PARENT AND TEACHER RATINGS OF SOCIAL SKILLS IN SCHOOL-AGED CHILDREN ASSESSED FOR AUTISM SPECTRUM DISORDER: THE ROLE OF PARENT EDUCATION, SYMPTOM SEVERITY AND ADAPTIVE FUNCTIONING

by

SOPHIA WINSTON ELDRED

THEODORE S. TOMENY, COMMITTEE CHAIR
ANSLEY GILPIN
ANGELA BARBER

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ABSTRACT

When assessing an individual for autism spectrum disorder (ASD), clinicians often use multiple measures in order to get a complete picture of the individual's functioning. Many studies have investigated the value of multiple informants, and how much additional information is gained by using multiple reports. As such, this practice has become an important part of a comprehensive ASD assessment. When assessing a child for ASD, most clinicians seek out both parent and teacher reports, however the variance in settings among raters often results in report discrepancies (Duvekot, van der Ende, Verhulst & Greaves-Lord, 2015). Although studies have examined the correlations and discrepancies between parent- and teacher-reported scores in various assessments used in ASD evaluations, many factors that may influence the relations between parent and teacher reports have not been examined. The current study investigated the extent to which parent education, children's ASD symptom severity, and children's adaptive functioning individually weakened or strengthened the relation between parent and teacher report of social skills deficits. Furthermore, the study assessed whether these relations varied differently when parent- and clinician-reported symptoms and specific ASD symptom subdomains and adaptive functioning subdomains were examined independently. Finally, exploratory analyses were conducted to assess whether these relations varied according to diagnostic group (ASD or non-ASD) or geographic classification (rural county or urban county). The tested hypotheses were generally unsupported, and the proposed moderators were not significant.

LIST OF ABBREVIATIONS AND SYMBOLS

α	Cronbach's index of internal consistency
B	Beta coefficients: the estimates resulting from a regression analysis
f^2	Cohen's f^2*:* standardized measure of effect size
M	Mean: the sum of a set of measurements divided by the number of measurements in the set
N	Total sample size
n	Subset sample size
p	Probability associated with the occurrence under the null hypothesis of a value as extreme as or more extreme than the observed value
r	Pearson product-moment correlation: a measure of the strength of the linear relationship between two variables
R^2	Explained variation
ΔR^2	Change in variance explained
SD	Standard Deviation: the amount of variation or dispersion of a set of data values
<	Less than
=	Equal to

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CHAPTER 1

INTRODUCTION

When diagnosing an individual with autism spectrum disorder (ASD), clinicians often use multiple measures in order to gain a more comprehensive picture of their client's functioning. Because of the disorder's complexity, numerous measures are often administered to assess the core diagnostic features of ASD: deficits in social communication and social interaction, as well as restricted and repetitive behavior and interests [American Psychiatric Association (APA), 2013]. Although some assessment measures are tailored specifically for use by clinicians, family members, teachers, or the individual being assessed, others have multiple versions that allow clinicians and researchers to gather information about the same (or similar) behaviors and abilities from multiple reporting sources. The use of multiple sources is meant to help determine if the symptoms being assessed are pervasive and consistent across settings, which is a requirement for an ASD diagnosis (APA, 2013).

Assessments with Multiple Informants

Utilizing multiple informants when assessing children for ASD and other childhood disorders has long been considered important and beneficial (Duvekot et al., 2015; Kim & Lord, 2012; Ozonoff, Goodlin-Jones, & Solomon, 2005). Although a single informant can report on behaviors and symptoms present in a particular environment, these same behaviors may be absent in other environments or when the child is with other individuals (De Los Reyes, 2011). Additionally, the presence of a specific individual could alter a child's behavior and lead to

discrepancies in reporting. Lastly, reports can be influenced by informant bias and by specific expectations and standards the rater has of the child (De Los Reyes, 2011; Hoyt, 2000). As such, when assessing children, both parents and teachers often report on the child in order to acquire as much information as possible about a child's functioning across different settings (Stratis & Lecavalier, 2015).

As stated above, although researchers and clinicians agree that the use of multiple informants is an important part of evidence-based assessment, and therefore an important part of a comprehensive ASD assessment (Dirks, De Los Reyes, Briggs-Gowan, Cella, & Wakschlag, 2012; Hunsley & Mash, 2007; Jepsen, Gray & Taffe, 2012), questions remain as to just how much additional information is gained by using multiple reports. A 2015 study by Duvekot, van der Ende, Verhulst and Greaves-Lord investigated whether including teacher-reported scores in addition to parent-reported scores on the Social Responsiveness Scale, Second Edition (SRS-2), which measures social skills deficits associated with ASD, improved the assessment's screening accuracy. Screening accuracy was determined by comparing a child's ASD symptom severity, as measured by parent and teacher SRS scores, to a child's symptom severity, as measured by the Autism Diagnostic Observation Schedule, Second Edition (ADOS-2). The ADOS-2, often considered the gold-standard in ASD assessment, is a commonly used, in-depth observational assessment of ASD symptoms designed to be administered by an experienced clinician or researcher (Lord, Rutter, DiLavore, Risi, Gotham et al., 2012). Duvekot et al. (2015) found that the addition of teacher reports provided a significant independent contribution that was over and above the predictive ability of parent reports when comparing both tests to ADOS-2 scores determined by clinicians. However, because unique sets of social and behavioral abilities are required and expected when a child is at school versus at home, variability in the types of

behavior that are observed across the two settings is likely to be present. In general, this difference in settings, and therefore the child's behavior, often results in informant discrepancy between pairs of raters (Duvekot et al., 2015).

Informant Discrepancy in Assessment of Childhood Psychopathology

The discrepancy between parent and teacher reports is often present across various domains of child psychopathology and behavioral assessment, and extensive research has examined these report discrepancies in typically developing (TD) youth. A 1987 meta-analysis by Achenbach, McConaughy and Howell, which included 119 studies focused on informant agreement, found that pairs of more similar informants (e.g., two parents) reported scores that were more similar than pairs of informants that were more different (e.g., a parent and a teacher). Additionally, for both similar and different informants, the meta-analysis found that informant discrepancy varied depending on the type of behavior being rated, as well as the age of the child being assessed. However, two more recent meta-analyses found conflicting results, with one study indicating that discrepancy did not vary according to the type of behavior being rated (Duhig, Renk, Epstein & Phares, 2000) and the other finding no significant difference among similar and different informant pairs (Renk & Phares, 2004). Together, this research indicates that discrepancies among raters may be present but likely vary according to types of raters, the behavioral symptoms being assessed, and age of the child (Achenbach et al., 1987; Duhig et al., 2000; Renk & Phares, 2004).

Informant Discrepancy in ASD Assessment

Informant discrepancy is also present in parents' and teachers' assessments of children's ASD symptoms, and is generally comparable to the discrepancies present in assessments of general childhood psychopathology (Stratis & Lecavalier, 2015). Although the literature on

informant discrepancy in this specific area is limited, studies have found that within childhood assessments of ASD symptomatology, significant discrepancies are often present in reports of child behavior, child social skills, and child internalizing and externalizing problems (Murray, Ruble, Willis & Molloy, 2009; Reed & Osborne, 2013; Stratis & Lecavalier, 2015). Although these previous studies have established that discrepancies are present among parent and teacher assessments of various aspects of ASD symptomatology, few studies have examined factors that moderate these discrepancies or whether the influence of those moderators varies among assessment measures, or within assessment scales.

Factors Influencing Informant Discrepancy in Childhood Psychopathology Assessment

As part of a meta-analysis investigating factors related to informant discrepancies in the assessment of general child psychopathology, researchers investigated child, parent, and family characteristics that influenced discrepancy. Results indicated that across studies, child's age and birth order, as well as parents' levels of depression, stress, and anxiety all had a significant influence on both parent-parent and parent-teacher informant discrepancy (De Los Reyes & Kazdin, 2005). However, results varied when family socio-economic status (SES) was investigated as a predictor of discrepancy (Chi & Hinshaw, 2002; Duhig et al., 2000; Kolko & Kazdin, 1993; Renouf & Kovacs, 1994; Treutler & Epkins, 2003). Researchers note that these varied results are likely due to the fact that SES is a broadly defined variable that is closely tied to other informant characteristics such as parent employment, race/ethnicity, parent psychopathology and parent education (De Los Reyes & Kazdin, 2005). Despite the variability in their results, these studies suggest that informant discrepancy may also differ according to a variety of personal and contextual factors.

Potential Factors Related to Informant Discrepancy in ASD Assessment

Although child, parent, and family characteristics have been investigated in assessments of TD youth, research on similar factors that may influence informant discrepancy in ASD assessments has been sparse and the results are inconsistent. In a 2015 meta-analysis, researchers found that child age and IQ were both significant moderators of informant agreement, with higher informant agreement for younger children and children with higher IQ scores (Stratis & Lecavalier, 2015). Additionally, Reed and Osborne (2013) found that higher levels of parent stress resulted in higher ratings of behavior problems in children with ASD, however these differences did not reach statistical significance. Lastly, whereas studies investigating the influence that child gender has on informant discrepancy have been inconsistent, both parents and teachers consistently rate lower levels of ASD symptoms in females compared to males, which affects screening accuracy across multiple measures (Duvekot et al., 2015). Although attention to this area has recently begun to increase, many potential predictors of informant discrepancy within assessments of ASD symptoms remain unexamined.

The 2005 meta-analysis by Des Los Reyes and Kazdin examining informant discrepancies in general assessments of child psychopathology also examined the influence of child problem type on report differences. Researchers found that although informant discrepancies were present in most studies, these discrepancies were lower when rating child externalizing problems (e.g., aggression, hyperactivity, and oppositional behavior), than they were when rating child internalizing problems (e.g., anxiety, depression; Achenbach et al., 1987; De Los Reyes & Kazdin, 2005; Duhig et al., 2000). The researchers suggested this was because externalizing problems are more easily observable to informants (De Los Reyes & Kazdin,

2005). Externalizing symptoms that are often present in children with ASD include tantrums, screaming, hyperactivity, aggressive acts, and non-compliance (Ming, Brimacombe, Chaaban, Zimmerman-Bier, & Wagner, 2008). Whereas a child with moderate or severe ASD may display frequent tantrums, hyperactivity, or non-compliant behavior, a child with mild ASD, or without ASD, may not display these externalizing behaviors to the same degree. In addition, Arnold, Vitiello, McDougle, Scahill, Shah et al. (2003) found that parents identified aggression, tantrums, hyperactivity/impulsivity, self-injury and stereotypy as areas of greatest concern among their children with ASD. Although not all core behaviors associated with ASD (deficits in social communication and social interaction, and restricted/repetitive behaviors; APA, 2013) are considered externalizing behaviors, they are indeed observable by design. Therefore, higher levels of ASD severity, and the resulting increase in externalizing and observable behaviors, could result in greater similarity between parent and teacher reports of ASD symptoms. Specifically, higher levels of more easily observable symptoms that are often categorized as restricted/repetitive behaviors (i.e., stereotypy, self-injury, tantrums) could result in the highest levels of similarity across informant reports.

