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Sex Differences in Autism Spectrum Disorder: An Examination of Developmental Functioning, Autistic Symptoms, and Coexisting Behavior Problems in Toddlers

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Abstract

Little is known about the female presentation of autism spectrum disorder (ASD) during early childhood. We investigated sex differences in developmental profiles using the Mullen Scales of Early Learning, autistic symptoms on the ADOS-G, and coexisting behavior problems on the CBCL in 157 boys and 42 girls with ASD aged 1.5–3.9 years. Overall, boys and girls evidenced a markedly similar pattern of developmental profiles, autism symptoms, and coexisting behavior problems, although subtle differences exist. Boys and girls evidenced a similar pattern of developmental strengths and weaknesses. Girls with ASD evidenced greater communication deficits than boys and boys evidenced more restricted, repetitive, and stereotyped behavior than girls. Girls exhibited more sleep problems and anxious or depressed affect than boys.

Keywords

Autism; Sex; Girl; Developmental functioning; Behavior problems

Introduction

The male to female ratio of autism spectrum disorders (ASD) is estimated to range from 5.5:1.4 to 16.8:4.0 (Centers for Disease Control and Prevention [CDC] 2007). Given this marked sex discrepancy, most ASD research has focused on boys. When girls with ASD are included in studies, sample sizes are often too small to allow for comparisons by sex. The neurobiological mechanisms responsible for the heightened ratio of ASD in boys may also result in sex differences in cognitive profiles, autistic symptoms, and coexisting behavior problems (e.g., Baron-Cohen and Hammer 1997; Schultz et al. 2000; Skuse 2000; Ingudomnukul et al. 2007). An understanding of sex differences in the presentation of ASD has important implications for tailoring assessment measures and interventions to the potentially unique presentations and needs of boys and girls.

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Developmental Functioning

Numerous studies of older children with ASD report that girls are more likely to have mental retardation, and particularly IQs in the severe and profound range, than boys (CDC 2007); Lord et al. 1982; Lord and Schopler 1985; Tsai and Beisler 1983; Tsi et al. 1981; Volkmar et al. 1993; Wing 1981). Findings are less clear when examining early developmental functioning of young children with ASD. Several studies suggest that young boys and girls with ASD evidence a similar pattern of developmental strengths and weaknesses. Both boys and girls perform better on visual reception and fine motor tasks than gross motor and language tasks (Carter et al. 2007; Joseph et al. 2002; Lincoln et al. 1995). To date, only one published study has systematically examined whether sex differences occur within this profile. In a sample of 22 girls and 68 boys with ASD aged 18–33 months using the Mullen Scales of Early Learning (MSEL; Mullen 1995),Carter et al. (2007) found that boys had better developed language and fine motor skills than girls. In contrast, girls had better developed visual reception abilities than boys. However, concern regarding the generalizability of these results was raised by the study authors due to their use of exclusion criteria; toddlers with a genetic disorder, physical health limitation, or neurological disease were not included in the study. Additional research is needed to determine whether these early sex differences in developmental abilities can be replicated in a larger and more representative sample of young children with ASD.

Autistic Symptoms

Previous studies have reported inconsistent findings regarding differences in autistic symptoms between boys and girls with ASD. In early studies, researchers noted that girls with ASD had more appropriate interests than boys (Kopp and Gillberg 1992; Wolff and McGuire 1995). In contrast, boys with ASD were found to show more unusual motor movements and abnormal use of their body and objects than girls (Lord et al. 1982; Tsi et al. 1981; Volkmar et al. 1988). Other studies have found no sex differences using self-reported or parent measures and interviews (Baron-Cohen et al. 2006, 2001; Volkmar et al. 1993; Wakabayashi et al. 2004, 2007; Wing and Gould 1979). However, these early studies failed to control for sex differences in cognitive functioning. Cognitive functioning is negatively associated with severity of autistic features (e.g., Bartak and Rutter 1976; Hus et al. 2007; Szatmarr et al. 1996), and thus sex discrepancy in cognitive functioning may have obscured true differences in autistic symptoms between boys and girls.

