was
present (and in some cases in the clinical range). Among 256 sibling pairs, both ADHD
probands and their siblings exhibited increased RSI and other social skill deficits as
measured by the CSBQ (Nijmeijer et al., 2009).

RSI are also elevated among other psychological disorders. Pine, Guyer,
Goldwin, Towbin, and Leibenluft (2008), as a follow-up to Towbin, Pradella, Gorrindo,
Pine, and Leibenluft (2005) found that all 245 subjects in their four clinical groups
(anxious, depressed, bipolar, and severe mood dysregulation [SMD]) experienced greater
social impairments than the 107 healthy controls as assessed by the SCQ, the SRS, and
Children’s Communication Checklist. Children with bipolar disorder or SMD had the
highest RSI, but all groups had higher scores than healthy controls.
Children with conduct disorder or other disruptive behaviors also show elevated RSI. Gilmour, Hill, Place, and Skuse (2004) found that among 55 clinical- and 54 community-ascertained children with conduct disorder (CD) or disruptive behaviors, RSI on the SCDC have gone unrecognized. These researchers suspected that social impairments were causally-related to exclusion from school, ostensibly due to disruptive behavior. Further examinations by these researchers of the relationship between exclusion from school on account of disruptive behavior and social skills problems again found verbal and non-verbal RSI similar to children with ASD, which they theorized may have had a causal role in disruptive behavior (Donno, Parker, Gilmour, & Skuse, 2010). They concluded that addressing behavior problems without also addressing social skills deficits would be ineffective.

Mild RSI on the SCDC were also associated with functional impairments in school and with hyperactivity and conduct disorders among approximately 70% of children in the Avon Longitudinal Study of Parents and Children cohort (8,094 children; Skuse et al., 2009). However, there was an interaction effect between gender and verbal IQ (VIQ). Girls with high VIQ (≥ 100) were less likely to exhibit RSI and its psychopathological correlates; however, males with high VIQ did not experience these benefits. Among those with ID (VIQ ≤ 70), RSI were higher and they experienced the psychopathological correlates of it.

Individuals without an ASD or a psychiatric disorder may show elevated RSI. For example, in a study of college undergraduates, Kanne, Christ, and Reiersen (2009) administered the SRS and the adolescent version of the Self Report of Personality from
the Behavioral Assessment System for Children—2nd edition (BASC-2). They found that participants scoring in the top 5% (n=34) on the SRS experienced greater psychiatric symptoms than the 73 matched controls with low levels of impairments. Only 6 of the 21 subscales on the BASC-2 failed to show statistically-significant differences between the low- and high-SRS groups.

Poor social competence also characterizes psychopathology. Some studies have not examined RSI or other social skills deficits, but have looked at social competence overall. In one longitudinal study of 205 children over 20 years, high social competence was inversely related to future internalizing disorders (Burt, Obradovic, Long, and Masten, 2008). At each point of data collection in the unconstrained measurement model, high social competence was inversely correlated to both internalizing (range \( r = -0.19 \) to \(-0.43\) for significant associations) and externalizing disorders (\( r = -0.19 \) Wave 3 and \(-0.52\) Wave 1).

High social competence, as measured by adaptive behavior scales, is also inversely related to measures of psychopathology. The manual of ABAS-II (Harrison & Oakland, 2003) reported correlations between the teacher/daycare-provider-completed form and the BASC for a sample of 37 non-clinical children. The Social domain was inversely correlated to the BASC behavior problem scales and composite scores (range \( r = -0.15 \) for Somatization to \(-0.67\) for Attention Problems), and positively correlated with Adaptability and Social Skills scales and the Adaptive Skills Composite (\( rs \geq 0.66\)). The Vineland-II (Sparrow, Cicchetti, & Balla, 2005) manual also reported correlations between the Socialization adaptive behavior domain and the BASC-II. Similar to the
ABAS-II, the Vineland-II was inversely correlated with the BASC-II behavior problem scales and composite scores (various ranges from $r = -.04$ to -.62 depending on age), and positively correlated with the adaptive functioning scales and composite (various ranges from $r = .34$ to .61 depending on age).

**Relation between psychopathology and RSI among those with Intellectual Disability.** Social skills deficits are elevated among those with ID. This includes RSI. On the SRS, those with ID obtained higher scores relative to the normative samples in both the US (Constantino & Gruber, 2005) and German versions (Bölte, Poustka, & Constantino, 2008). On the SCDC, Children with ID obtained higher scores than those without ID (Skuse et al., 2009), but it was not originally designed for use among those with ID (Skuse et al., 2005). Similar results have been found with the CSBQ: 152 children with ID and co-occurring ASD exhibited greater social behavior deficits than the 581 with only ID, both of which showed greater deficits than 232 typically-developing controls (Hartman et al., 2006). Among those with severe or profound ID, those with co-occurring ASD showed greater social skill deficits than individuals with similar levels of functioning without ASD (Wilkins & Matson, 2009; Matson, Dempsey, & LoVullo, 2009). Even though not all individuals with ID have co-occurring RSI, most have more RSI than those without ID.

RSI occur within the general population (Constantino & Todd, 2003), where they are correlated with psychopathology. However, few studies have examined the relationship between RSI and psychopathology among those with ID. In fact, ID is often an exclusionary criterion of general studies of RSI (e.g. Kenworthy et al., 2010) and of
studies relating RSI to psychopathology (e.g. Nijmeijer et al., 2009; Pine et al., 2008; Reiersen et al., 2007; Towbin et al., 2005). People with ID were part of other studies (8% of the 445 in Constantino et al., 2000; an unreported number in Constantino et al., 2003; about 50% of the 112 in Simonoff et al., 2008; about 4% of the 5,931 in Skuse et al., 2009), but they were not the target population.

Although RSI have not been well studied among those with ID, there has been some research regarding the association between other social skills or social competence and psychopathology. Most of the studies have focused on adults with severe or profound ID (e.g. Matson, Fodstad, & Rivet, 2009; Wilkins & Matson, 2009; Matson, Dempsey, & LoVullo, 2009), and found that those with ID and comorbid psychopathology have more social skills deficits than those with only ID. Additionally, the presence or absence of a comorbid ASD impacts social skill deficits. For example, one study found that 137 adults with ID, co-occurring ASD, and psychopathology exhibited a different pattern of social skill deficits than 138 matched controls with ID and psychopathology without ASD (Matson, Dempsey, & Rivet, 2009). Poor social skills, as measured by the Matson Evaluation of Social Skills for Individuals with sEvere Retardation (MESSIER), were positively correlated with psychopathology symptoms on the Diagnostic Assessment for the Severely Handicapped-II (DASH-II). In another study, Matson, Anderson, and Bamburg (2000) showed that, among 127 adults with mild or moderate ID, social skills deficits increased as overall level of psychopathology increased. However, these studies did not look at RSI specifically. RSI are more focused on social behavior consistent with ASD.
Most of the studies of social skills and psychopathology among those with ID have focused on adults, especially adults with severe and profound ID. Very little is known about the relationship between social skills deficits (in general, much less RSI) and psychopathology among children with mild or moderate ID.