However, not all children assessed for ASD receive a diagnosis. Children assessed for ASD may instead be diagnosed with another childhood disorder, associated with similar or different externalizing behaviors (APA, 2013; McPartland, Reichow & Volkmar, 2012). These differential diagnoses may include attention-deficit/hyperactivity disorder (ADHD), oppositional defiant disorder (ODD), intellectual disability (ID), global developmental delay or language disorder (LD), among other disorders (National Collaborating Centre for Women's and Children's Health, 2011). Although informant discrepancy can be present in the assessment of all childhood disorders (Des Los Reyes & Kazdin, 2005), studies have found that interrater

agreement is often smaller when a child is not diagnosed with the disorder that the assessment battery was meant to target (Lyneham, Abbott & Rapee, 2007). For example, in a study examining interrater reliability of the child and parent versions of the Anxiety Disorders Interview Schedule (ADIS), investigators found that interrater agreement among pairs of clinicians for any anxiety disorder was good ($\kappa = 63.4$), while interrater agreement among individuals who did not receive a diagnosis was fair ($\kappa = 43.8$). This decreased interrater agreement even among skilled clinicians suggests that informant disagreement or discrepancy between parents and teachers may be even larger among individuals assessed for ASD who do not receive a diagnosis. In addition, if a larger discrepancy is present due to a disagreement regarding possible diagnosis, the degree to which an unrelated moderator such as parent education affects this discrepancy may be smaller.

Similar to externalizing behaviors, adaptive functioning is another area of impairment that is often highly observable in children with ASD and related disorders. Research has found that adaptive functioning impairments in areas such as daily living skills, social skills, and communication skills often represent some of the most recognizable symptoms of ASD (Gillham, Carter, Volkmar & Sparrow, 2000; Klin, Saulnier, Sparrow, Cicchetti, Volkmar & Lord, 2007; Perry, Flanagan, Dunn & Freeman, 2009). In addition, multiple studies have found no statistically significant differences in parent and teacher report scores when assessing a child's overall level of adaptive functioning, (e.g., Hundert, Morrison, Mahoney & Vernon, 1997; Szatmari, Archer, Fisman & Streiner, 1994; Voelker, Shore, Lee & Szuszkiezicz, 2000), indicating that overall deficits are often clearly apparent across settings. However, adaptive functioning is multi-dimensional: although specific abilities and skills across different areas of adaptive functioning (i.e., functional academics, home living, and health and safety) are related,

they are also considered independent (Harrison, & Oakland, 2003) and may not be observed by particular informants. As discussed above, research suggests that informants are less discrepant when rating more easily observable behaviors and characteristics in children (De Los Reyes & Kazdin, 2005). Though adaptive functioning is observable, it is also unique from both ASD symptom severity and externalizing behaviors, such as tantrums or hyperactivity (Duhig et al., 2000; Hill, Gray, Kamps & Varela, 2015). Moreover, it is possible that the degree to which parent and teacher reports of children assessed for ASD correlate may differ according to the level of each child's adaptive functioning. As such, parent and teacher reports may be more similar when children exhibit lower levels of overall adaptive functioning. However, because certain skills may be more salient in certain settings, levels of parent-teacher report congruence may also vary differentially when specific areas of adaptive functioning (e.g., daily living skills, social skills, and/or communication skills) are assessed independently.

Lastly, although it is often included as an important parent characteristic in various domains of study (e.g., Corwyn & Bradley, 2002; Davis-Kean, 2005; Desai & Alva, 1998), and is closely tied to SES (De Los Reyes & Kazdin, 2005), parent education is another factor that has not been considered as an independent characteristic that may influence informant discrepancy in ASD assessment. Literature suggests that parents with higher levels of education spend more hours per week in child care activities than parents with less education, resulting in more time spent with their children (Gauthier, Smeeding & Furstenberg, 2001; Guryan, Hurst & Kearney, 2008; Sayer, Gauthier & Furstenberg, 2004; Yeung, Sandberg, Davis-Kean & Hofferth, 2001). In addition, research has shown that early diagnosis of ASD is associated with higher levels of parent education (Emerson, Morrell & Neece, 2016; Herlihy, Brooks, Dumont-Mathieu, Fein, Chen et al., 2014). One explanation may be that parents who are more highly educated are, on

average, more knowledgeable about early symptoms of ASD and more likely to seek an appropriate assessment. Taken together, these findings suggest that parents with higher levels of education may provide more accurate ratings of their children's ASD symptoms. In addition, parents who have a bachelor's (or more advanced) degree have received a level of education more similar to the level that is required to become a teacher (compared to parents with lower levels of education). Although research has not investigated if obtaining similar levels of education or having similar experiences increases report similarity, teachers and parents who have received comparable levels of education may share a more similar breadth of knowledge than is shared by teachers and more poorly educated parents. Therefore, higher levels of parent education may result in parent assessments that are more similar to those provided by teachers.

Mental Health Literacy and ASD in Rural and Underserved Communities

When investigating potential circumstances that may influence informant discrepancy, it is important to consider community factors that may affect ASD assessment on a broader level, such as geographic location. These community factors are of particular interest for this study due to the large number of rural counties in the state of Alabama. According to the Alabama Rural Health Association, 55 of the 67 counties in Alabama are classified as rural, with 42 of the 55 considered heavily rural (Alabama Rural Health Association, 2003). Although the site of the current study is located in an urban county, it is surrounded by six rural counties, five of which are classified as heavily rural.

According to 2015 data from the US Department of Health and Human Services, significant healthcare disparities exist between rural and urban communities. Specifically, rural areas in the United States experience a general scarcity of services, a lack of primary care physicians, and limited transportation. In Alabama specifically, all 54 of the rural counties are

classified as mental health care shortage areas, a designation used to identify areas in which there is a shortage of mental health professionals (Alabama Rural Health Association, 2016). These healthcare disparities are also compounded by a corresponding "digital divide" or gap in access to technology, specifically internet services (Douthit, Kiv, Dwolatzky & Diswas, 2015).

In addition, it is important to consider the effect that health literacy may have on ASD assessment and informant discrepancy. Health literacy encompasses both patient literacy and healthcare providers' patient-appropriate communication skills, and is defined by the National Institutes of Health as "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (Selden, Zorn, Ratzan & Parker, 2000, p. vi). Researchers often link health literacy to general functional literacy due to the reading skills needed to navigate the complexities of the healthcare system. General functional literacy levels are a significant issue in rural communities (Jackson et al., 1991; Kirsch, Jungeblut, Jenkins & Kolstad, 1993), and researchers have linked these low literacy levels to lower levels of health literacy as well (Kuhajda, Thorn, Gaskins, Day & Cabbil, 2011).

In regard to ASD assessment and diagnosis specifically, research has found significant differences in age of diagnosis across large rural/urban communities and small rural/urban communities, as well as across high SES and middle/low SES families (Durkin et al., 2010; Mandell et al., 2010). Durkin et al. found that children from high SES families were diagnosed with ASD 1.1-2.7 months earlier than children from middle and low SES families. Both of the above mentioned studies hypothesize that lack of access to appropriate services in rural and/or underserved areas plays a role in these age discrepancies (Durkin et al., 2010; Mandell et al., 2010).

While differences in informant discrepancy across rural and urban populations have not been examined, these findings suggest that geographic classification may contribute to parent and teacher knowledge and ratings of ASD behaviors. Specifically, due to the above mentioned factors (i.e., lack of resources, lower levels of health literacy), discrepancy among parent and teacher ratings of ASD symptoms may be more pronounced among individuals who live in rural or high need communities. In addition, due to these and other community factors, the interaction effect of moderators such as parent education and parent report of functioning are likely important to consider in the context of urban and rural counties.

Rationale, Purpose, and Hypotheses

Gathering assessment information from multiple informants allows clinicians to acquire additional data about a child's functioning across multiple settings (Duvekot et al., 2015; Kim and Lord, 2012; Ozonoff, Goodlin-Jones, & Solomon, 2005) and is considered an important part of evidence-based assessment (Dirks, et al., 2012). However, because a child's behavior may vary across settings, and each reporter's views of the child's behaviors and abilities is unique, discrepancy between raters is common (Duvekot et al., 2015). As discussed above, research investigating factors that may affect this informant discrepancy between teacher and parent reports of ASD symptomatology has been scarce. Although recent studies have found that a variety of factors may influence the strength of relations between parent and teacher report scores (Reed & Osborne, 2013; Stratis & Lecavalier, 2015), many child and parent factors documented and measured in typical assessment batteries remain unexamined.

Using archival data on school-aged children assessed for ASD, the purpose of the current study was to examine whether parent education, children's ASD symptom severity, and children's adaptive functioning individually weakened or strengthened the relations between

parent and teacher report of social skills. Specifically, the study investigated whether the degree of parent-teacher report relations varied at different levels of parent education, children's ASD symptom severity, and children's adaptive functioning. In addition, the study examined whether parent-teacher report relations varied differently across different ASD symptomatology and adaptive functioning subdomains, and according to subdomain rater (clinician or parent). Lastly, the current study investigated whether the moderating effects of the hypothesized variables varied according to diagnosis group (ASD vs. non-ASD), or according to rural and urban geographic classification.

It is important to continue to research factors that influence informant discrepancy, particularly within the context of ASD assessments. Obtaining a better understanding of the potential moderators of informant discrepancy may give clinicians more information about their clients in general, more information about how each informant views the child being assessed, and, potentially, more information about why these views might differ (De Los Reyes & Kazdin, 2005). If discrepancies are present among multiple informants, it is important to know whether the difference is due to fundamental differences in the child's behavior across settings, or if other child or informant characteristics better explain the differences. Moreover, these discrepant perspectives may impact the problem areas and/or behaviors targeted during treatment planning, regardless of the child's final diagnosis. Identifying the factors that may influence discrepancies prior to the development of a treatment plan can help clinicians better determine which problems to target during treatment planning, which may lead to better collective participation across informants once the treatment plan is enacted (De Los Reyes & Kazdin, 2005).

Preliminary and Primary Hypotheses. It was first hypothesized that both parent and teacher report of child social skills will be positively related to ASD severity (Hypothesis 1).

However, it is expected that there will be a significant difference between the parent and teacher reported scores of child social skills (Hypothesis 2). It is also hypothesized that parent education (Hypothesis 3a), child ASD symptom severity (3b) and child adaptive functioning (3c) will all separately moderate the relation between parent and teacher social skills ratings. Specifically, it is predicted that the relation between parent and teacher reports of child social skills will be stronger at higher levels of parent education and child ASD symptom severity and at lower levels of adaptive functioning.