Only a few studies have examined sex differences in autistic symptoms while controlling for cognitive functioning. Two studies reported no sex differences in autistic symptoms. There was not a difference on the Autism Diagnostic Interview-Revised (ADI-R; Rutter et al. 2003) and Childhood Autism Rating Scale (CARS; Schopler et al. 1988) between 18 boys and 18 girls with ASD, matched on age (ranging 3–30 years) and IQ (Pilowsky et al. 1998). Similarly, no differences were found on the ADI-R and Autism Diagnostic Observation Schedule-Generic (ADOSG; Lord et al. 2000) in 23 high functioning girls and 23 boys matched for age (ranging 2–21 years) and IQ (Holtmann et al. 2007). In contrast, three studies reported sex differences in autistic symptoms. Lord and colleagues reported higher rates of restricted or repetitive behaviors and inappropriate play in 384 boys as compared to 91 girls aged 3–8 years with ASD when IQ was controlled (Lord et al. 1982). Similarly,McLennan et al. (1993) examined autistic behaviors in 21 boys and 21 girls with ASD aged 6–36 years matched for IQ using the ADI (Le Couteur et al. 1989) and found that boys showed more restricted and repetitive behaviors related to play than girls. Moreover, during early childhood boys were reported to have displayed greater deficits in reciprocal social interaction and communication than girls. In contradiction to this last finding, in a sample of boys and girls aged 18–33 months, Carter et al. (2007) noted a trend for girls with ASD to have greater communication impairment than boys on the ADOS-G.

One hypothesis for the inconsistency in study findings of sex differences in autistic symptoms is the age range studied. The studies (Holtmann et al. 2007; Pilowsky et al. 1998) that did not find sex differences included participants spanning a wide age range, from early childhood through adulthood. In contrast, the studies (Carter et al. 2007; Lord et al. 1982; McLennan et al. 1993) that reported differences between boys and girls either used a restricted age range focused on early childhood or only found differences during early childhood. Together these findings suggest that sex differences in autistic symptoms are most prominent in young children. Furthermore, the discrepancy in sex-related findings for autistic communication deficits may be due to variation in methodology;McLennan et al. (1993) used retrospective parent-reports of early communication problems in individuals with ASD aged 6–36 years, whereas Carter et al. (2007) examined standardized observations of communication deficits in young children with ASD. Retrospective parent-ratings of early communication problems may differ from direct observations of these problems. Additional research utilizing a large sample of young children with ASD, controlling for IQ and age, is needed to further clarify sex differences during early childhood.

Coexisting Behavior Problems

Little is known about sex differences in coexisting behavior problems among young children with ASD. A few studies using large samples of young children with ASD found no differences in behavior problems such as aggression, inattention, and mood problems between boys and girls (Gadow and DeVincent 2005; Gadow et al. 2005, 2004; Herring et al. 2006). However, these studies did not control for differences in cognitive functioning. In a recent study using a sample of 23 girls and 23 boys with ASD aged 5–20 years matched on IQ and age, caregivers reported more behavior problems in girls than boys on the Child Behavior Checklist for individuals 4 through 18 years (CBCL; Achenbach and Rescorla 2000; Holtmann et al. 2007). Although differences were subtle, girls were rated as having more social problems, attention problems and thought problems. Further investigation into coexisting behavior problems in a large sample of toddlers with ASD, while controlling for age and cognitive functioning, is needed to determine whether these differences also occur in early childhood.

This study investigated developmental profiles, autistic symptoms, and coexisting behavior problems in 157 boys and 42 girls with ASD aged 1.5–3.9 years. It was hypothesized that both boys and girls with ASD would evidence a similar pattern of developmental functioning; visual reception and fine motor skills would be better developed than language skills. Within this pattern, boys were predicted to have better language and fine motor skills than girls. Girls were expected to have better visual reception skills than boys. In regard to autistic symptoms, boys were expected to have more restricted, repetitive, and stereotyped behavior and impairments in social relatedness than girls. Girls with ASD were hypothesized to exhibit more coexisting behavior problems than boys.

Method

Participants

Four hundred and ninety-nine toddlers aged 18–47 months were referred to an interdisciplinary autism clinic in a tertiary medical hospital in the northwest region of the United States by their primary care medical provider in 2003–2007. One hundred and ninety-nine toddlers (58.9%) were diagnosed with ASD [133 Autistic Disorder and 66 Pervasive Developmental Disorder Not Otherwise Specified (PDD-NOS)]. One hundred and fifty-seven (78.9%) toddlers were male and 42 were female (21.1%). This male to female ratio is comparable to that reported for the overall ASD population (CDC 2007). Table 1 displays the subject characteristics of the young children with ASD.