**The Current Study**

The current study addresses the relationship between RSI and psychopathology symptom severity among children with mild or moderate ID. RSI are a defining feature of ASD and correlated with psychopathology among the general population, but it was unknown if this relationship would also exist among those with ID. Psychopathology symptoms were measured in four domains: ADHD, ODD, Anxiety Disorders, and Depressive Disorders. It was hypothesized that RSI would positively correlate with these domains. It was unclear to what degree RSI will correlate with these or how much variance would be explained. However, a better understanding of this relationship is necessary as it has implications for treatment. Among those with ASD, comorbid psychopathology impacts response to treatment. In one study, those with comorbid ADHD failed to respond to a group social skills intervention, whereas those with only ASD or ASD with comorbid anxiety disorders showed a response (Antshel et al., 2011). In research on disruptive behavior disorders, Donno and colleagues (2010) argued that RSI need to be addressed in treatment for the treatment to be effective. If indeed there was a relationship between RSI and psychopathology, as we expected that there would be, treatment would need to be modified to address both RSI and psychopathology in order to be most effective.
Adaptive behavior was measured to provide support of an ID diagnosis and quantify delays. Insofar as adaptive behavior was expected to relate to both RSI and psychopathology, hierarchical multiple regression was used for data analysis. However, measures of RSI are weakened in that they may also share variance with other correlates of psychopathology. Thus, a previous diagnosis of ADHD, a previous diagnosis of ASD, and sex were considered as potential covariates within each domain.

Two exploratory objectives of this study were (a) to examine the association between the SRS total score and the treatment subscales and a more global measure of social competence such as the ABAS-II social skill area, and (b) the association between the SRS treatment subscales and psychopathology among individuals with ID. The SRS has not been well validated among those with ID and the subscales have little empirical support (Constantino & Gruber, 2005). The purpose of these objectives was to evaluate the total score and subscales as they relate to other types of social skills and psychopathology. It was hypothesized that a moderate to strong relationship would occur between the SRS and ABAS-II social skill area, and that no subscale would be more highly related to any psychopathology domain than another, insofar as all of the treatment subscales are measuring the same construct (i.e. RSI).
Chapter 2: Methods

Power Analyses

It was hypothesized that a medium-sized correlation \( R^2 > .13 \) would occur within each psychopathology domain. If only the ABAS-II Practical domain and SRS total score were included, about 70 children will be necessary to obtain .80 power when alpha is set at .05. If all potential covariates were included and for the exploratory analysis with the SRS, there would be five predictors, and thus 70 children would only provide .67 power (Faul, Erdfelder, Lang, & Buchner, 2007). Therefore, we sought to recruit about 85 children, which would provide adequate power (> .76) with two to five predictors.

Participants

Participants were school-age children, 5 to 17 years old inclusive with mild or moderate ID, and their parents. Participants were drawn from school districts throughout Ohio, Children’s Behavior Support Services at the Nisonger Center, and from families responding to a study flyer. Parents completed all measures. Children with severe sensory limitations (e.g. blind or deaf) were excluded. No diagnostic or other exclusionary criteria were enforced. Additional information on eligibility determination follows below. Per guidelines from the Institutional Review Board, parents were also considered participants due to collection of information from them on their child and
collection of their information for the distribution of the incentive. Thus each returned packet represents two participants.

Three-hundred twelve packets were delivered to school districts and directly to families (in response to flyers). Of the 312, 67 were returned, for a response rate of 21%. However, not all returned packets included analyzable data. Packets were excluded due to insufficient data on one or multiple instruments, ineligibility due to age, or ineligibility due to level of functioning. The final sample included data from 37 children (12%), which is less than the targeted sample size. Table 1 provides demographic information on the child participants whose data were analyzed.

Table 1: Subject Demographics

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean, range)</td>
<td>11.7 (6.1 – 17.7)</td>
</tr>
<tr>
<td>Sex (girls : boys)</td>
<td>9 : 28</td>
</tr>
<tr>
<td>Previous ADHD Diagnosis (n)</td>
<td>10</td>
</tr>
<tr>
<td>Previous ASD Diagnosis (n)</td>
<td>14</td>
</tr>
<tr>
<td>Ethnicity: (n, %)</td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>30 (81%)</td>
</tr>
<tr>
<td>African-American</td>
<td>4 (11%)</td>
</tr>
<tr>
<td>Other</td>
<td>3 (8%)</td>
</tr>
<tr>
<td>Parent-Reported Level of Functioning: (n, %)</td>
<td></td>
</tr>
<tr>
<td>Borderline</td>
<td>4 (11%)</td>
</tr>
<tr>
<td>Mild Impairment</td>
<td>11 (30%)</td>
</tr>
<tr>
<td>Moderate Impairment</td>
<td>6 (16%)</td>
</tr>
<tr>
<td>Unsure (n, %)</td>
<td>16 (43%)</td>
</tr>
<tr>
<td>Practical Adaptive Behavior (mean, range)</td>
<td>53 (40 – 83)</td>
</tr>
<tr>
<td>Taking Medications (n, %)</td>
<td>25 (68%)</td>
</tr>
<tr>
<td>From Single-Parent Homes (n, %)</td>
<td>13 (35%)</td>
</tr>
<tr>
<td>Receiving Therapies:</td>
<td></td>
</tr>
<tr>
<td>Speech Therapy</td>
<td>12 (32%)</td>
</tr>
<tr>
<td>Occupational Therapy</td>
<td>10 (27%)</td>
</tr>
<tr>
<td>Physical Therapy</td>
<td>5 (14%)</td>
</tr>
<tr>
<td>Other Therapies or Unspecified Therapies</td>
<td>15 (41%)</td>
</tr>
</tbody>
</table>
Measures

**Child demographic form.** The demographic form for each child (see Appendix A) was completed along with the other measures. It requested information about current diagnoses, medications, age, and gender. There was also space available to provide IQ range. It also contained questions regarding conditions that have previously been correlated with psychopathology among those with ID (based largely in part on Dekker & Koot, 2003b and Emerson, 2003).

**Social Responsiveness Scale (SRS; Constantino & Gruber, 2005).** The SRS (see Appendix B) is a parent- or teacher-completed measure of reciprocal social behavior and deficits thereof (i.e. RSI). It consists of 65 items rated on a 4-point likert scale, some of which are reverse scored. The SRS presents a severity score for RSI including a cut-off for suspected ASD diagnoses (see Norris & Lecavalier, 2010 regarding sensitivity and specificity of several ASD diagnostic measures including the SRS).