Because levels of parent-teacher discrepancy may vary according to different types of ASD symptoms and/or adaptive skills deficits, and according to the subdomain rater, further analyses examined specific subdomains of parent- and clinician-rated ASD symptomatology and parent-rated adaptive functioning as moderators. First, it was hypothesized that the relation between parent and teacher reports would be strongest when parent-reported restricted/repetitive behaviors and social abilities were examined, compared to clinician-reported behaviors (4a). It was also hypothesized that behaviors and adaptive skills that are likely to be consistent across settings (e.g., communication, self-direction) would serve as the strongest moderators of the relation between parent and teacher reports of social skills. Specifically, it was predicted that the relation between parent and teacher reports of social skills will be strongest when children exhibit low levels of adaptive skills that are likely to be consistent across settings (4b; e.g., communication and self-direction). Alternatively, it was expected that moderating effects of adaptive skills on the relation between parent and teacher report of social skills would be weaker (or nonexistent) when examining adaptive skills that are not salient across settings (4c; e.g., home living, health and safety, and functional academics).

Exploratory Hypotheses. In addition to the primary hypotheses, exploratory research questions explored whether the moderating effects of the initial hypothesized moderators vary according to diagnostic group and according to geographic classification. First, it was hypothesized that for each moderator (i.e., parent education, clinician-reported social affect, clinician-reported restricted and repetitive behavior, parent-reported repetitive behaviors, parent-reported social/communication behavior, and adaptive functioning), the interaction effect of each moderator will be weaker or non-existent for children without an ASD diagnosis (i.e., three-way interactions between parent-reported social skills, each proposed moderator, and diagnostic classification; Hypothesis 5). Next, it was hypothesized that for the same moderators, the interaction effect of each moderator will be weaker or non-existent for children from urban counties (i.e., three-way interactions between parent-reported social skills, each proposed moderator, and geographic classification; Hypothesis 6).

CHAPTER 2

METHODOLOGY

Participants

The current study was completed using archival data acquired from a larger sample of children who received diagnostic evaluations completed at a local clinic specializing in ASD assessment and treatment. Given the nature of the research questions, only cases that included measurements of each of the constructs of interest were included in the current study. This subsample included assessments from 71 school-age children ages 3 to 16 years (M = 8.1; SD = 3.6), and was 77.5% male. The children were 60.6% Caucasian, 26.8% African American, 5.6% Hispanic/Latino and 7% other, and 26.8% were from rural counties. Families were referred to the clinic by physicians (50.7%), friends/relatives (11.2%), school staff (7%), early intervention services (4.2%), or other referral sources (19.7%). Although ASD diagnoses make up the majority of the overall clinic sample, 49.3% of the individuals in the current subsample were diagnosed with ASD, and 50.7% received another diagnosis or no diagnosis (ADHD [18.3%], various mood/anxiety disorders [5.6%], Developmental Delay [4.2%], other [5.6%], no diagnosis (16.9%]). The assessment tools included in the evaluations consisted of various measures completed by each child's parents/guardians and teachers, in addition to measures completed by a clinician following their observations of each child's behavior and symptomatology. Of the parents/guardians completing the measures, 80.3% were mothers, 9.9% were grandparents, 4.2% were fathers, and 2.8% were other legal guardians. When parents/guardians were asked about their highest level of education completed, 5.6% reported that they had a graduate degree, 18.3%

had bachelor's degrees, 28.2% had completed some college, 38% had received a high school degree, and 7% completed some high school. Data on parent/guardian education (henceforth referred to as "parent education") and SRS rater were missing for two participants. It is important to note that while the overall sample size was 71, some cases were missing some of the assessments included in the current study. In an attempt to conserve statistical power, pairwise deletion was employed. As such, sample size varies from 59 to 69 for analyses according to available data. Additional demographic information can be found in Table 1.

Table 1

Sample Characteristics: Child and Rater Demographics

Characteristic			
Child		*n*	%
Age	3	5	7
	4	10	14.1
	5	9	12.7
	6	9	12.7
	7	10	14.1
	8	6	8.5
	9	1	1.4
	10	3	4.2
	11	6	8.5
	12	2	2.8
	13	4	5.6
	14	2	2.8
	15	2	2.8
	16	2	2.8
Gender			
	Male	55	77.5
	Female	16	22.5
Race			
	Caucasian	43	60.6
	African American	19	26.8
	Hispanic/Latino	4	5.6
	Other	5	7
Birth Order			
	Only Child	9	12.7
	Oldest	21	29.6
	Middle	12	16.9
	Youngest	20	28.2
	Twin-Only	1	1.4
	(birth order data missing)	8	11.3

Table 1 (continued).

Diagnosis			
	ASD	35	49.3
	Developmental Delay	3	4.2
	ADHD	13	18.3
	Mood/Anxiety	4	5.6
	Other	4	5.6
	No Diagnosis	12	16.9
Geographic Classification			
	Rural	19	26.8
	Urban	52	73.2
Referral Source			
	Physician	36	50.7
	School Staff	5	7
	Early Intervention	3	4.2
	Friend	5	7
	Relative	3	4.2
	Other	14	19.7
	(referral source data missing)	5	7
Rater			
Education Level			
	Some high school	5	7
	High school degree	27	38
	Some college	20	28.2
	Bachelor's degree	13	18.3
	Graduate degree	4	5.6
	(education level data missing)	2	2.8
SRS Rater			
	Father	3	4.2
	Mother	57	80.3
	Grandparent	7	9.9
	Other legal guardian	2	2.8
	(SRS rater data missing)	2	2.8

Note. ASD = Autism Spectrum Disorder; ADHD = Attention-Deficit/Hyperactivity Disorder

Measures

Clinic Intake Form. The clinic intake form was a six-page demographic form that gathered information about different areas of the child's development, characteristics, and family history. The current study utilized information related to geographic classification, parent/guardian education levels, as well as child's gender, age and birth order, all derived from this form. Parent/guardians reported the highest level of education completed, and responses were coded as a continuous variable (less than seventh grade, some high school, high school degree, some college, bachelor's degree, or graduate degree) as a measure of parent education. Geographic classification (i.e., rural or urban) was coded by first matching participants' reported zip codes to their corresponding Alabama counties (United Stated Zip Codes, 2014), and then identifying the rural/urban status of each county according to the definitions set by the Alabama Rural Health Association (2003).

Social Responsiveness Scale – First and Second Editions. The Social Responsiveness Scale-Second Edition (SRS-2) is a 65-item parent- or teacher-report measure of social skills deficits associated with ASD that takes approximately 15 to 20 minutes to complete (Constantino & Gruber, 2012). Because the SRS-2 was published in 2012, this measure was based on ASD symptoms within the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV). However, the SRS-2 is still considered valid for use with the DSM-5 (Constantino & Gruber, 2012). For the current study, both parent and teacher versions of the Preschool and School-Age Forms (measuring ages two through six and four through eighteen, respectively) were used. Each version is normed to the respective age group and all forms are rated on a 4-point Likert scale which ranges from *not true* = 1 to *always true* = 4 (Bruni, 2014; Constantino & Gruber, 2012).

The SRS-2 consists of five subscales (Social Awareness, Social Cognition, Social Communication, Social Motivation, and Restricted Interests and Repetitive Behavior) and a Total score. The Total score is considered the most reliable indicator of social skills deficits associated with ASD, and was the primary SRS-2 score analyzed in this study. (Bruni, 2014; Constantino & Gruber, 2012).

The SRS-2 has been found to have high internal consistency and high interrater reliability for both parent and teacher versions (Bruni, 2014). The SRS-2 has high content validity, moderate to high concurrent validity, and good construct validity (Bruni, 2014). It is important to note that, because the SRS-2 was released in 2012, data for the current study included both First and Second Editions of the SRS. However, according to Constantino and Gruber (2012) and Bruni (2014), item content is not significantly different between the two editions, and data from both versions can be analyzed together. For the current study, parent and teacher SRS/SRS-2 Total Scores (henceforth referred to as "SRS"; higher scores reflect more severe skills deficits) served as measures of overall social skills. Estimates of internal consistency for the six versions of the SRS used in the current study were good, with alpha coefficients ranging from $\alpha = .87$ to $\alpha = .93$ among both parent and teacher reports.

The Adaptive Behavior Assessment System, Second and Third Editions. The Adaptive Behavior Assessment System, Second Edition (ABAS-II) is an assessment tool that provides a reliable, valid, comprehensive, and normative-based measure of adaptive behavior skills in children and adults (Harrison & Oakland, 2003). Specifically, the ABAS-II assesses practical, independent functioning as well as the ability to interact with others while considering community and cultural contexts. Raters score each item on a 4-point Likert scale from 1 (*is not able*) to 4 (*always or almost always when needed*). Scores are adjusted according to age-based

norms, and the measure can be completed by parents and teachers (although only parent assessments were available for the proposed study). Psychometric studies have shown that the ABAS-II possesses high internal consistency, test-retest reliability, construct validity, and concurrent validity (Harrison & Oakland, 2003; Rust & Wallace, 2004).

The ABAS-II has three separate domain scores (Conceptual, Social, and Practical) that measure ten adaptive skill areas (Communication, Community Use, Functional Academics, Health and Safety, Home or School Living, Leisure, Self-Care, Self-Direction, Social, and Work). Behaviors that parents identify within the ten sections are specific to the skill area being assessed. For example, in the Communication section, behaviors include "speaks clearly and distinctly" or "looks at others' faces when they are talking," whereas the Home Living section includes "places clothes in the proper place" or "makes his/her own bed." The three domain scores and the General Adaptive Composite score (GAC) provide a comprehensive view of an individual's overall adaptive behavior skills (Harrison & Oakland, 2003). For the current study, the GAC score (mean of 100, standard deviation of 15; higher scores represent more skills) will serve as the measure of overall adaptive functioning, whereas scaled scores within specific skill levels (mean of 10, standard deviation of 3) will serve as measures of specific behaviors and abilities that may differ across settings.

It is important to note that because the Adaptive Behavior Assessment System, Third Edition (ABAS-3; Harrison & Oakland) was published in 2015, data from the current study included both the second and third editions of the ABAS. Due to the novelty of the ABAS-3, independent research has not been done to assess reliability and validity of the updated measure. However, while both norms and item content has been updated, the adaptive domains and specific adaptive skills areas assessed remain the same, therefore data from both the ABAS-II

and the ABAS-3 (henceforth referred to as "ABAS") were utilized (Harrison & Oakland, 2015). Estimates of internal consistency among the total scores for the four versions of the ABAS used in the current study were high, with alpha coefficients ranging from α = .97 to α = .99. Additionally, ranges of internal consistency for the five subscales examined were: Communication (α = .83 to α = .90); Self-Direction (α = .84 to α = .96); Home Living (α = .83 to α = .96); Health and Safety (α = .69 to α = .94); and Functional Academics (α = .94 to α = .98). Although the internal consistency for the Health and Safety subscale for the ABAS-3 (Ages 2-5) was not as strong compared to other subscales, this value mirrors the relatively low internal consistencies exhibited by this scale in other studies (Oakland, Iliescu, Chen & Chen, 2013).