Measures

Subject Characteristics—Age, sex, ethnicity, and whether or not the child was receiving Early Intervention/Early Childhood Education Services were reported by Parents. Parents also completed the Vineland Adaptive Behavior Scales, Second Edition, Survey Interview Form (Sparrow et al. 2005), a semistructured interview of a child's personal and social everyday living skills in the domains of: Communication, Daily Living Skills, Socialization Skills, and Motor Skills. Openended questions are used to determine if the child "usually," "sometimes or partially," or "never" performs each activity. The domains combine to form the Adaptive Behavior Composite (ABC), which is a standard score (M = 100, SD = 15). The Vineland ABC score has satisfactory reliability and concurrent validity (Sparrow et al. 2005).

Developmental Functioning—The Mullen Scales of Early Learning (MSEL; Mullen 1995) is a standardized measure of cognitive and motor development in infants and children up to 68 months of age. Four areas of development (Visual Reception, Fine Motor, Expressive Language, and Receptive Language) are assessed and converted to T-scores (M = 50, SD = 10). Due to the insensitivity of standard scores when considering low functioning children, previous ASD research has utilized MSEL age-equivalent subscale scores (Carter et al. 2007). To be consistent with this approach, age-equivalents were utilized in all analyses. As in past research (Carter et al. 2007), the Visual Reception age-equivalent was utilized as a measure of cognitive functioning.

Autistic Symptoms—The ADOS-G is a standardized, play-based assessment of autistic symptoms. There are four modules based on expressive language ability (Lord et al. 2000). In this study, 188 toddlers were administered Module 1 and 11 toddlers were administered Module 2. In order to account for the difference between modules in the number of items, items within domains were summed and divided by total number of items in the domain. The ADOS-G diagnostic algorithms for the domains of Communication, Social Interaction, and Restricted/Repetitive/Stereotyped Interests, Behaviors or Activities were assessed. Items within each domain were scored based on a three point scale (0 = no impairment to 2 = marked impairment) and summed. Cutoff scores in the domains of Communication, Social Interaction, and Combined (Communication + Social Interaction), correspond to the classification categories of Autism, Autism Spectrum Disorder, and Non-spectrum category. The ADOS-G has good to excellent reliability of the items, domains, and classification categories and satisfactory ability to differentiate children with ASD from children not on the spectrum (Lord et al. 2000). In this study, all children received an ADOS-G Communication, Social Interaction, and Combined (Communication + Social Interaction Communication) in the classification category of Autism or Autism Spectrum.

A semi-structured diagnostic interview of the Diagnostic and Statistical Manual, Fourth Edition (American Psychiatric Association 2000) criteria for Autistic Disorder was completed with parents. Interviews were conducted by a Developmental Pediatrician or Psychologist, who determined whether each criterion was met or unmet based on parent responses. All children met DSM-IV-TR criteria for a diagnosis of Autistic Disorder or PDD-NOS based on this interview, including at least 6 out of the 12 criteria and onset of symptoms prior to 3 years of age.

Coexisting Behavior Problems—The CBCL for ages 1.5 through 5 years, is a caregiver-completed paper and pencil measure of a variety of behavior problems. Caregivers are asked to rate the frequency of each behavior on a 3-point Likert scale (0 = not true, 1 = somewhat or sometimes true, 2 = very true or often true). Scores are summed and converted to T-scores (M = 50, SD = 10) to form seven syndrome scales: Emotionally Reactive,

Anxious/Depressed, Somatic Complaints, Withdrawn, Sleep Problems, Attention Problems, and Aggressive Behavior. Syndrome scales are combined to yield the Internalizing Problems, Externalizing and Total Problems composite scores. The manual for the CBCL reports adequate reliability and validity for scale and composite scores (Achenbach and Rescorla 2000).

Procedure

Parents, who were largely mothers, were interviewed regarding DSM-IV-TR criteria for Autistic Disorder and participated in the Vineland semi-structured interview. Parents also completed the CBCL. Children completed a battery of assessments including the MSEL and ADOS-G. All measures were individually administered by licensed professionals. The ADOS-G was administered and scored by two professionals, at least one of whom had reached clinical reliability standards (Lord et al. 2000). In addition to receiving an ADOS-G classification of Autism or Autism Spectrum and meeting DSM-IV TR criteria for Autistic Disorder or PDD-NOS, all children were judged to have one of these conditions by team consensus using all of the available information.