The SRS also contains 5 subscales for treatment planning purposes, (a) Social Awareness, (b) Social Cognition, (c) Social Communication, (d) Social Motivation, and (e) Autistic Mannerisms. The authors of the SRS studied its psychometric properties in several contexts and found it to demonstrate good discriminate validity (Constantino et al., 2000; Constantino & Todd, 2003) and concurrent validity (Constantino, Davis, et al., 2003). The authors recommend that Total Scores, which range from 0 to 195, be used for research purposes as opposed to the T-Scores presented in the manual (Constantino & Gruber, 2005).
The SRS has not been well studied among those with ID, either for diagnostic purposes or for quantifying RSI. The authors reported that in a sample of 16 nonASD clinical referrals, the SRS was unrelated to IQ ($r = -0.08$), but there was a moderate inverse relationship among 21 individuals with a nonAutism ASD diagnosis ($r = -0.42$), though not all of the subjects had ID (Constantino et al., 2000). In another study, the SRS was unrelated to IQ (nonsignificant correlations for teacher-, mother-, and father-completed SRS) among 38 subjects, not all of whom had ID (Constantino, Davis, et al., 2003). Further investigation of the relationship between the SRS and IQ is warranted since sample sizes were small in both studies and other investigators measuring social skills deficits with different instruments found that scores were related to IQ (e.g. Skuse et al. 2009, contradicting Skuse et al., 2005; Dekker & Koot, 2003a).

**Children’s Symptom Inventory – 4 (CSI-4; Gadow & Sprafkin, 2002).** The CSI-4 is a parent- or teacher-completed level one screener for psychopathology syndromes. Items correspond with DSM-IV symptoms on a one-to-one basis and thus have high content validity. Most items are scored on a 4-point likert scale ($0 = \text{never}$, $1 = \text{sometimes}$, $2 = \text{often}$, $3 = \text{very often}$), with several items for depressive disorders dichotomously scored (“yes” = present, “no” = absent). Numerous studies have demonstrated satisfactory psychometric properties of the CSI-4 (for a review, see Gadow & Sprafkin, 2002, 2007). As with the SRS, the CSI-4 has not been well studied among those with ID. This does not, however, prevent it from being used among those with ID or ASD, including as an intake measure in clinical trials (e.g. Arnold et al., 2000).
The CSI-4 can be scored in two ways: symptom severity, and symptom count. The Likert scale ratings are summed for each category to determine symptom severity. Symptom count disregards severity ratings and instead classifies symptoms as present or absent and then sums the number of symptoms present. There are symptom domains for ADHD, ODD, CD, GAD, Social Phobia, Separation Anxiety Disorder, Obsessive-Compulsive Disorder (OCD), Post-Traumatic Stress Disorder (PTSD), Specific Phobia, Major Depressive Disorder (MDD), Dysthymic Disorder, Elimination Disorders, all three symptom domains for ASD diagnoses, and Tics.

For the purpose of this study, parents completed an abridged version of the CSI-4 (see Appendix C). Four anxiety disorders (GAD, Social Phobia, Separation Anxiety, and Specific Phobia) were combined into one symptom domain “Anxiety Disorders” because it was expected that there would be a high prevalence of anxiety symptoms in general, but not of any individual syndrome. Dysthymic Disorder and MDD were also combined into one symptom category “Depressive Disorders,” because there is a high overlap in symptoms among these conditions. The symptom domains of ADHD and ODD were unchanged. This abridged version maintained 58 items from the 97 original items on the CSI-4 split into four symptom domains: ADHD (18 items, score range 0-54), ODD (8 items, score range 0-24), Anxiety Disorders (21 items, score range 0-63), and Depressive Disorders (12 items, score range 0-36). One item is shared between ADHD and Anxiety, and two items are shared between Anxiety and Depressive Disorders.

**The Adaptive Behavior Assessment System-Second Edition (ABAS-II; Harrison & Oakland, 2003).** The ABAS-II is a standardized measure of adaptive
behavior that uses teachers/daycare-providers or parents/caregivers as informants, or adults can be self-informants. There are different measures for different age ranges (parent form: 0-5, 5-21, and 16-89 years; teacher form: 2-5 and 5-21 years; self-informant: 16-89 years). This study used the school-age parent-completed form (age 5-21). The ABAS-II measures 10 different adaptive behavior skill areas in three domains: Conceptual (Communication, Functional Academics, and Self-Direction), Social (Leisure and Social), and Practical (Community Use, Home or School Living, Health and Safety, and Self-Care); the tenth skill area is Work, which is scored, but not included in any domain or the General Adaptive Composite (GAC) for the school-age form.

The ABAS-II has demonstrated satisfactory psychometric properties. According to its manual, the ABAS-II school-age parent-completed form was normed on a representative sample of 1,670 children (Harrison & Oakland, 2003), including children with ID. The ABAS-II is frequently used among those with ID, because adaptive behavior deficits are part of the diagnostic criteria for ID. It has good internal consistency and test-retest reliability. The authors of the ABAS-II found an adequate fit of the factor structure after submitting it to confirmatory factor analysis for a one-factor and a three-factor structure (for the GAC and the three skill domains, respectively).

For the purpose of this study, only the social skill area and the four skill areas of the Practical domain were measured (See Appendix D). The parent-completed Practical domain contains 94 items related to appropriate home behavior, safety practices, and basic daily living skills. These skills, especially daily living skills, have negatively correlated with psychopathology (e.g. Dekker & Koot, 2003b). The parent-completed
Practical domain correlates with the WISC-III FSIQ ($r = .48$) and with the WISC-IV FSIQ ($r = .28$). The social skill area contains 23 items measuring social behavior. It was not included in the primary hypothesis regarding the relationship between RSI and psychopathology symptom domains. However, it was expected that RSI would be associated with social skills as measured by the ABAS-II.

**Procedures**

**Recruitment.** The primary means of recruitment was through local schools. Information regarding the study was provided to the schools (Appendix E), who were then asked to distribute a packet of study material to eligible students by sending them home in the child’s book bag. These packets included a brief description of the study for parents (Appendix F) including information regarding the incentive (discussed below), all study measures (the SRS, CSI, ABAS-II), and a postage-paid business reply envelope. After parents received the packets, those who wished to participate completed the measures and returned them in the enclosed business reply envelope.

Additional participants were recruited through flyers and made available through community organizations (Appendix H) or through school districts that did not wish to distribute the actual study material but agreed to distribute the flyer (Appendix I). Parents interested in the study contacted the investigators regarding receiving study material and it was mailed to them.

**Consent.** The documentation of consent was waived for this study. All study measures were coded prior to distribution of study packets, so the researchers remained blind to the identity of participants. Parents who received study materials that were
distributed through their local schools were able to discard the materials if they did not consent to participation.

**Eligibility determination.** Schools have a responsibility to identify children with ID as they may be eligible for special education services. In this study, measures were distributed through the schools to children they have identified as ID. This was confirmed by reviewing the demographics page to ensure that informants checked “Mild Impairment (IQ between 55 and 75)” or “Moderate Impairment (IQ between 40 and 55)” or a diagnosis of “Mental Retardation / Intellectual Disability” to describe their child.

Since the investigators did not administer an individual IQ test to the children, the ABAS-II was used to provide convergent information on the diagnosis of ID. Informants were not completing the entire ABAS-II, so the strict criterion of two standard deviations below the mean was not followed, but it was still expected that the participants would show significant deficits relative to their peers. As such, children who did not score at least one standard deviation below the mean on the Practical Domain of the ABAS-II were excluded.