The Autism Diagnostic Observation Schedule, Second Edition. The Autism Diagnostic Observation Schedule, Second Edition (ADOS-2), often considered the "gold standard" in observational assessments of ASD (Kanne, Randolph & Farmer, 2008), is a semi-structured and standardized measure of communication, social interaction, play and imagination, and restricted and repetitive behaviors. (Lord, Luyster, Gotham, & Guthrie, 2012; Lord, Rutter et al., 2012). The measure can be completed by an appropriately credentialed professional in about one hour. The ADOS-2 is standardized, and has moderate to high internal consistency, test-retest reliability, and interrater reliability. Additionally, it has high content and construct validity, as well as high predictive validity (McCrimmon & Rostad, 2014).

The ADOS-2 is administered by an examiner who selects one of five modules based on the age and expressive language levels of the individual being tested. Items assessed are separated into two domains: Social Affect (SA; social communication and reciprocal social interaction) and Restricted and Repetitive Behavior (RRB). Severity scores (ranging from one to 10; higher scores represent more severe symptomatology) derived from total ADOS-2 scores

(ranging from zero to 28) were used as a measure of overall ASD severity. Whereas ADOS-2 total scores fluctuate according to factors such as module level, age, and language ability, severity scores were calculated by Gotham, Pickles and Lord (2009) to account for these factors. As such, these severity scores can be used to more accurately compare ASD severity across different groups of children, and across different time points (Wiggins et al., 2017). In addition, SA and RRB raw scores (ranging from zero to 20 and zero to eight respectively) were used as measures of symptom severity within the two symptom subdomains. Measures of internal consistency for each of the ADOS-2 modules were calculated for the current sample and were found to be fair to strong. Alpha coefficients were .78 for Module 2 and .91 for Module 3 (internal consistency could not be calculated for Module 1, as only one participant received this Module).

Repetitive Behavior Scale – Revised. The Repetitive Behavior Scale – Revised (RBS-R) is a clinical rating scale that measures the breadth and severity of restricted and/or repetitive behaviors that are common in individuals with ASD. The measure is designed to reflect the spectrum of repetitive behaviors seen in individuals with ASD, and asks the raters to report the extent to which the behaviors are a problem for both the individual being assessed and the people around them (Bodfish, Symons, Parker & Lewis, 2000). Raters score items on a 4-point Likert scale from 0 (*behavior does not occur*) to 3 (*behavior occurs and is a severe problem*). The RBS-R has been found to have good psychometric properties, with subscale internal consistency ranging from 0.78 and 0.91, and interrater reliability among parents/caregivers ranging from 0.57 and 0.73 (Lam & Aman, 2006). Because the RBS-R was published in 2000, the measure was based on ASD symptoms within the Diagnostic and Statistical Manual of Mental Disorders,

Fourth Edition (DSM-IV). However, the measure is still considered valid for use with the DSM-5 (Fulceri et al., 2016).

The items in the RBS-R are conceptually grouped into six subscales (Stereotyped Behavior, Self-Injurious Behavior, Compulsive Behavior, Ritualistic Behavior, Sameness Behavior and Restricted Interests Behavior) and two separate raw scores are calculated for each subscale. The subscale total score sums the item scores in each subscale, providing the severity of the behaviors, while the total endorsed score sums the number of items endorsed in each subscale, providing the amount of repetitive behaviors (Lam & Aman, 2006). However, the primary score analyzed in this study was the Total score, which sums the item scores within each subscale (Bodfish et al., 2000; Lam & Aman, 2006). Because of the similarity between the skills assessed in both measures, the current study used the RBS-R as a parent perspective on the skills and behaviors assessed in the RRB scale of the ADOS-2 (Mirenda, Smith, Vaillancourt, Georgiades, Duku et al., 2010).

Autism Spectrum Rating Scales. The Autism Spectrum Rating Scales (ASRS) is a norm-referenced questionnaire measuring behaviors that are common in children with ASD (Goldstein & Naglieri, 2009). The ASRS is rated by parents/caregivers or teachers, however only parent/caregiver ratings were used in the current study. The measure is based on the diagnostic criteria for ASD in the DSM-IV-TR, however is still considered valid for use with the DSM-5, and the necessary scales have been updated accordingly (Goldstein & Naglieri, 2014). The measure has been found to have good internal consistency, test-retest reliability and interrater reliability. In addition, the ASRS has exemplified good criterion-related validity and construct validity (Goldstein & Naglieri, 2009; Simek & Wahlberg, 2011). Lastly, the measure has good content validity, and the subscales represent key aspects of an ASD diagnosis

[Social/Communication, Unusual Behaviors, Self-Regulation, Peer Socialization, Adult Socialization, Social/Emotional Reciprocity, Atypical Language, Stereotypy, Behavioral Rigidity, Sensory Sensitivity, Attention/Self-Regulation, and Attention (Goldstein & Naglieri, 2009; Goldstein & Naglieri, 2014)].

The primary ASRS score analyzed for the current study was the Social/Communication subscale score. Because of the similarities between the items assessed in the Social/Communication subscale of the ASRS and the SA subdomain of the ADOS-2, the Social/Communication subscale score will be used as a parent perspective of the social and communication deficits seen in individuals assessed for ASD (Goldstein & Naglieri, 2014). The ASRS yielded alpha coefficients for the current sample ranging from $\alpha = .87$ to $\alpha = .91$, which is considered good to strong internal consistency.

Procedure

Participants were part of an ongoing data collection project conducted by The University of Alabama Autism Clinic, which began in 2009 with its establishment as an independent clinic. Data have been collected through evaluations performed by multiple psychologists, speech pathologists, and pediatricians. Approximately 100 assessments have been conducted each year since 2014. Because the current study used archival data from this database, there was no interaction between the participants and the researcher. Per clinic procedure, the caregiver(s) provided consent for general testing, and were given the option to participate in research activities at the time of their child's evaluation. A child's information was excluded from the database if the consent for research was denied. The parent-reported SRS/SRS-2 and ABAS-II/ABAS-3 assessments were completed at the beginning of testing along with other assessments of abilities, language, and behavior in order to obtain an accurate picture of the child's

functioning. Additionally, the clinician administered the ADOS/ADOS-2, and a copy of the SRS/SRS-2 teacher-report was sent to the child's teacher(s) who spent the most time with the child and who could provide a well-informed evaluation of his/her social skills (as determined by parents). The ADOS/ADOS-2 was scored by a licensed psychologist, whereas the SRS/SRS-2 and ABAS-II/ABAS-3 reports were scored by either the licensed psychologist or students trained in assessment scoring. Data from these assessments were then entered into a research database by undergraduate and graduate research assistants, and were subsequently verified. Data entry for the individuals in the current study began in 2015, but included evaluations completed from 2012 to 2017. Each child was given a research identification number and no identifying information was entered into the database. To test the hypotheses, data were culled from these clinical intake files, and parents' and teachers' SRS/SRS-2 reports (social skills), parents' ABAS-II/ABAS-3 reports (adaptive functioning), clinicians' ADOS/ADOS-2 reports (ASD symptom severity), and demographic data on parent education and other child characteristics were also examined.

CHAPTER 3

RESULTS

Prior to any data analysis, all data were examined descriptively. Data were examined for any significant outliers or irregularities, and skewness and kurtosis was examined for each variable of interest (see Table 2). No significant outliers or irregular data were found, and skewness and kurtosis were within acceptable limits for all variables (Field, 2009; Gravetter & Wallnau, 2014).

Table 2

Descriptives of Variables of Interest

	n	*M*	*SD*	Min.	Max.	Skew.	Kurt.
Parent-Reported SRS	71	73.59	11.96	46	101	-.23	-.29
Teacher-Reported SRS	71	65.68	14	40	91	-.03	-.88
Parent Education Level	69	4.77	1.03	3	7	.40	-.47
ADOS Severity Score	67	4.39	2.84	1	10	.27	-1.33
ABAS Total Score	59	74.54	15.52	44	114	.42	.11
ADOS – Social Affect	67	6.19	4.55	0	18	.63	-.42
ADOS – RRB	67	1.57	1.34	0	5	.65	-.48
ASRS	69	64.48	9.20	33	82	-.72	.78
RBS-R	64	40.38	25.96	0	111	.56	-.37
ABAS – Communication	61	5.89	2.79	1	11	.16	-.89
ABAS – Self Direction	62	5.65	2.99	1	13	.47	.05
ABAS – Home Living	62	6.73	3.27	1	13	-.07	-.85
ABAS – Health & Safety	62	6.69	3	1	14	.14	-.19
ABAS – Fun. Academics	61	6.51	3.33	1	14	.44	-.57

Note. SRS = Social Responsiveness Scale, First and Second Editions; ADOS = Autism Diagnostic Observation Schedule, First and Second Editions, RRB = Restricted and Repetitive Behaviors; ASRS = Autism Spectrum Ratings Scales, Social/Communication subscale; RBS-R = Repetitive Behavior Scale – Revised; ABAS = Adaptive Behavior Assessment Scale, Second and Third Editions; ABAS Fun. Academics = Adaptive Behavior Assessment Scale, Second and

Third Editions – Functional Academics subscale; Min. = Minimum; Max. = Maximum; Skew. = Skewness; Kurt. = Kurtosis

Preliminary Analyses

Descriptive statistics and the intercorrelations of the variables of interest are reported in Tables 2 through 4. An examination of the relations between teacher-reported SRS scores with parent-reported SRS scores and moderator variables shows that parent-reported SRS scores were significantly negatively related to ABAS total scores (r = -.39, p < .001), as well as ABAS Communication (r = -.31, p = .02), Self-Direction (r = -.35, p = .01), Home Living (r = -.44, p < .001), and Health and Safety (r = -.43, p < .001) scale scores (all ABAS scores were also significantly positively correlated with one another; see Table 4). Parent-reported SRS scores were significantly positively related to ASRS Social/Communication scores (r = .70, p < .001) and RBS-R total scores (r = .64, p < .001; ASRS Social/Communication and RBS-R scores were also significantly positively correlated with one another, see Table 3). However, parent-reported SRS scores were not significantly related to ADOS severity or subdomain scores, parent education level, or the ABAS Functional Academic scale score. In addition, teacher-reported SRS scores were not significantly related to parent-reported SRS scores, nor were they significantly related to any of the moderator variables. The relations between potential covariates (child age, child gender, and child birth order rank) and the teacher-reported social skills (i.e., the criterion variable) were examined and are reported in Table 4. The three potential covariates were not significantly correlated with teacher-reported social skills and therefore were not included as covariates in any analyses. Lastly, in order to assess for multicollinearity, variance inflation factors were examined among the predictors, and were determined to be within acceptable limits (i.e., below 2).