Results

Data Analysis Plan

A multivariate analysis of variance (MANOVA) and chisquare analyses were first conducted to identify differences in the subject characteristics of the boys and girls with ASD. A repeated measure analysis of covariance (ANCOVA) was conducted to identify differences in MSEL developmental profiles by sex, with age as the covariate. A multivariate analysis of covariance (MANCOVA) was conducted to examine differences in ADOS-G domain scores between boys and girls with ASD, while controlling for age and MSEL Visual Reception age-equivalent. MANCOVAs were conducted to identify sex differences in CBCL scores, using age and MSEL Visual Reception age-equivalent as covariates. Table 2 presents the estimated marginal means and standard errors for the MSEL age-equivalents, ADOS-G domains, and CBCL scores in the ANCOVA and MANCOVA analyses.

Subject Characteristics

A MANOVA was conducted to identify differences between the boys and girls in age (months), cognitive functioning (MSEL Visual Reception age-equivalent), adaptive behavior (Vineland ABC standard score), and Early Intervention/Early Childhood Special Education Services (0 = not receiving, 1 = receiving). There was not a significant difference in subject characteristics by sex (Wilks' Lambda = .96, $F(1, 198) = 1.82$, $p = .13$). Chisquare analyses indicated that there was not a significant difference between boys and girls in ASD diagnosis ($\chi^2 = .12$, $p = .73$, phi = .21) or Ethnicity ($\chi^2 = 5.80$, $p = .22$, phi = .21).

Developmental Functioning

A repeated measure ANCOVA was conducted in which sex was the fixed factor, age was a covariate, and the four MSEL age-equivalent subscale scores were the repeated factors. There was not a significant main effect of sex ($F(1, 198) = .11$, $p = .74$, partial $\eta^2 = .01$). There was also not a significant interaction effect of sex by MSEL subscale ($F(3, 196) = 1.34$, $p = .26$, partial $\eta^2 = .02$). There was a significant main effect for MSEL subscale ($F(3, 196) = 7.90$, $p < .01$, partial $\eta^2 = .10$). Bonferroni-corrected follow-up paired comparisons were conducted for the boys and girls together. The Visual Reception subscale age-equivalent ($M = 20.95$, SE = .50) was significantly higher than the Receptive Language age-

equivalent (M = 14.16, SE = .043) and the Expressive Language age-equivalent (M = 15.33, SE = .59). The Fine motor age-equivalent (M = 22.54, SE = .54) was significantly higher than the Visual Reception age-equivalent, Receptive Language age-equivalent, and Expressive Language age-equivalent. The Expressive Language age-equivalent was significantly higher than Receptive Language age-equivalent.

Autistic Symptoms

A MANCOVA was conducted using sex as the fixed factor, ADOS-G domain scores as the dependent variables, and age and MSEL Visual Reception age-equivalent as covariates. Results indicated a significant effect of sex (Wilks' Lambda = .91, $F(1, 261) = 4.64$, $p < .01$, partial $\eta^2 = .09$). Girls had a significantly higher ADOS-G Communication score than boys ($F(1, 261) = 4.97$, $p = .03$, partial $\eta^2 = .03$). In contrast, boys had a significantly higher ADOS-G Restricted/Repetitive/Stereotyped Interests, Behaviors or Activities score than girls ($F(1, 261) = 5.60$, $p = .03$, partial $\eta^2 = .03$). There was not a significant effect of sex on the ADOS-G Social Interaction score ($F(1, 261) = 1.31$, $p = .26$, partial $\eta^2 = .01$).

Coexisting Behavior Problems

A MANCOVA was conducted using sex as the fixed factor, CBCL composite scores as the dependent variables, and age and MSEL Visual Reception age-equivalent as covariates. There was not a significant difference in CBCL composite scores by sex (Wilks' Lambda = .199, $F(1, 198) = .50$, $p = .68$, partial $\eta^2 = .01$). A MANCOVA was conducted using sex as the fixed factor, the seven CBCL syndrome scales as the dependent variables, and age and MSEL Visual Reception age-equivalent as covariates. Results indicated a significant effect for CBCL syndrome scale (Wilks' Lambda = .81, $F(7, 192) = 2.27$, $p = .03$, partial $\eta^2 = .10$). Girls had a significantly higher Sleep Problems score than boys ($F(1, 198) = 6.31$, $p = .01$, partial $\eta^2 = .04$). Girls also had a significantly higher Anxious/Depressed score than boys ($F(1, 198) = 3.86$, $p = .05$, partial $\eta^2 = .03$). There was not a significant difference between girls and boys in Emotionally Reactive ($F(1, 198) = 1.90$, $p = .17$, partial $\eta^2 = .01$), Somatic Complaints ($F(1, 198) = .01$, $p = .92$, partial $\eta^2 = .01$), Withdrawn ($F(1, 198) = 1.43$, $p = .23$, partial $\eta^2 = .01$), Attention Problems ($F(1, 198) = 1.55$, $p = .22$, partial $\eta^2 = .01$), or Aggression ($F(1, 198) = .10$, $p = .75$, partial $\eta^2 = .01$).