**Incentive.** In order to encourage participation, an incentive of $10.00 per completion was offered to the parents choosing to participate. An incentive form (Appendix G) was included with all packets, but was not coded with the study measures so that personally identifiable information could not be tied to any specific set of measures. When an incentive form was received, it was mailed to the parent.
Data Analyses

Hierarchical multiple regressions were used to investigate the relationship between each of the four psychopathology symptom domains on the abridged CSI-4 and RSI. It was initially planned to analyze the psychopathology domains as related to RSI, after controlling for practical adaptive behavior in the primary model, and then adding sex and previous diagnosis of ASD or ADHD for the secondary model.

However due to the smaller than anticipated sample size, the data analysis model was changed from looking for effects of other variables in the secondary model to a hierarchical model with additional covariates. Zero-order correlations between sex, previous ASD diagnosis, and previous ADHD diagnosis were analyzed for statistical significance. Those found to be significant at a $\alpha = 0.10$ level were determined to be statistically relevant to the analysis and added as a covariate before including RSI. As planned, adaptive behavior was entered on the first step of analysis to control for level of functioning, regardless of whether it was statistically significantly related to the psychopathology domain. In the second step, sex and previous diagnoses of ASD or ADHD were added if they related to the domain of interest. In the final step, the independent contribution of RSI, as measured by the SRS, was added.

An exploratory objective of this study was evaluating the relationship between the SRS treatment subscales and more global social skills and psychopathology. First, the SRS total score and each of the five treatment subscales were correlated with the social skill area from the ABAS-II in order to determine if they are measuring the same, or a very similar construct. Second, multiple regression was used to examine if the treatment
subscales explained meaningful variance in the four psychopathology domains independent of one another. No covariates were included in these analyses.
Chapter 3: Results

Zero-Order Correlations

Table 2 presents zero-order correlations between the four CSI-4 psychopathology domains and the possible predictor variables. (Refer to Appendix J for zero-order correlations between the SRS and CSI-4 domains.) Note that although ABAS-II Practical Domain score was not significantly related to any CSI-4 domain, it was included in the hierarchical regressions to serve as a proxy of and control for functional ability.

Of the potential covariates, sex was not significantly correlated with any outcome variable. A previous diagnosis of ADHD was related to all CSI-4 domains, with the exception of Anxiety. A previous diagnosis of ASD was related to the CSI-4 ADHD domain. These were entered as covariates in the second step of the hierarchical regression to test if the SRS adds significant variance in predicting the ADHD, ODD, Anxiety disorders, and Depressive disorders scores.

Table 2: Zero-Order Correlations between Potential Covariates and CSI-4 Psychopathology Domains

<table>
<thead>
<tr>
<th></th>
<th>ADHD</th>
<th>ODD</th>
<th>Anxiety</th>
<th>Depressive</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABAS Practical Domain</td>
<td>-0.254</td>
<td>0.12</td>
<td>-0.085</td>
<td>0.026</td>
</tr>
<tr>
<td>Sex</td>
<td>-0.267</td>
<td>-0.059</td>
<td>0.257</td>
<td>0.153</td>
</tr>
<tr>
<td>Previous ADHD Diagnosis</td>
<td>0.511**</td>
<td>0.377*</td>
<td>0.206</td>
<td>0.434**</td>
</tr>
<tr>
<td>Previous ASD Diagnosis</td>
<td>0.467**</td>
<td>-0.018</td>
<td>0.130</td>
<td>0.009</td>
</tr>
</tbody>
</table>

* $p < 0.05$, ** $p < 0.01$
Attention-Deficit / Hyperactivity Disorder (ADHD)

Table 3 presents the results of the hierarchical linear regression for ADHD. Practical adaptive behavior was entered on the first step. It did not provide statistically significant predictive ability in ADHD scores. On the second step, previous ASD and ADHD diagnoses were also entered. Adding these variables significantly improved the variance predicted by the model ($p < .001$). On the final step, RSI as measured by the SRS Total raw score was entered. It significantly improved $R^2$ ($p = .028$).

Table 3: Attention-Deficit / Hyperactivity Disorder Hierarchical Regression

<table>
<thead>
<tr>
<th>Step/Predictor</th>
<th>$\beta$</th>
<th>$\beta$</th>
<th>$\beta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.00</td>
<td>-0.62**</td>
<td>-0.35</td>
</tr>
<tr>
<td>1- ABAS Practical</td>
<td>-0.25</td>
<td>-0.13</td>
<td>-0.01</td>
</tr>
<tr>
<td>2- Previous ASD Dx</td>
<td>0.84**</td>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td>Previous ADHD Dx</td>
<td>1.11***</td>
<td>0.94**</td>
<td></td>
</tr>
<tr>
<td>3- SRS Total</td>
<td>0.45*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.06</td>
<td>0.48***</td>
<td>0.55***</td>
</tr>
<tr>
<td>$\Delta R^2$</td>
<td>--</td>
<td>0.42***</td>
<td>0.07*</td>
</tr>
</tbody>
</table>

*Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Oppositional Defiant Disorder (ODD)

The only potential covariate with a significant correlation to ODD was a previous ADHD diagnosis. Thus, in the hierarchical regression, Practical adaptive behavior was entered in the first step and previous ADHD diagnosis was entered in the second step (see Table 4). Practical adaptive behavior was unrelated to ODD. A previous ADHD diagnosis improved the model ($p = .025$), but the addition of RSI did not significantly
improve the model, and the overall model did not predict a significant proportion of variance in CSI-4 ODD scores \( R^2 = 0.16, p > .10 \).

**Table 4: Oppositional Defiant Disorder Hierarchical Regression**

<table>
<thead>
<tr>
<th>Step/Predictor</th>
<th>( \beta )</th>
<th>( \beta )</th>
<th>( \beta )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.00</td>
<td>-0.23</td>
<td>-0.22</td>
</tr>
<tr>
<td>1- ABAS Practical</td>
<td>0.12</td>
<td>0.11</td>
<td>0.15</td>
</tr>
<tr>
<td>2- Previous ADHD Dx</td>
<td>0.83*</td>
<td>0.80*</td>
<td></td>
</tr>
<tr>
<td>3- SRS Total</td>
<td></td>
<td></td>
<td>0.07</td>
</tr>
</tbody>
</table>

\[ R^2 \]
\[ \Delta R^2 \]

*Note: * \( p < 0.05 \)

**Anxiety Disorders**

Anxiety disorders were unrelated to any of the potential covariates. As such, the hierarchical regression only included two steps: controlling for Practical adaptive behavior and adding RSI as measured by the SRS Total raw score (see Table 5). Practical adaptive behavior did not predict a significant proportion of variance in anxiety scores \( R^2 < .01, p > .10 \). Adding RSI significantly improved the model \( p = .03 \), but the model \( R^2 \) was not significantly different from zero \( R^2 = .14, p = .08 \).
Table 5: Anxiety Disorders Hierarchical Regression

<table>
<thead>
<tr>
<th>Step/Predictor</th>
<th>$\beta$</th>
<th>$\beta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- ABAS Practical</td>
<td>-0.09</td>
<td>0.11</td>
</tr>
<tr>
<td>2- SRS Total</td>
<td>0.41*</td>
<td></td>
</tr>
</tbody>
</table>

$R^2 <0.01$  
$\Delta R^2$ --  

* $p < 0.05$

Note: The intercept is not reported because all variables were standardized and no dichotomous variables were included

It was prespecified that ABAS-II Practical Adaptive Behavior scores would be entered into the first step of the analyses for all psychopathology domains. The Practical domain was not expected to be unrelated to all psychopathology domains (c.f. Table 2), including Anxiety Disorders. Were the Practical domain not included in the analysis, the SRS would be the only predictor of Anxiety symptom severity, and it would have been a statistically significant predictor ($r = .36, p = .03$). However, because two predictors were included in the regression equation, the model failed to reach statistical significance.