Table 3

Intercorrelations of Variables of Interest

	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
1. SRS-P	.11	-.04	-.07	-.39**	.04	-.14	.70**	.64**	-.31*	-.35**	-.44**	-.43**	-.18
2. SRS-T	---	.11	.12	-.03	.09	.15	-.01	.002	-.08	-.14	.16	.02	-.09
3. Parent Ed.		---	.21	.12	.19	.04	-.11	-.15	.17	.22	.01	.11	.18
4. ADOS			---	.18	.93**	.42**	-.01	-.07	.09	.14	.07	.16	.23
5. ABAS				---	.18	-.09	-.55**	-.36**	.81**	.83**	.70**	.77**	.70**
6. ADOS-SA					---	.24	-.01	.003	.12	.19	.07	.20	.21
7. ADOS-RRB						---	-.07	.04	-.06	-.15	-.14	-.08	-.02
8. ASRS							---	.52**	-.54**	-.35**	-.46**	-.48**	-.26*
9. RBS-R								---	-.29*	-.28*	-.27*	-.43*	-.18
10. Comm.									---	.68**	.47**	.56**	.62**
11. Self Dir.										---	.61**	.62**	.66**
12. H. Liv.											---	.54**	.35**
13. H&S												---	.60**
14. F. Acad.													---

Note. SRS-P = Parent-Reported Social Responsiveness Scale, First and Second Editions; SRS-T = Teacher-Reported Social Responsiveness Scale, First and Second Editions; Parent Ed. = Parent Education Level; ADOS = Autism Diagnostic Observation Schedule, Second Editions-Severity Score; ABAS = Adaptive Behavior Assessment Scale, Second and Third Editions; SA = Social Affect; RRB = Restricted and Repetitive Behaviors; ASRS = Autism Spectrum Ratings Scales-Social/Communication Scale; RBS-R = Repetitive Behavior Scale – Revised; Comm. = ABAS-Communication; Self Dir. = ABAS-Self Direction; H. Liv. = ABAS-Home Living; H&S = ABAS-Healthy and Safety; F. Acad. = ABAS- Functional Academics

*$p < .05$ **$p < .01$

Table 4

Intercorrelations of Possible Covariates with Outcome Variable

	Gender	Birth Order	Teacher-Reported SRS
Age	-.01	-.04	-.05
Gender	---	.04	.17
Birth Order		---	.06
Teacher-Reported SRS			---

Note. SRS = Social Responsiveness Scale, First and Second Editions

Preliminary Hypothesis Testing

Hypothesis 1. Hypothesis 1 (that parent- and teacher-reported social skills deficits would be positively significantly related to clinician-reported ASD severity) was examined through two bivariate correlations. As discussed in the previous section, neither parent-reported SRS scores, $r = -.07$, $p = .60$, nor teacher-reported SRS scores, $r = .12$, $p = .33$, were significantly related to ADOS severity scores.

Hypothesis 2. Next, Hypothesis 2 (that parent reported SRS scores would be significantly greater than teacher-reported SRS scores) was examined through a paired samples *t*-test, which analyzed the mean difference between parent and teacher SRS scores. The analysis revealed a significant difference in parent-reported (M=73.59, SD=11.96) and teacher-reported (M=65.67, SD=14.00) SRS scores; $t(70)=3.84$, $p < .001$.

Hypothesis Testing

Hypothesis 3. Hypothesis 3 (that parent education, child ASD symptom severity, and child adaptive functioning would all separately moderate the relation between parent and teacher reports of social skills, with the relation stronger at higher levels of parent education, higher levels of child ASD symptom severity, and lower levels of adaptive functioning) was examined using the aforementioned PROCESS tool in SPSS (Hayes, 2013). The moderating effects of

parent education level, ADOS severity scores, and ABAS scores (as separate moderators) on the relations between parent-reported social skills and teacher-reported social skills were examined via three moderated multiple regression analyses (Table 5). When examining parent education level as a potential moderator of the relation between parent- and teacher-reported social skills, Model 1 (main effects) was nonsignificant when predicting teacher-reported social skills. In addition, parent education level did not emerge as a moderator of the relation between parent- and teacher-reported social skills $B = .09$, $SE = .15$, $p = .55$. Next, child's adaptive functioning was examined as a potential moderator of the relation between parent- and teacher-reported social skills. Again, Model 1 (main effects) was nonsignificant, and child's adaptive functioning did not emerge as a moderator of the relation between parent- and teacher-reported social skills, $B = -.001$, $SE = .01$, $p = .94$. Finally, when examining symptom severity as a potential moderator of the relation between parent- and teacher-reported social skills, Model 1 (main effects) was nonsignificant. However, there was a statistical trend for the interaction term when symptom severity was examined as a moderator of the relation between parent- and teacher-reported social skills, $B = .09$, $SE = .05$, $p = .09$. While the interaction terms were not found to explain statistically significant amounts of variance in the criterion variable, the unstandardized regression coefficients measuring the conditional relations between each predictor and each criterion variable at different levels (low, moderate, and high) of each moderator were examined. Though still statistically nonsignificant, the magnitude of these regression coefficients increased as parent education level and ASD severity increased, and as level of adaptive functioning decreased.

Table 5

Parent-Reported Social Skills by Parent Education Level, Parent-Reported Social Skills by Clinician-Reported ASD Severity and Parent-Reported Social Skills by Child Adaptive Functioning Predicting Teacher-Reported Social Skills

Predictor Variables	Criterion Variable
	Teacher-Reported Social Behavior
Parent Education Level as a Moderator (n=69)	
Model 1	
Parent education level	1.50 (1.64)
Parent-reported social skills	.11 (.14)
R^2	.02
Model 2	
Parent education level X Parent-reported social skills	.09 (.15)
ΔR^2	.01
ASD Severity as a Moderator (n=67)	
Model 1	
ASD severity	.63 (.62)
Parent-reported social skills	.11 (.14)
R^2	.02
Model 2	
ASD severity X Parent-reported social skills	.09† (.05)
ΔR^2	.04†
Adaptive Functioning as a Moderator (n=59)	
Model 1	
Adaptive Functioning	-.02 (.13)
Parent-reported social skills	.03 (.18)
R^2	.001
Model 2	
Adaptive Functioning X Parent-reported social skills	-.001 (.01)
ΔR^2	.0001

Note. Unstandardized regression coefficients reported for each predictor with standard errors in parentheses; ASD = autism spectrum disorder

$^{\dagger}p < .10$

Hypothesis 4. Hypothesis 4 (that behaviors and skills that are likely to be consistent across settings will serve as stronger moderators of the relation between parent and teacher reports, and that parent-reported moderators will account for more variance than clinician-reported moderators in each model) was examined in a similar manner using PROCESS for

SPSS (Hayes, 2013). The moderating effects of ADOS domain scores, RBS-R total scores, ASRS Social/Communication scale scores, and ABAS adaptive skills subscale scores on the relations between parent-reported social skills and teacher-reported social skills were examined via nine moderated multiple regression analyses (Tables 6 & 7). When examining ADOS Social Affect (ADOS-SA) and Restricted and Repetitive Behavior (ADOS-RRB) domain scores separately as potential moderators of the relation between parent- and teacher-reported social skills (Hypothesis 4a; Table 6), Model 1 (main effects) was nonsignificant. In addition, neither ADOS-SA, $B = .05$, $SE = .03$, $p = .15$, nor ADOS-RRB, $B = .01$, $SE = .09$, $p = .94$ emerged as moderators of the relation between parent- and teacher-reported social skills.

Next, when examining parent-reported RBS-R total scores and ASRS Social/Communication scale scores separately as potential moderators of the relation between parent and teacher reports (Hypothesis 4a), main effects were nonsignificant when predicting teacher reports (Table 6). However, while ASRS Social/Communication did not emerge as a moderator of the relation between parent and teacher reports, $B = .01$, $SE = .01$, $p = .34$, there was a statistical trend for the interaction term when RBS-R was examined as a moderator $B = .01$, $SE = .01$, $p = .058$. Again, although the interaction terms were not found to explain statistically significant amounts of variance in the criterion variable, the unstandardized regression coefficients measuring the conditional relations between each predictor and each criterion variable at different levels (low, medium, and high) of each moderator was examined. Though all were still statistically nonsignificant, the magnitude of these regression coefficients increased as parent- and clinician-reported social communication deficits and restricted and repetitive behavior increased. Specifically, a significant positive relation emerged between

parent- and teacher-reported SRS scores when RBS-R scores were high, yet a non-significant relation emerged when RBS-R scores were low.

Table 6

Parent-Reported Social Skills by Clinician-Reported Social Affect, Parent-Reported Social Skills by Clinician-Reported Restricted and Repetitive Behavior, Parent-Reported Social Skills by Parent-Reported Social/Communication Behaviors, and Parent-Reported Social Skills by Parent-Reported Restricted and Repetitive Behavior Predicting Teacher-Reported Social Skills

Predictor Variables	Criterion Variable
	Teacher-Reported Social Skills
Clinician-Reported Social Affect as a Moderator (n=67)	
Model 1	
Clinician-reported social affect	.28 (.39)
Parent-reported social skills	.11 (.15)
R^2	.02
Model 2	
Clinician-reported social affect X Parent-reported social skills	.05 (.03)
ΔR^2	.03
Clinician-Reported RRB as a Moderator (n=67)	
Model 1	
Clinician-reported RRB	1.74 (1.31)
Parent-reported social skills	.13 (.15)
R^2	.03
Model 2	
Clinician-reported RRB X Parent-reported social skills	.01 (.09)
ΔR^2	.0001
Parent-Reported Social/Comm. as a Moderator (n=69)	
Model 1	
Parent-reported social/comm.	-.29 (.26)
Parent-reported social skills	.31 (.20)
R^2	.04
Model 2	
Parent-reported social/comm. X Parent-reported social skills	.01 (.01)
ΔR^2	.01

Table 6 (continued).