Discussion

Autism spectrum disorder is approximately 3–4 times more prevalent in boys than girls (CDC 2007) and the majority of ASD research has focused on the male ASD presentation. The few studies that have investigated girls with ASD suggest that there are subtle yet potentially important differences between the male and female ASD phenotype. This study examined sex differences in developmental profile, autistic symptoms, and coexisting behavior problems in 199 young boys and girls with ASD referred to an Autism Clinic in a tertiary medical hospital. Overall, findings indicate that boys and girls with ASD evidence a similar pattern of developmental profiles, autism symptoms and behavior problems during early childhood, although subtle differences exist.

In this study, the overall developmental profile of strengths and weaknesses was similar for boys and girls with ASD; visual reception and fine motor skills were better developed than language skills for both sexes on a standardized developmental test. Previous studies have also found this developmental profile in boys and girls with ASD (Carter et al. 2007; Joseph et al. 2002; Lincoln et al. 1995). The present study did not replicate a previous finding that sex interacted with developmental profile in such a way that girls were significantly better at some developmental tasks than boys (Carter et al. 2007). This discrepancy in results may be due to differences in sampling. Carter et al. 2007 utilized extensive exclusion criteria to

remove young children with genetic disorders or additional disabilities from their sample. The present study included all boys and girls with ASD who presented to an autism clinic, suggesting that significant differences in early developmental abilities between boys and girls with ASD are not apparent in a broader sample of young children with ASD who present to an autism clinic.

The present study builds on previous research to clarify sex differences in autistic symptoms. Overall, young boys and girls with ASD display a markedly similar pattern of autistic symptoms and differences are limited in scope. As was reported in two previous studies (Lord et al. 1982; McLennan et al. 1993), young boys with ASD evidenced more stereotyped and repetitive behaviors than young girls when controlling for age and cognitive functioning. This is arguably the most consistent sex discrepancy to emerge in methodologically sound research using both parent interview and structured observations. In contrast to a previous study (McLennan et al. 1993), there was not a sex difference in social reciprocity. This may be due to sampling and methodological differences;McLennan et al. (1993) used retrospective parent-report in a sample of high functioning individuals with ASD (IQ > 60), whereas this study used standardized observations of both high and low functioning children with ASD. Thus, it may be that only higher functioning boys with ASD show more severe deficits in social reciprocity than girls. Alternatively, retrospective parent-ratings of social reciprocity may differ significantly from observational ratings, particularly when parents are asked to report on what their child was doing several years ago. Previous studies have suggested that parent-report and direct observation of behavior do not always agree (e.g., Winsler and Wallace 2002; Voigt et al. 2007). Further research is needed to investigate these possibilities. In this study, girls with ASD had more impaired communication skills than boys on the ADOS-G even after controlling for age and cognitive functioning, suggesting that their problems with communication are independent of their cognitive deficits.Carter et al. (2007) also found a trend for girls with ASD to have more impaired communication than boys in a large sample of similarly aged toddlers on the ADOSG, who had varied cognitive functioning.

The phenotype differences in autistic symptoms between girls and boys have important implications for early identification efforts. Clinicians should be mindful that young girls with ASD may not present with severe stereotyped and repetitive interests and behaviors and thus a greater focus should be given to autistic communication and social behaviors in diagnostic evaluations. Various interview, parent-rated, and observations measurement tools may be more or less relevant for ASD diagnostic evaluations depending on the sex of the toddler. Additional research is needed to determine whether the statistical differences between boys and girls with ASD found in this study translate into clinical differences. If this is the case, then intervention services should have a relatively greater focus on communication and social relationship skills in girls with ASD and stereotyped and repetitive interest in boys with ASD.

The present study also contributes to our understanding of sex differences in coexisting behavior problems in young children with ASD. Although a similar behavior problem profile was found for both sexes, subtle differences also emerged. On the CBCL, girls with ASD had more sleep problems and greater difficulty with anxious or depressed affect than boys, albeit mean differences were relatively small. These findings build on a previous study which found that older girls with ASD are at greater risk for coexisting behavior problems than boys (Holtmann et al. 2007). Comorbid behavior problems are often associated with greater distress to families and teachers than core autistic symptoms (Hastings et al. 2005; Lecavalier et al. 2006; Mandell et al. 2005). Families of girls with ASD may therefore be at a greater risk for distress than families of males with ASD. This question is deserving of further research attention. Comorbid behavior problems can also interfere with early

intervention efforts and thus treatment services to address challenging behaviors may be particularly important for girls with ASD.