**Depressive Disorders**

A previous ADHD diagnosis was significantly related to depressive disorders. As such, it was added as a covariate in the second step of the hierarchical regression (see Table 6). Practical adaptive behavior did not predict a statistically significant proportion of variance in Depressive Disorders score ($R^2 < .001, p > .10$). Adding a previous ADHD diagnosis improved the model ($p < .01$). RSI could not predict additional variance above a previous ADHD diagnosis ($\Delta R^2 = .07, p = .08$).
Table 6: Depressive Disorders Hierarchical Regression

<table>
<thead>
<tr>
<th>Step/Predictor</th>
<th>β</th>
<th>β</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.00</td>
<td>-0.26</td>
<td>-0.22</td>
</tr>
<tr>
<td>1- ABAS Practical</td>
<td>0.03</td>
<td>0.02</td>
<td>0.16</td>
</tr>
<tr>
<td>2- Previous ADHD Dx</td>
<td></td>
<td>0.96**</td>
<td>0.82*</td>
</tr>
<tr>
<td>3- SRS Total</td>
<td></td>
<td></td>
<td>0.31</td>
</tr>
</tbody>
</table>

$R^2$ < 0.001 0.19* 0.26*

$\Delta R^2$ -- 0.19** 0.07

Note: * p < 0.05, ** p < 0.01

The Association between the SRS and the ABAS-II Social Skill Area or CSI-4

Psychopathology

The SRS and social adaptive behavior. The SRS total raw score, total T-score and the treatment subscales T-score were correlated with the ABAS-II social skill score, which is one subscale of the Social Domain. The results are shown in Table 7. The SRS shows a moderate association with social skills as measured by the ABAS-II. Only the Social Motivation subscale fails to reach a statistically significant correlation with the social skill area. The other correlations are moderate in size.

Table 7: SRS Correlations with the ABAS-II Social Skill Area

<table>
<thead>
<tr>
<th>SRS Scale</th>
<th>ABAS Social Skill</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Raw Score</td>
<td>-.57</td>
<td>-.75 to -.30</td>
</tr>
<tr>
<td>Total T-Score</td>
<td>-.53</td>
<td>-.73 to -.25</td>
</tr>
<tr>
<td>Social Awareness</td>
<td>-.61</td>
<td>-.78 to -.35</td>
</tr>
<tr>
<td>Social Cognition</td>
<td>-.39</td>
<td>-.64 to -.08</td>
</tr>
<tr>
<td>Social Communication</td>
<td>-.55</td>
<td>-.74 to -.27</td>
</tr>
<tr>
<td>Social Motivation</td>
<td>-.30</td>
<td>-.56 to .04</td>
</tr>
<tr>
<td>Autistic Mannerisms</td>
<td>-.50</td>
<td>-.71 to -.21</td>
</tr>
</tbody>
</table>
The treatment subscales and psychopathology. As an exploratory analysis, each of the CSI-4 psychopathology domains were regressed on the treatment subscales of the SRS. Unlike the above primary analyses, CSI-4 scores were not standardized and the SRS treatment subscales remained in the T-score metric. The treatment subscales predicted a significant proportion of variance in ADHD scores ($R^2 = .55$, $F(5,31) = 7.47$, $p < .001$). However, only Autistic Mannerisms was a significant predictor (b-weight = 0.59, $p < .001$). The treatment subscales were unrelated to ODD ($R^2 = .10$, $F(5,31) = .72$, $p > .10$), Anxiety ($R^2 = .25$, $F(5,31) = 2.02$, $p = .10$), and Depressive Disorders ($R^2 = .15$, $F(5,31) = 1.08$, $p > .10$).
Chapter 4: Discussion

RSI are a type of social skill deficit consistent with ASD. However, they do not occur only in ASD, but in the general population and in individuals with psychiatric problems (Constantino & Todd, 2003). ID and ASD often co-occur and diagnostic criteria for ID imply problems with social competence (Schalock et al., 2010), part of which may include RSI. It was hypothesized that social skills impairments consistent with ASD, such as RSI, would be related to increased psychopathology among those with ID.

Unexpectedly, ODD, Anxiety, and Depressive Disorders were unrelated to RSI. RSI only predicted increased ADHD symptom severity above and beyond the select covariates. These findings differ from some previous research among those without ID. Those with ID have been excluded from many previous investigations of RSI and psychopathology (e.g. Antshel et al., 2011; Nijmeijer et al., 2009; Pine et al., 2008; Reiersen et al., 2007; Towbin et al., 2005). The previous studies that included individuals with ID focused on adults (e.g. Matson et al., 2000), especially adults with severe or profound impairments (e.g. Wilkins & Matson, 2009).

These results are inconsistent with research among children and adolescents without ID, where a relationship between social skills impairments, including RSI, exists among ADHD, ODD, Anxiety, and Depressive disorders. Disruptive behavior disorders,
such as ODD, have been associated with RSI as measured by the SCDC (Gilmour et al., 2004). Pine and colleagues (2008) found that RSI on the SRS (and other measures of ASD) were elevated among all clinical groups compared to 107 healthy controls. The 62 children and adolescents with bipolar disorder or 63 with SMD had the highest scores on all measures of ASD symptoms, including the SRS used herein. The 32 children and adolescents with depression and 88 with anxiety disorders also obtained higher ratings on all measures, including the SRS, but less so than those with bipolar or SMD. This study, though, did not consider bipolar or SMD. Even among those in the general population (i.e. without mental illness or a DD), increased RSI are associated with increased symptomology of psychopathology. Among 107 college-age students chosen for extreme scores on the SRS, significant group differences on BASC-2 subscales related to internalizing problems emerged (Kanne et al., 2009). Thus the results of this study among those with ID do not match the results of previous research among those without ID.

RSI were only related to ADHD in this study. ADHD is one of the most common comorbid conditions for individuals with ID (Dekker & Koot, 2003a; Emerson, 2003) and with ASD (Simonoff et al., 2008). Previous research has demonstrated that those with ADHD are at greater risk for impaired friendships (Mikami, 2010), high rates of RSI (Reiersen et al., 2009), and other social skill deficits. Children with comorbid ASD and ADHD obtain higher scores on other types of psychopathology as well (Gadow et al., 2009). Thus, it is not surprising that in this study, RSI were predictive of ADHD.
symptom severity, even beyond previous ADHD diagnoses. The association between the two disorders has been documented in a number of studies, including this one.