Parent-Reported RRB as a Moderator (n=64)	
Model 1	
Parent-reported RRB	-.09 (.09)
Parent-reported social skills	.30 (.18)
R^2	.04
Model 2	
Parent-reported RRB X Parent-reported social skills	.01† (.005)
ΔR^2	.06†

Note. Unstandardized regression coefficients reported for each predictor with standard errors in parentheses; RRB = restricted and repetitive behaviors; Social/Comm. = social/communication behaviors

†$p < .10$

Finally, in order to examine if the relations between parent and teacher reports varied when children exhibited low levels of adaptive skills that were salient (i.e., Communication and Self Direction; Hypothesis 4b) or not salient (i.e., Home Living, Health and Safety, and Functional Academics; Hypothesis 4c) across settings, these five ABAS subdomains were examined separately as potential moderators of the relation between parent and teacher reports (Table 7). Main effects for each analysis were found to be nonsignificant when predicting teacher reports. In addition, none of the subdomains emerged as moderators of the relation between parent and teacher reports: Communication, $B = -.03$, $SE = .07$, $p = .66$; Self-Direction, $B = .03$, $SE = .07$, $p = .71$; Home Living, $B = -.04$, $SE = .06$, $p = .46$; Health and Safety, $B = -.02$, $SE = .06$, $p = .71$; and Functional Academics, $B = .02$, $SE = .06$, $p = .77$. As before, although the interaction terms did not explain statistically significant amounts of variance in the criterion variable, the unstandardized regression coefficients (measuring the conditional relations between each predictor and each criterion variable at different levels of each moderator [low, moderate, and high]) were again examined. Though these regression coefficients were still statistically nonsignificant, the magnitude of each coefficient was slightly greater at low levels of

communication, self direction, home living, and health and safety skills and at high levels of functional academic skills.

Table 7

Parent-Reported Social Skills by Communication Skills, Parent-Reported Social Skills by Self-Direction Skills, Parent-Reported Social Skills by Home Living Skills, Parent-Reported Social Skills by Health and Safety Skills, Parent-Reported Social Skills by Functional Academic Skills Predicting Teacher-Reported Social Skills

Predictor Variables	Criterion Variable
	Teacher-Reported Social Skills
Communication Skills as a Moderator (n=67)	
Model 1	
Communication skills	-.35 (.67)
Parent-reported social skills	.02 (.16)
R^2	.01
Model 2	
Communication Skills X Parent-reported social skills	-.03 (.07)
ΔR^2	.003
Self-Direction Skills as a Moderator (n=61)	
Model 1	
Self-direction skills	-.64 (.62)
Parent-reported social skills	-.01 (.16)
R^2	.02
Model 2	
Self-direction skills X Parent-reported social skills	.03 (.07)
ΔR^2	.002
Home Living Skills as a Moderator (n=62)	
Model 1	
Home living skills	.90 (.58)
Parent-reported social skills	.16 (.17)
R^2	.04
Model 2	
Home living skills X Parent-reported social skills	-.04 (.06)
ΔR^2	.01

Table 7 (continued).

Health and Safety Skills as a Moderator (n=62)	
Model 1	
Health and safety skills	.22 (.64)
Parent-reported social skills	.07 (.17)
R^2	.004
Model 2	
Health and safety skills X Parent-reported social skills	-.02 (.06)
ΔR^2	.002
Functional Academic Skills as a Moderator (n=61)	
Model 1	
Functional academic skills	-.35 (.54)
Parent-reported social skills	.01 (.16)
R^2	.01
Model 2	
Functional academic skills X Parent-reported social skills	.02 (.06)
ΔR^2	.002

Note. Unstandardized regression coefficients reported for each predictor with standard errors in parentheses; RRB = restricted and repetitive behaviors

Exploratory Research Question Testing

Hypothesis 5. Hypothesis 5 (that the interaction effect of each hypothesized moderator would be weaker for children who did not receive an ASD diagnosis) was examined using the aforementioned PROCESS tool in SPSS (Hayes, 2013). To test this hypothesis, six three-way regression models were analyzed to further examine variance according to diagnosis group. Six interaction terms were created (parent-reported social skills X diagnostic group X hypothesized moderators [parent education, ADOS-SA, ADOS-RRB, ASRS Social/Communication, RBS-R, and ABAS total score]) to examine if the moderating effects of parent education level, clinician-reported subdomain severity (ADOS-SA; ADOS-RRB), parent-reported subdomain severity (ASRS Social Communication; RBS-R), and level of adaptive functioning varied according to diagnosis group. Each interaction term was examined via a multiple regression analysis (Tables 8 through 13). With the exception of clinician-reported social affect, Model 1 and Model 2 for each analysis were found to be nonsignificant when predicting teacher reports. However, when

examining clinician-reported social affect and diagnostic group as proposed moderators, there was a statistical trend in the overall variance increase in Model 1 (Table 9). Specifically, diagnostic group accounted for unique variance B = -12.39, SE = 4.74, p = .01 in teacher-reported social skills. However, the addition of a three-way interaction term in each Model 3 did not account for additional variance in teacher-reported social skills in any of the tested models. In other words, the moderating effects of the following variables did not vary according to diagnosis group: parent education, B = .43, SE = .29, p = .14 (Table 8); ADOS-SA, B = .09 SE = .14, p = .56 (Table 9); ADOS-RRB, B = -.24, SE = .28, p = .40 (Table 10); ASRS Social/Communication, B = .001, SE = .03, p = .97 (Table 11); RBS-R, B = -.004, SE = .01, p = .71 (Table 12); and ABAS total score, B = .04, SE = .03, p = .21 (Table 13).

Table 8

Parent-Reported Social Skills by Diagnostic Group by Parent Education Level, Predicting Teacher-Reported Social Skills

Predictor Variables	Criterion Variable
	Teacher-Reported Social Behavior
Model 1	
Parent-reported social skills	.13 (.14)
Parent education level	.76 (1.65)
Diagnostic Group	-6.69† (3.38)
R^2	.08
Model 2	
Parent-reported social skills X Parent education level	.11 (.14)
Parent-reported social skills X Diagnostic group	-.40 (.29)
Diagnostic group X Parent education level	-1.04 (3.34)
ΔR^2	.04
Model 3	
Parent-reported SS X Parent ed. level X Dx. Group	.43 (.29)
ΔR^2	.03

Note. Unstandardized regression coefficients reported for each predictor with standard errors in parentheses; Diagnostic group coded as 0 = ASD group, 1 = non-ASD group; ASD = autism spectrum disorder; SS = social skills; ed. = education; Dx. = Diagnostic group

†$p < .10$

Table 9

Parent-Reported Social Skills by Diagnostic Group by Clinician-Reported Social Affect, Predicting Teacher-Reported Social Skills

Predictor Variables	Criterion Variable
	Teacher-Reported Social Behavior
Model 1	
Parent-reported social skills	.11 (.14)
Clinician-reported social affect	-.69 (.52)
Diagnostic Group	-12.39* (4.74)
R^2	.11†
Model 2	
Parent-reported social skills X Clinician-reported social	.04 (.06)
Parent-reported social skills X Diagnostic group	.07 (.50)
Diagnostic group X Clinician-reported social affect	.82 (1.16)
ΔR^2	.03
Model 3	
Parent-reported SS X Clinician-reported SA X Dx. Group	.09 (.14)
ΔR^2	.005

Note. Unstandardized regression coefficients reported for each predictor with standard errors in parentheses; Diagnostic group coded as 0 = ASD group, 1 = non-ASD group; ASD = autism spectrum disorder; SS = social skills; SA = social affect; Dx. = Diagnostic group

$^{\dagger}p < .10$. $*p < .05$

Table 10

Parent-Reported Social Skills by Diagnostic Group by Clinician-Reported Restricted and Repetitive Behavior, Predicting Teacher-Reported Social Skills

Predictor Variables	Criterion Variable
	Teacher-Reported Social Behavior
Model 1	
Parent-reported social skills	.12 (.14)
Clinician-reported RRB	.46 (1.44)
Diagnostic Group	-7.40† (3.81)
R^2	.09
Model 2	
Parent-reported social skills X Clinician-reported RRB	.01 (.11)
Parent-reported social skills X Diagnostic group	-.30 (.34)
Diagnostic group X Clinician-reported RRB	-4.70 (3.04)
ΔR^2	.05
Model 3	
Parent-reported SS X Clinician-reported RRB X Dx.	-.24 (.28)
ΔR^2	.01

Note. Unstandardized regression coefficients reported for each predictor with standard errors in parentheses; Diagnostic group coded as 0 = ASD group, 1 = non-ASD group; ASD = autism spectrum disorder; SS = social skills; RRB = restricted and repetitive behaviors; Dx. = Diagnostic group

†$p < .10$

Table 11

Parent-Reported Social Skills by Diagnostic Group by Parent-Reported Social/Communication Behavior, Predicting Teacher-Reported Social Skills

Predictor Variables	Criterion Variable
	Teacher-Reported Social Behavior
Model 1	
Parent-reported social skills	.35† (.19)
Parent-reported social/communication behaviors	-.34 (.25)
Diagnostic Group	-6.48† (3.28)
R^2	.09
Model 2	
Parent-reported SS X Parent-reported social/comm.	.01 (.01)
Parent-reported SS X Diagnostic group	-.45 (.42)
Diagnostic group X Parent-reported social/comm.	.37 (.59)
ΔR^2	.03
Model 3	
Parent-reported SS X Parent-reported social/comm. X Dx.	.001 (.03)
ΔR^2	.00

Note. Unstandardized regression coefficients reported for each predictor with standard errors in parentheses; Diagnostic group coded as 0 = ASD group, 1 = non-ASD group; ASD = autism spectrum disorder; SS = social skills; Social/Comm. = social/communication behaviors; Dx. = Diagnostic group

†$p < .10$

Table 12

Parent-Reported Social Skills by Diagnostic Group by Parent-Reported Restricted and Repetitive Behavior, Predicting Teacher-Reported Social Skills

Predictor Variables	Criterion Variable
	Teacher-Reported Social Behavior
Model 1	
Parent-reported social skills	.30 (.18)
Parent-reported restricted and repetitive behaviors	-.09 (.09)
Diagnostic Group	-4.73 (3.39)
R^2	.07
Model 2	
Parent-reported SS X Parent-reported RRB.	.01 (.01)
Parent-reported SS X Diagnostic group	.03 (.53)
Diagnostic group X Parent-reported RRB	.15 (.88)
ΔR^2	.08
Model 3	
Parent-reported SS X Parent-reported RRB X Dx. Group	.004 (.01)
ΔR^2	.002

Note. Unstandardized regression coefficients reported for each predictor with standard errors in parentheses; Diagnostic group coded as 0 = ASD group, 1 = non-ASD group; ASD = autism spectrum disorder; SS = social skills; RRB = restricted and repetitive behaviors; Dx. = Diagnostic

Table 13

Parent-Reported Social Skills by Diagnostic Group by Child Adaptive Functioning, Predicting Teacher-Reported Social Skills

Predictor Variables	Criterion Variable
	Teacher-Reported Social Behavior
Model 1	
Parent-reported social skills	.02 (.18)
Adaptive functioning	-.02 (.13)
Diagnostic Group	-6.12† (3.54)
R^2	.05
Model 2	
Parent-reported SS X Adaptive functioning	-.004 (.01)
Parent-reported SS X Diagnostic group	-.25 (.36)
Diagnostic group X Adaptive functioning	.17 (.26)
ΔR^2	.03
Model 3	
Parent-reported SS X Adaptive Functioning X Dx. Group	.04 (.03)
ΔR^2	.03