There are several limitations to this study. We examined young children with ASD presenting to an autism clinic in a large tertiary hospital and research university that serves a wide geographical region. Participants in this study are thought to be similar to those referred to other large specialty autism clinics. However, results from this study may not generalize to children with ASD who are not referred for ASD diagnosis until later ages or children diagnosed outside of a specialty autism clinic. Although there was not a discrepancy between boys and girls in the receipt of early intervention services, the types of services administered is not known and the possibility that intervention discrepancies account for the findings cannot be ruled-out. In addition, genetic and medical information was not gathered for this study and thus the extent to which boys and girls had comorbid syndromes (e.g., Down syndrome or Fragile X syndrome) or medical problems that may have impacted their developmental functioning, autistic symptoms, or coexisting behavior problems is not known.

This study is also limited in that co-occurring behavior problems were assessed through parent-report. Further research is needed to determine whether young girls with ASD exhibit more sleep problems and anxious and depressed affect than boys when using observational measures or clinician-rated behaviors. Moreover, further research is needed to determine whether the parent-reported mean differences in sleep and anxious/depressed affect found in this study translate into meaningful sex differences that impact day to day functioning and family wellbeing. Additional studies using a larger sample size and alternative measures of autistic symptoms and developmental functioning are also needed to increase confidence in findings from this study. Research into the underlying neurobiological mechanisms contributing to these observed sex differences is a necessary next step to better understand and subsequently treat ASD.

In conclusion, results from this study identified subtle, yet meaningful differences between young boys and girls diagnosed with ASD. Girls appear to have greater deficits in communication, while boys have more stereotyped and repetitive behaviors and interests. Girls also have more sleep problems and affective problems than boys with ASD. These differences, if replicated with other samples, suggest that diagnostic and intervention strategies may need to become more sex-specific in order to provide the best possible service for all young children with ASD.

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Table 1

Subject characteristics of boys and girls with ASD

	Boys	Girls
ASD diagnosis (*n*)		
Autistic disorder	104	29
PDD-NOS	53	13
Age in months (*M*, SD)	35.51 (7.09)	35.98 (7.29)
Ethnicity (*n*)		
Caucasian	76	21
Black	2	2
Hispanic	15	2
Asian/Pacific Islander	3	3
Other	10	2
Not reported	51	12
MSEL visual age equivalent (*M*, SD)	20.71 (6.64)	21.16 (7.95)
Vineland ABC (*M*, SD)	63.83 (10.05)	60.34 (10.19)
Early intervention/early childhood		
Education services (*n*)		
Receiving	101	33
Not receiving	56	9

MSEL mullen scales of early learning; *ABC* adaptive behavior composite

Table 2

Estimated marginal means and standard error for MSEL age equivalents, ADOS-G domain scores, and CBCL scores used in the ANCOVA and MANCOVAs

	Girls	Boys
MSEL age equivalent		
Visual	20.59 (1.08)	21.05 (0.56)
Fine motor	22.58 (0.93)	22.53 (0.48)
Receptive language	12.94 (1.45)	14.49 (0.75)
Expressive language	15.67 (1.28)	15.30 (0.66)
ADOS-G		
Communication *	7.02 (0.26)	6.35 (0.14)
Social interaction	11.79 (0.36)	11.33 (0.19)
Restricted/repetitive/stereotyped Behaviors, interests and activities *	2.81 (0.25)	3.48 (0.13)
CBCL		
Total problems	65.90 (1.72)	63.64 (0.57)
Internalizing problems	63.74 (1.46)	62.27 (0.74)
Externalizing	62.66 (1.81)	60.60 (0.91)
Emotionally reactive	62.99 (1.74)	60.32 (0.85)
Anxious/depressed *	58.47 (1.25)	55.73 (0.61)
Somatic complaints	57.92 (1.43)	58.08 (0.70)
Withdrawn	74.06 (1.77)	71.70 (0.56)
Sleep problems *	62.82 (1.72)	58.00 (0.81)
Attention	65.28 (1.68)	62.96 (0.82)
Aggression	60.30 (2.16)	61.07 (1.05)

MSEL mullen scales of early learning; *ADOS-G* autism diagnostic observation schedule-generic; *CBCL* child behavior checklist

* Significant difference at $p < .05$