Given this relationship, individuals with ID and symptoms of ADHD should be evaluated for RSI. There are implications for treatment. A treatment may have longer lasting impact if it addresses both components. This is consistent with the recommendations of other investigators. For example, Antshel et al. (2011) found that comorbid ADHD among those with ASD can interfere with treatment response during a social skills training group, and Donno et al. (2010) found RSI to be related to disruptive behavior and argued that both disruptive behavior and RSI should be addressed for a treatment to be effective.

Unfortunately, there aren’t many treatments available for those with ID, RSI, and ADHD symptoms. Reichow and Volkmar (2010) recently reviewed the best evidence for social skills interventions for individuals with ASD. In their review, they included studies involving children and adolescents with co-occurring ID and ASD. Thus, the interventions they found as empirically supported training programs for individuals with ID and ASD may also be effective for those with ID and RSI. They found social skills groups for school-aged children to be an established intervention and video modeling for school-aged children to be a promising intervention.

Although Reichow and Volkmar (2010) recommended social skill groups, it is unclear what type of social skills group is effective. When White, Koenig, and Scahill (2007) reviewed the research on social skills groups among those with ASD, they found that although there was some evidence that they were effective, few investigations of
social skills training programs had strong methodologies or used manualized interventions, making replication of training difficult. No studies in either review directly assessed the relationship between ASD (or RSI) and ADHD. However, Antshel et al. (2011) found that comorbid ADHD can blunt group social skills treatment response for those with ASD. As with other studies of RSI and psychopathology, they excluded individuals with ID. Thus, although interventions for those with ID, symptoms of ADHD, and elevated RSI should address all three domains, a proven and effective intervention is yet to be established.

Unlike with ADHD, RSI were not significantly related to symptoms of ODD, Anxiety, and Depressive Disorders. One possible explanation for this difference is that individuals with ID already have higher rates of social skill deficits than typically developing children and adolescents such that additional impairments minimally affect comorbidity. It is also possible that this is a statistical artifact related to lack of power or adequate range in the variables or differential rates of item endorsement. Increasing the sample size could have revealed oddities within this smaller sample or provided additional support for or against a relationship between the variables. Regarding symptom endorsement, among those with ASD, rates of endorsement vary with IQ (Witwer & Lecavalier, 2010). That could have happened here, but could not be made certain. Future research on the relationship between social skills impairments such as RSI and psychopathology are warranted.

Even with poor social skills, individuals with strong support networks may be a protective factor from psychopathology, though only longitudinal studies could truly...
answer this question. Social support or social strain impacts child functioning to such an extent that intervention programs often target supporting parents to improve child outcomes (c.f. Thompson & Ontai, 2000). As with RSI and psychopathology, there hasn’t been much research on social support and psychopathology among those with ID; most has focused on quality of life. However, in two studies among adults with ID, social support was less predictive of depression than social strain (Lunsky & Benson, 2001; Lunsky & Havercamp, 1999). In a longitudinal study, Wieland and Baker (2010) compared children with ID to typically-developing children between ages 6 and 8 years. They found that maternal marital support (marital quality and spousal support) were predictive of child outcome among typically-developing children, but not among those with ID; child behavior problems did not predict marital support for either group, suggesting a unidirectional relationship between parental social support and child outcomes.

The lack of association between RSI and ODD, Anxiety, and Depressive Disorders in the current study may be due to the higher rates of social skill impairment among those with ID such that additional RSI fail to predict more severe psychopathology. This is consistent with the different responses to social support found among those with ID compared to typically-developing individuals. There may be fundamental differences in the association between psychopathology and other variables such as RSI among those with ID.

When considering the research on comorbid psychopathology among those with ID, high rates of ODD are common. Emerson (2003), using the ICD-10 diagnostic
system, found ODD to be more common (13.3%) than hyperkinesis (8.7%). ADHD and ODD had similar 1-year prevalence rates (14.8 & 13.9%, respectively) among 474 children and adolescents with ID in a Dutch sample (Dekker & Koot, 2003a). ADHD and ODD also have similar prevalence rates among those with ASD. For example, among 112 children with ASD in a British population cohort, the prevalence rate for ADHD was 28.2% and the rate for ODD was 28.1% (Simonoff et al., 2008). In the general population, ADHD and ODD are often comorbid conditions (Angold, Costello, & Erkanli, 1999). Thus, it was rather unexpected in this study to find an association between RSI and ADHD with no relationship whatsoever with ODD. Anxiety disorders, as a group, are also common among those with ID. In the Dutch sample, 21.9% of the sample had an anxiety disorder (Dekker & Koot, 2003a). This study was underpowered to find an effect for anxiety disorders (see Limitations, below).

One exploratory objective of this study was to evaluate the association between the SRS and more global measures of social skills, specifically the ABAS-II social skill subscale. Correlations between the SRS Total raw and T-scores and the treatment subscale T-scores, excluding Social Motivation, were significantly related to the ABAS-II Social skill area. This supports the conclusion that the SRS is not measuring the same construct as the ABAS-II. The correlations in this sample were not as large as what was found by Kenworthy et al. (2010) among typically-developing children. Unlike that study, though, this study cannot partial out IQ, as they did in their ASD sample, to see if these relationships become nonsignificant when considering IQ.
Previous evaluations of the SRS and the CBCL have found moderate correlations between the two, raising concerns about whether the SRS is measuring generic psychopathology as opposed to RSI (Constantino et al., 2000). After further evaluation, Constantino et al. (2003) argued that RSI are genetically independent from psychopathology. Similar results were found in this study. The subscales were unable to predict significant variance in the CSI-4 psychopathology domains excluding ADHD symptoms, in which only Autistic Mannerisms was a significant predictor. In the primary analyses, the SRS total score was only a significant predictor for ADHD symptoms, after controlling for other relevant variables. The Autistic Mannerisms subscale is more behaviorally-focused than the other treatment subscales. One possibility for the relationship between RSI and ADHD symptoms is that the behavioral changes associated with RSI are predictive of ADHD severity, but not more social aspects of RSI. In that case, the validity of RSI as a unidimensional construct should be questioned. Further investigations on the validity of the SRS are warranted, especially among those with ID, including evaluating the dimensionality of RSI.

Limitations

The primary limitation in this study was the means of recruitment. Several problems were identified during this phase of the study. First, the research material referenced “Intellectual Disability” as the preferred term. This is consistent with the AAIDD definition (c.f. Schalock et al., 2010). However, the school districts used the term “Cognitive Disability” as an IDEA label. Several districts declined to participate because of this semantic difference.
Secondly, although the school district personnel were informed about eligibility criteria, it is unclear how well this was followed. For example, one ineligible individual received a packet and questioned the IRB about the study; and several other individuals returned packets but were ineligible due to age or level of functioning. The letter to parents (Appendix F) should have also contained the eligibility criteria to ensure that parents receiving the packets were truly eligible to participate. This also assumes that school districts actually handed out the packets. Another limitation of recruitment involves this assumption – it is unclear to what extent the study packets were distributed. At least one packet was received from each district, but that does not ensure that all packets given to the districts were delivered to parents.