Note. Unstandardized regression coefficients reported for each predictor with standard errors in parentheses; Diagnostic group coded as 0 = ASD group, 1 = non-ASD group; ASD = autism spectrum disorder; SS = social skills; Dx. = Diagnostic

†$p < .10$

Hypothesis 6. Lastly, to test the final hypothesis (that the interaction effect of each hypothesized moderator will be weaker for children from urban counties) the above protocol was followed. Six three-way regression models were employed to further examine variance according to geographic classification (urban versus rural county). Six interaction terms were created (parent-reported social skills X geographic classification X hypothesized moderators [parent education level, ADOS-SA, ADOS-RRB, ASRS Social/Communication; RBS-R, and ABAS total score]) to examine if the moderating effects of parent education level, clinician-reported subdomain severity (ADOS-SA; ADOS-RRB), parent-reported subdomain severity (ASRS Social Communication; RBS-R), and level of adaptive functioning varied according to geographic classification. Each interaction term was examined via moderated multiple regression

analysis (Tables 14-20). With the exception of clinician-reported restricted and repetitive behaviors, Model 1 and Model 2 for each analysis were found to be nonsignificant when predicting teacher reports. However, when examining clinician-reported restricted and repetitive behaviors and geographic classification as moderators, there was a statistical trend in the overall variance increase in Model 2 when predicting teacher-reported social skills (Table 16). Additionally, the interaction between clinician-reported restricted and repetitive behaviors and geographic classification accounted for unique variance in teacher-reported social skills, B = -8.32, SE = 3.13, p = .01 (Table 16), and, when further examined as a separate 2-way interaction, this interaction term again accounted for unique variance in teacher-reported social skills (B = -7.97, SE = 3.01, p = .01; Table 17). However, the addition of a three-way interaction term in each Model 3 did not account for additional variance in teacher-reported social skills in any of the tested models. In other words, the moderating effects of the following variables did not vary significantly according to geographic classification: parent education, B = .68, SE = .60, p = .26 (Table 14); ADOS-SA, B = .13, SE = .09, p = .13 (Table 15); ADOS-RRB, B = -.16, SE = .32, p = .62 (Table 16); ASRS Social/Communication, B = .05, SE = .05, p = .37 (Table 18); RBS-R, B = -.03, SE = .02, p = .28 (Table 19); and ABAS total score, B = -.04, SE = .04, p = .27 (Table 20).

Table 14

Parent-Reported Social Skills by Geographic Classification by Parent Education Level, Predicting Teacher-Reported Social Skills

Predictor Variables	Criterion Variable
	Teacher-Reported Social Behavior
Model 1	
Parent-reported social skills	.11 (.14)
Parent education level	1.51 (1.65)
Geographic classification	1.13 (3.79)
R^2	.02
Model 2	
Parent-reported social skills X Parent education level	.16 (.16)
Parent-reported social skills X Geographic classification	-.43 (.41)
Geographic classification X Parent education level	7.51 (4.74)
ΔR^2	.05
Model 3	
Parent-reported SS X Parent ed. level X Geo.	.68 (.60)
ΔR^2	.02

Note. Unstandardized regression coefficients reported for each predictor with standard errors in parentheses; Geographic classification coded as 0 = rural county, 1 = urban county; ASD = autism spectrum disorder; SS = social skills; ed. = education; Geo. = Geographic classification

Table 15

Parent-Reported Social Skills by Geographic Classification by Clinician-Reported Social Affect, Predicting Teacher-Reported Social Skills

Predictor Variables	Criterion Variable
	Teacher-Reported Social Behavior
Model 1	
Parent-reported social skills	.10 (.15)
Clinician-reported social affect	.28 (.39)
Geographic classification	-.41(4.04)
R^2	.02
Model 2	
Parent-reported social skills X Clinician-reported social	.04 (.03)
Parent-reported social skills X Geographic classification	-.03 (.39)
Geographic classification X Clinician-reported social	-1.23 (.95)
ΔR^2	.06
Model 3	
Parent-reported SS X Clinician-reported SA X Geo.	.13 (.09)
ΔR^2	.04

Note. Unstandardized regression coefficients reported for each predictor with standard errors in parentheses; Geographic classification coded as 0 = rural county, 1 = urban county; ASD = autism spectrum disorder; SS = social skills; SA = social affect; Geo. = Geographic classification

Table 16

Parent-Reported Social Skills by Geographic Classification by Clinician-Reported Restricted and Repetitive Behavior, Predicting Teacher-Reported Social Skills

Predictor Variables	Criterion Variable
	Teacher-Reported Social Behavior
Model 1	
Parent-reported social skills	.13 (.15)
Clinician-reported RRB	1.75 (1.32)
Geographic classification	-.65 (4.01)
R^2	.04
Model 2	
Parent-reported social skills X Clinician-reported RRB	-.003 (.09)
Parent-reported social skills X Geographic classification	-.20 (.39)
Geographic classification X Clinician-reported RRB	-8.32* (3.13)
ΔR^2	.10†
Model 3	
Parent-reported SS X Clinician-reported RRB X Geo.	-.16 (.32)
ΔR^2	.004

Note. Unstandardized regression coefficients reported for each predictor with standard errors in parentheses; Geographic classification coded as 0 = rural county, 1 = urban county; ASD = autism spectrum disorder; SS = social skills; RRB = restricted and repetitive behaviors; Geo. = Geographic classification

$^{\dagger}p < .10$. $^{*}p < .05$

Table 17

Clinician-Reported Restricted and Repetitive Behaviors by Geographic Classification Predicting Teacher-Reported Social Skills

Predictor Variables	Criterion Variable
	Teacher-Reported Social Behavior
Model 1	
Parent-reported social skills	.10 (.14)
R^2	.01
Model 2	
Geographic Classification	-.65 (4.01)
Clinician-reported RRB	1.75 (1.32)
ΔR^2	.03
Model 3	
Geographic Classification X Clinician-reported RRB	-7.97* (3.01)
ΔR^2	.10*

Note: Clinician RRB = Clinician-reported restricted and repetitive behaviors; Geo. Class. = Geographic Classification; Geographic classification coded as 0 = rural county, 1 = urban county
*$p < .05$

Table 18

Parent-Reported Social Skills by Geographic Classification by Parent-Reported Social/Communication Behavior, Predicting Teacher-Reported Social Skills

Predictor Variables	Criterion Variable
	Teacher-Reported Social Behavior
Model 1	
Parent-reported social skills	.31 (.20)
Parent-reported social/communication behaviors	-.29 (.26)
Geographic classification	1.06 (3.76)
R^2	.04
Model 2	
Parent-reported SS X Parent-reported social/comm.	.01 (.02)
Parent-reported SS X Geographic classification	-.20 (.54)
Geographic classification X Parent-reported social/comm.	-.05 (.70)
ΔR^2	.02
Model 3	
Parent-reported SS X Parent-reported social/comm. X	.05 (.05)
ΔR^2	.01

Note. Unstandardized regression coefficients reported for each predictor with standard errors in parentheses; Geographic classification coded as 0 = rural county, 1 = urban county; ASD = autism spectrum disorder; SS = social skills; Social/Comm. = social/communication behaviors; Geo. = Geographic classification

Table 19

Parent-Reported Social Skills by Geographic Classification by Parent-Reported Restricted and Repetitive Behavior, Predicting Teacher-Reported Social Skills

Predictor Variables	Criterion Variable
	Teacher-Reported Social Behavior
Model 1	
Parent-reported social skills	.30 (.18)
Parent-reported restricted and repetitive behaviors	-.09 (.09)
Geographic classification	.60 (3.93)
R^2	.04
Model 2	
Parent-reported SS X Parent-reported RRB.	.01† (.01)
Parent-reported SS X Geographic classification	-.23 (.42)
Geographic classification X Parent-reported RRB	-.02 (.21)
ΔR^2	.06
Model 3	
Parent-reported SS X Parent-reported RRB X Geo.	-.03 (.02)
ΔR^2	.02

Note. Unstandardized regression coefficients reported for each predictor with standard errors in parentheses; Geographic classification coded as 0 = rural county, 1 = urban county; ASD = autism spectrum disorder; SS = social skills; RRB = restricted and repetitive behaviors; Geo. = Geographic classification

$^{\dagger}p < .10$

Table 20

Parent-Reported Social Skills by Geographic Classification by Child Adaptive Functioning, Predicting Teacher-Reported Social Skills

Predictor Variables	Criterion Variable
	Teacher-Reported Social Behavior
Model 1	
Parent-reported social skills	.03 (.18)
Adaptive functioning	-.02 (.13)
Geographic classification	.20 (3.94)
R^2	.001
Model 2	
Parent-reported SS X Adaptive functioning	-.003 (.01)
Parent-reported SS X Geographic classification	-.34 (.42)
Geographic classification X Adaptive functioning	-.30 (.37)
ΔR^2	.02
Model 3	
Parent-reported SS X Adaptive Functioning X Geo.	-.04 (.04)
ΔR^2	.02

Note. Unstandardized regression coefficients reported for each predictor with standard errors in parentheses; Geographic classification coded as 0 = rural county, 1 = urban county; ASD = autism spectrum disorder; SS = social skills; Geo. = Geographic classification

CHAPTER 4

DISCUSSION

The current study examined the extent to which parent education, children's ASD symptoms severity, and children's adaptive functioning individually strengthened or weakened the relation between parent and teacher report of social skills, along with how this relation varied across different ASD symptoms and adaptive functioning subdomains, and according to subdomain rater (clinician or parent). In addition, the current study investigated whether the moderating effects of these constructs varied according to diagnosis group (ASD vs. non-ASD), or according to rural versus urban geographic classification.

Hypothesis 1 was unsupported, as neither parent nor teacher report of child social skills were significantly positively related to ASD severity. However, Hypothesis 2 was supported, as a significant difference was found between parent and teacher reports of social skills with parent-reported scores greater than teacher reported scores on average.

Hypothesis 3 was unsupported. Parent education level, child ASD symptom severity and child adaptive functioning did not separately moderate the relation between parent and teacher ratings of social skills. However, a statistical trend emerged for the interaction term when ASD severity was examined as a moderator. While the other interaction effects did not achieve statistical significance, the magnitude of the regression coefficients indicated that the variables were relating in the direction that was predicted (i.e., stronger relations between parent- and teacher-reported social skills at higher levels of parent education and ASD severity and at lower levels of adaptive functioning).