Thirdly, the study material encountered an administrative error early in recruitment. The administrative offices that printed off the labels had an error on the business reply envelopes such that they may have been misdelivered. This was eventually remedied, but it is unclear how many packets were misdelivered or never received by the research project. The response rate of 21% should be accepted as a lower bound on the actual response rate.

Another weakness is the small sample size. We had aimed at recruiting data on 85 children and adolescents, but only 37 individuals were obtained with usable data. This limits the generalizations which can be made from these results. One might argue that the null findings for ODD, Anxiety, and Depression are due to limited sample size. The overall regression model for Anxiety disorders was approaching significance (p = .08) and Depressive disorders was significant in the last step (p = .03). If the effect sizes
found with this smaller sample are accurate, the SRS explains minimal additional variance in ODD or Depressive disorders such that it would take data on a large number of individuals (n > 100) to find the SRS as a significant predictor. However, a larger sample size could change increase the range and variability in scores such that the association between variables could change. Regarding Anxiety Disorders, a larger sample size or conducting analyses without the ABAS-II Practical Domain as a covariate would have RSI to be a significant predictor. Thus conclusions on this analysis should be interpreted with caution at present.

A third limitation is the lack of IQ testing. The purpose of this study was to investigate the relationship between RSI and psychopathology among an ID sample, but only parental records and ABAS-II scores were used to support a diagnosis. It is quite possible that eligible children were excluded if their adaptive behavior is significantly higher or lower than their IQ and it is possible that ineligible children were included since IQ testing was not conducted on them.

**Conclusion**

RSI are related to psychopathology among the general population. In this study, a relationship was only found for ADHD symptoms. Unexpectedly, there was no relationship with ODD, Anxiety, or Depressive disorders. These results are of interest insofar as a relationship between social skills in general and RSI specifically have been related to comorbidity among those with typical IQ scores.

Attempts to replicate the findings of the study should also consider using other or additional measures. Additional psychometric evaluations of the SRS among those with
ID are warranted, given its unclear relationship with IQ and adaptive behavior in the literature. RSI as a unitary construct also deserves further evaluation. The SRS, and possibly the SCDC, are the only measures specific to RSI. The items theorized to be relevant to RSI relate to a wide variety and phases of social interaction such that a unidimensional RSI construct could be questioned. The differences between social aspects and behavioral aspects to RSI are one potential dimensional split within RSI. In this study, only the SRS Autistic Mannerisms subscale was related to ADHD. In the primary analysis, RSI were related to ADHD, but the total score might only reflect the relationship between the behavioral aspect of RSI and ADHD, not the social aspect of RSI. Using a multidimensional scale, such as the CSBQ, may be more appropriate for evaluating the relationship between social skills consistent with ASD and psychopathology. Other means of quantifying psychopathology are also possible, including using structured or semi-structured diagnostic interviews or focusing on behavioral dimensions, such as internalizing or externalizing symptoms.

Further research on the relationship between RSI and psychopathology among those with ID is warranted. It is possible that those with ID already have lower social competence due to their disability that additional RSI do not increase risk for symptoms of other disorders (possibly excluding ADHD). Or, future research could find a relationship between RSI and psychopathology, refuting the findings of this study. Previous research in adults with ID and children with typical IQ scores show a relationship between social skills and psychopathology, so the lack of association here may be due to the sample as opposed to a veridical lack of relationship.
References


Appendix A: Demographics Form
Child Demographic Information

Today's Date: ______/_____/_____

Child Information:
Date of Birth (month/year): ______/_____/_____
Gender: □ Male □ Female
Ethnicity:
□ White, Non-Hispanic
□ Hispanic
□ African-American
□ Asian-American
□ Other: ____________________________
□ Prefer not to answer

What is the child's level of intellectual functioning (IQ):
□ Average (IQ greater than 80)
□ Borderline (IQ between 70 and 80)
□ Mild impairment (IQ between 55 and 70)
□ Moderate (IQ between 40 and 55)
□ Severe (IQ between 25 and 40)
□ Profound (IQ less than 25)
□ Unsure / Don't know

What type of classroom does this child attend?
□ Regular Classroom
□ Developmentally Handicapped
□ Partial Mainstream
□ Multiple Handicapped
□ Cognitive Disability

Please check any diagnoses the child currently has:
□ Autism / PDD-NOS
□ ADHD
□ Epilepsy / Seizure Disorder
□ Prader-Willi Syndrome
□ William's Syndrome
□ Traumatic or Acquired Brain Injury
□ Sensory Limitation (vision, hearing, list below)
□ Mental Retardation / Intellectual Disability
□ Heart problems / cardiac condition
□ Other Musculoskeletal or Neurological Condition (list below)

Please list other known diagnoses:
_____________________________________________________________________________
_____________________________________________________________________________

Does the child take any over-the-counter (such as melatonin, Benadryl, or vitamins) or prescription medication (such as Ritalin, Risperdal, Ativan, Prozac, etc.): □ Yes □ No

If yes, please list medications:
_____________________________________________________________________________
_____________________________________________________________________________

Other Information

Does the child live in:
□ A two-parent home    □ A single-parent home    □ A residential placement

Does the child currently receive mental health services (such as psychiatry, psychology, or other therapy?): □ Unsure / Don't know □ No □ Yes

If yes, please indicate what type of services:
Appendix B: The Social Responsiveness Scale (SRS)

[COPYRIGHTED MATERIAL – WITHHELD]
Appendix C: The Abridged Children’s Symptom Inventory-4 (CSI-4)

[COPYRIGHTED MATERIAL – WITHHELD]

Social Skill Area and Practical Domain

[COPYRIGHTED MATERIAL – WITHHELD]
Appendix E: Study Information for School Districts
Dear [Prefix] [Contact Person];

I am a graduate student in Psychology at the Nisonger Center at the Ohio State University. I am specializing in Intellectual and Developmental Disabilities. For my master’s thesis, I am examining the relationship between social impairments and psychological problems among children with intellectual disability (ID, formerly known as mental retardation). This study has been approved by the Ohio State University Institutional Review Board. Dr. Luc Lecavalier, my advisor, is supervising this study.

Children with ID often have difficulties with social interaction. In typically-developing children and adolescents, impairments in social skills have been related to other psychological problems (ADHD, mood disorders, anxiety, etc). However, the relationship between these two is not well understood among those with ID. The purpose of my project is to clarify this relationship. We believe clarifying this relationship can have important implications for developing better treatments.

We are asking that you assist us in this project. We would like schools in your district to distribute study packets to parents of children with ID. These packets can go home with the kids in their school bags. The parents will be asked to complete three questionnaires. They will be compensated for their time. Information regarding participants will be kept confidential and anonymous. If parents do not want to participate they can simply throw out the packet. However, we would need district support. We need districts like yours to distribute the packets to parents of children with ID. We need the help of your district and your teachers to reach these families.

We appreciate your cooperation in this research. In fact, it would not be possible without help from school districts like yours! If you have any questions, please let us know.

Sincerely,

Aaron Kaat, B.A.
Graduate Student, IDD Psychology
Nisonger Center Room 279
The Ohio State University
1581 Dodd Drive, Columbus OH 43210
aaron.kaat@osumc.edu
614-247-8028

Luc Lecavalier, Ph.D.
Associate Professor of Psychology and Psychiatry
Nisonger Center Room 305
The Ohio State University
1581 Dodd Drive, Columbus OH 43210
luc.lecavalier@osumc.edu
614-292-3378
Appendix F: Study Information for Parents
Dear Parent:

I am a graduate student in Psychology at the Nisonger Center at the Ohio State University. I am specializing in Intellectual and Developmental Disabilities. For my master’s thesis, I am examining the relationship between social impairments and psychological problems among children with intellectual disability (ID, formerly known as mental retardation). Dr. Luc Lecavalier, my advisor, is supervising this study.

Children with ID often have difficulties with social interaction. In typically-developing children and adolescents, impairments in social skills have been related to other psychological problems (ADHD, mood disorders, anxiety, etc). However, this relationship is not well understood among those with ID. The purpose of my project is to clarify this relationship, because it has important implications for developing better treatments for children like yours.

We are seeking your assistance for this very important study. This study involves research. Please carefully read over the following information and consider participating in this study.

We have asked school districts like yours to distribute these packets to parents of children with ID, like you. We would like you to complete three questionnaires and a demographics form on your child. We estimate that this study will take less than an hour of your time. If you choose to participate, please complete the study questionnaires in this packet.

You will be compensated for participating in this study. We will provide you with $10.00 for completing and returning the study questionnaires and demographics form in this packet.

Your participation is voluntary. We hope that after reading this information, you choose to participate and complete the enclosed questionnaires. But, if you do not wish to participate in this study, you may dispose of this packet. You may also choose to skip any questions or stop participating at any time.

This study involves research, and there is some risk associated with research. We believe that this study presents no more than minimal risk to you, with the main concern being unauthorized disclosure of your information. We have taken steps to prevent this from occurring as much as is possible. If you feel harmed by this study, please contact one of the researchers listed below. For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact Ms. Sandra Meadows in the Office of Responsible Research Practices at 1-800-678-6251.

Certain information that you will be asked to disclose, should you choose to participate, is considered Protected Health Information by HIPAA – specifically, your child’s month and year of birth, previous diagnoses, and current medications, and the information you provide about yourself to receive the incentive. We are requesting that you provide this information in order to ensure your child is eligible for the study, to score certain questionnaires accurately, and to ensure you receive your incentive. This information will not be shared or disclosed with others outside of the study. If you choose to complete this study and later would like to revoke
the authorization to use your information, please contact one of the study investigators listed below or Sherry Feinstein, HIPAA Privacy Officer, at 614-297-7190.

Efforts and strict control of the information you provide have been made to keep your responses confidential. However, there may be circumstances where the information you provide must be released. For example, information regarding this study may be disclosed if required by state law. Also, the information you provide may be reviewed by the following groups (as applicable to the research): the Office for Human Research Protections or other federal, state, or international regulatory agencies; or The Ohio State University Institutional Review Board or Office of Responsible Research Practices.

We really hope you take the time to complete the questionnaires included in this package. This research study would not be possible without your help! If you have any questions or would like any more information about the study, please let us know. We appreciate your help as we seek to better understand the relationship between social impairments and psychological problems. Thank you.

Sincerely,

Aaron Kaat, B.A.
Graduate Student, I/DD Psychology
Nisonger Center Room 279
The Ohio State University
1581 Dodd Drive, Columbus OH 43210
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614-247-8028

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614-292-2378
Appendix G: Incentive Form
Incentive Form

If you choose to participate in this study, you will receive $10.00. However, in order to provide this incentive, we need to collect some basic information:

To whom should the $10.00 check be made out? ____________________

Where should the $10.00 check be sent?

First and Last Name: ____________________
Street Address: ____________________
City, State, Zip: ____________________

You should receive your check within a few weeks after returning this form. If you have any questions regarding how you will receive your incentive, or anything else regarding this study, feel free to contact either of the study investigators:

Aaron Kaat, B.A.  Luc Lecavalier, Ph.D.
Graduate Student, I/DD Psychology  Associate Professor of Psychology
Nisonger Center Room 279  and Psychiatry
The Ohio State University  Nisonger Center Room 305
1581 Dodd Drive, Columbus OH 43210  The Ohio State University
aaron.kaat@osumc.edu  1581 Dodd Drive, Columbus OH 43210
614-247-8028  luc.lecavalier@osumc.edu
614-292-2378
Appendix H: Community Flyer
Research Opportunity

The Relationship between Social Skills and Behavioral/Emotional Problems in Children with Intellectual Disability.

What is the study about?
This study will investigate the relationship between social skills and psychopathology among children with an Intellectual Disability (ID).

What does the study involve?
Parents of children with ID are asked, at their leisure, to complete a demographics form and 3 questionnaires on their child. We estimate that it will take less than an hour to complete the questionnaires.

Who can participate?
The parents of children are asked to complete all study materials. Children must be between 5 and 17 years and have an IQ score between 40 and 70. No other diagnoses are required or excluded.

Participants in this study will receive $10.

Where can I get more information?
Contact Aaron Kaat, graduate student, (614–247–8028 or aaron.kaat@osumc.edu) or Luc Lecavalier, Ph.D., faculty advisor (614–292–2378 or luc.lecavalier@osumc.edu)

This study has been approved by the Ohio State University Institutional Review Board
Protocol Number: 2010B0148
Appendix I: School Flyer
Research Opportunity

The Relationship between Social Skills and Behavioral/Emotional Problems in Children with Intellectual Disability.

What is the study about?
This study will investigate the relationship between social skills and psychopathology among children with an Intellectual Disability (ID).

What does the study involve?
Parents of children with ID are asked, at their leisure, to complete a demographics form and 3 questionnaires on their child. We estimate that it will take less than an hour to complete the questionnaires.

Who can participate?
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Participants in this study will receive $10.

Where can I get more information?
Contact Aaron Kaat, graduate student, (614-247-8028 or aaron.kaat@osumc.edu) or Luc Lecavalier, Ph.D., faculty advisor (614-292-2378 or luc.lecavalier@osumc.edu)

This study has been approved by the Ohio State University Institutional Review Board
Protocol Number: 2010080148
## Appendix J: Zero-Order Correlations

### Table 8: Zero-Order Correlations between Study Variables

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<th>Prev. ASD</th>
<th>SRS</th>
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<th>ADHD</th>
<th>ODD</th>
<th>Anx</th>
<th>Dep</th>
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<tr>
<td>ABAS</td>
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<td>.62**</td>
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<td>.03</td>
<td>.50**</td>
<td>.56**</td>
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</table>

**Note:** Anx = Anxiety Disorders and Dep = Depressive Disorders.

‡ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$