Hypothesis 4 was primarily unsupported. Congruence between parent- and teacher-reported social skills did not vary significantly when specific ASD symptom subdomains and adaptive functioning subdomains were examined. However, a significant positive relation was found between parent- and teacher-reported social skills when parent-reported restricted and repetitive behaviors were high, yet a nonsignificant relation emerged when reports of these behaviors were low. This suggests that when parent-reported restricted and repetitive behaviors are high, agreement among raters on social skills is more consistent relative to when reports of these restricted and repetitive behaviors are low. However, given that this variation in parent- and teacher-reported social skills is based only on a statistical trend for the interaction term, this finding should be interpreted with caution. In addition, though other interactions did not achieve statistical significance, the magnitude of several of the regression coefficients indicated that the variables were relating in the direction that was predicted. For example, while mostly nonsignificant (with the exception of high parent-reported restricted and repetitive behaviors), the magnitude of the regression coefficients was greater among parent-reported measures when compared to clinician-reported measures, suggesting that the relation between parent and teacher reports may vary more as a function of behaviors and symptoms perceived by parents compared to symptoms and behaviors perceived by clinicians. However, in regard to specific areas of adaptive functioning, the magnitude of the regression coefficients did not vary consistently according to whether or not the skills being assessed were salient or not salient across settings.

Hypothesis 5 was also unsupported. The seven three-way interactions between the predictor (parent-reported social skills), proposed moderators (parent education, ADOS severity scores, ADOS domain scores, RBS-R total scores, ARSR Social/Communication scale scores and ABAS total scores), and diagnostic group were all nonsignificant, which was unsurprising

given the nonsignificance of the primary hypotheses. This suggests that the hypothesized moderators did not significantly moderate the relation between parent- and teacher-reported social skills, nor did the strength of the moderations vary significantly according to diagnosis group. However, a significant trend emerged for the main effect of diagnostic group when predicting teacher-reported social skills.

Lastly, hypothesis 6 was also unsupported. The seven three-way interactions between the initial predictor (parent-reported social skills), proposed moderators (parent education, ADOS severity scores, ADOS domain scores, RBS-R total scores, ARSR Social/Communication scale scores and ABAS total scores) and rural/urban geographic classification were all nonsignificant, which, again, was not unexpected given the nonsignificance of the primary hypotheses. Again, this suggests that the hypothesized relations did not vary significantly according to geographic classification, and, regardless of geographic classification, the hypothesized variables do not significantly moderate the relation between parent- and teacher-reported social skills. However, the interaction between clinician-reported restricted and repetitive behaviors and geographic classification was found to be significant when predicting teacher-reported social skills.

Links to Previous Literature

Although the majority of hypotheses were not supported, our findings regarding the significant difference between parent and teacher reports was consistent with previous research (Stratis & Lecavalier, 2015). However, the results when examining the potential moderators of the relation between parent and teacher reports appear to be indicative of the complexities associated with utilizing assessments from multiple informants and informant discrepancy.

Whereas utilizing assessment tools completed by multiple informants allows clinicians to gather additional information about the child's functioning across difference settings, the

outcomes of these assessment measures can be influenced by many factors, such as informant bias, rater expectations, and changes in the child's behavior across settings (De Los Reyes, 2011; Duvekot et al., 2015; Hoyt, 2000; Stratis & Lecavalier, 2015). Many studies have investigated informant agreement across various domains of child psychopathology and researchers continue to find varied results. For example, while a 1987 meta-analysis found that informant agreement varied across informant pairs (e.g., two parents or a parent and a teacher) as well as the type of behavior that was being assessed, more recent research has not found significant differences in discrepancy across informant pairs or according to the type of behavior assessed (Duhig, Renk, Epstein & Phares, 2000; Renk & Phares, 2004).

These varied results have been found when examining the influence of not only child characteristics, but also rater and family characteristics as well. While previous studies suggest that informant discrepancy may vary according to a variety of personal and contextual factors within families, results of these studies are inconsistent. For example, while numerous researchers have examined family socio-economic status (SES) as a predictor of discrepancy, these results continue to be varied (Chi & Hinshaw, 2002; Duhig et al., 2000; Kolko & Kazdin, 1993; Renouf & Kovacs, 1994; Treutler & Epkins, 2003), and some researchers have noted that these varied results may be due the broad and numerous characteristics associated with SES (e.g., income, occupation, educaiton; De Los Reyes & Kazdin, 2005). While this study attempted to examine parent education as a small part of this broad variable, it is closely tied to other potentially influential informant characteristics that were not available, and thus not examined in this study.

However, the stronger effects found in this study when examining children's restricted and repetitive behavior mirror previous findings. Specifically, previous research has found that

informant discrepancies tend to be lower when rating child externalizing problems than when rating child internalizing problems (Achenbach et al., 1987; De Los Reyes & Kazdin, 2005; Duhig et al., 2000). Researchers have suggested that this is likely because externalizing problems are more easily observable to informants (De Los Reyes & Kazdin, 2005). As such, the highly observable nature of restricted and repetitive behaviors may explain why a statistical trend for the interaction term emerged among this particular set of symptoms when examined as a moderator.

Limitations and Future Directions

Several limitations should be considered when interpreting the results of the current study. One major limitation was the relatively small sample size. With a sample size of 71, the power to detect the hypothesized effects was low. A post-hoc power analysis, using the G*Power program (Faul, Erdfelder, Lang, & Buchner, 2007), was conducted to determine the level of power given the current sample size and the observed effect sizes. For the analyses using fixed multiple regression models with three predictors, effect sizes ranged from $f^2 = .001$ to $f^2 = .11$, and power ranged from .05 to .56 respectively. For the exploratory analyses which employed fixed multiple regression models with seven predictors, effect sizes ranged from $f^2 = .04$ to $f^2 = .18$, and power ranged from .15 to .62 respectively.

While a meta-analysis investigating informant agreement on emotional and behavior problems and social skills in children with ASD or intellectual disability found a mean weighted effect size of $r = .36$ across all raters and behaviors, many of the studies included had sample sizes of over 100 cases (Stratis & Lecavalier, 2015). In addition, the effect sizes when examining parent-parent rater pairs was consistently higher than the effect size when examining parent-teacher rater pairs, regardless of the behavior that was being assessed (externalizing symptoms:

parent-parent, r = .71; parent-teacher, r = .41; internalizing symptoms: parent-parent, r = .69; parent-teacher, r = .21; social skills: parent-parent, r = .42; parent-teacher, r = .31). Also of note, across all raters the effect size was lowest when examining assessments of child's social skills (Stratis & Lecavalier, 2015). Therefore, examining parent and teacher ratings of child's social skills may require larger sample sizes than is required when examining other areas of report discrepancy.

Next, while it was hypothesized that there would be a significant difference between parent and teacher reports of child social functioning, the lack of a significant correlation between parent and teacher reports (r = .11, p = .35) was unexpected and this relation was lower than the correlations found in previous studies (Stratis & Lecavalier, 2015). Because moderation examines conditions under which a moderator variable affects the strength of the relation between the predictor and criterion variables, this initial low correlation between the predictor and criterion variables was likely problematic.

In addition, because the current study utilized existing data, the analyses were limited to the variables collected through the assessment process. While a wide breadth of data were collected during each assessment, factors such as family income or teacher characteristics were not included in the assessment forms. Specifically, although research has found that factors such as family income (Stone, Speltx, Collett, & Werler, 2013), teacher characteristics (Berg-Nielsen, Solheim, Belsky & Wichstrom, 2012; Zahner & Daskalakis, 1998) and parents' levels of depression, stress and anxiety (De Los Reyes & Kazdin, 2005) have a significant influence on parent-teacher informant discrepancy, measures assessing these constructs were not available and the variance attributed to the factors is unknown.

It is also important to consider the use of multiple editions of assessment measures. Due to new editions being published during the establishment of the database, two versions of the SRS, ADOS and ABAS were used in the current study. While previous studies have found that all updated versions are similar enough to be examined together (SRS with SRS-2, ADOS with ADOS-2, ABAS-II with ABAS-3; Bruni, 2014; Constantino & Gruber, 2012; Harrison & Oakland, 2015; McCrimmon & Rostad, 2014), it is possible that the combination of the different versions of each measure introduced additional error.

Moreover, this study examined assessments of children who did and did not receive a diagnosis of ASD. This approach preserved statistical power and allowed for conclusions about the relations between parent and teacher report discrepancy that were independent of clinician diagnosis (potentially making findings more applicable to a typical clinical setting). However, the variance added by examining children with and without ASD may have introduced inconsistencies into the variables examined. Future research examining multi-informant assessment in a clinically referred population would be strengthened by obtaining sample sizes large enough to allow for the examination of factors that may influence informant discrepancy both across diagnosis and non-diagnosis groups and between groups.

Another point to consider is the overall level of parent education in the sample. As discussed above, studies have found that pairs of similar informants (e.g., parent-parent) demonstrate higher agreement compared to pairs of different raters (e.g., teacher-teacher; Stratis & Lecavalier, 2015). Although the current study examined the relation between two different raters (e.g., parent-teacher), education-related similarities between parents and teacher increase as parent education level increases. Specifically, parents who have a bachelor's or graduate degree have received a level of education that is more similar to the level that is required to

become a teacher, when compared to parents with lower levels of education. However, in the current sample, only 23.9% of parents had received a bachelor's or graduate degree, and the rest had received lower levels of education. While the informant pairs examined in this study were already unrelated, the high percentage of parents without bachelor's or graduate degrees may have made the pairs even more dissimilar, possibly contributing to the weak relation between the variables.

A final limitation to consider is the conflicting results found in the previous literature examining informant discrepancy in both general childhood psychopathology and in ASD assessment. While the hypotheses were developed using the findings from previous studies, these findings varied across studies and across the predictors/moderators that were assessed. While some of the findings in the current study may be null due to the previously discussed methodological limitations, there are many factors that could affect the relation between parent and teacher reports, and other factors that were not measured in this study could be more predictive.

Conclusions and Clinical Implications

While the majority of the hypotheses for this study were unsupported, the results provide some noteworthy information. For example, the results supported the well documented discrepancy between parent and teacher assessment of ASD symptoms (Stratis & Lecavalier, 2015). While this discrepancy has been examined extensively in general childhood psychopathology, research on this discrepancy in ASD assessments has been sparse and many potential predictors of informant discrepancy within assessments of ASD symptoms remain unexamined.

Although the initial hypothesized moderators (parent education, child ASD severity and adaptive functioning) did not emerge as significant predictors of the relation between parent- and teacher-reported social skills, the magnitude of the regression coefficients indicated that the variables were relating in the direction that was predicted (i.e., stronger relations at higher levels of parent education and ASD severity and lower levels of adaptive functioning). In addition, when examining specific ASD symptoms subdomains (i.e., clinician-reported social affect, clinician-reported restricted and repetitive behaviors, parent-reported social/communication behaviors and parent-reported restricted and repetitive behavior), the observed regression coefficients also indicated that the variables were relating in the direction that was predicted. These findings suggest that as researchers continue to explore multi-informant ASD assessment, parent education, child ASD symptom severity and adaptive functioning are likely important factors to consider.

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