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### Publication Date

2022-07-01

### DOI

10.1007/s00787-022-02036-0

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Peer reviewed



# Behavioral gender differences in school-age children with autism

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Received: 2 February 2022 / Accepted: 20 June 2022  
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## Abstract

This study examined differences in internalizing and externalizing behaviors between school-aged boys and girls diagnosed with autism spectrum disorder (ASD). Eighty-nine children between the ages of 8 and 16 years participated in this study: 17 girls ( $M = 11.5$  years,  $SD = 2.3$ ) and 72 boys ( $M = 11.3$  years,  $SD = 2.2$ ). Participants were matched on the Autism Diagnostic Observation Schedule, Second Edition and Full-Scale IQ ( $FSIQ > 64$ ). The results indicated that, girls had higher reported instances of Bullying, less Anger Control, and poorer Emotional Self-Control than boys on the Behavior Assessment System for Children, Second Edition. Groups did not differ on subscales of the Social Communication Scale. While evidence of increased externalizing behaviors is less common in girls, there is evidence supporting these differing behaviors that warrant further research.

**Keywords** Autism spectrum disorder · Externalizing behaviors · Internalizing behaviors · Gender

## Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental condition characterized by impairments in social interaction and communication that affects 1 in every 54 children, with boys being four times more likely to be diagnosed than girls [22, 24, 27]. Diagnostic symptoms in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) include deficits in social–emotional [12] reciprocity and nonverbal communication as well as the presence of restricted and repetitive behaviors [2]. For example, children may exhibit fixed interests, repetitive movements, or

hyperactivity [24, 43], along with difficulty in making eye contact, interpreting body language, and maintaining relationships [9, 12].

Other aspects of behavior, such as differences between internalizing and externalizing behaviors in boys and girls, are less well understood in ASD but may be important with respect to gender differences in diagnosis. Internalizing behaviors involve emotions such as sadness or anxiety that are associated with withdrawal and diminished interactions [6], whereas externalizing behaviors involve behaviors associated with anger or irritability leading to frequent negative interactions with other people [26]. Both boys and girls with ASD may experience higher levels of internalizing behaviors, such as anxiety and depression, than their neurotypical peers that may greatly impact their overall emotional well-being [15]. However, previous research suggests that girls with ASD may exhibit more internalizing behaviors and show concentration difficulties and poor emotional regulation in comparison to boys [3, 15]. Moreover, internalizing behaviors may exacerbate girls' overall emotional well-being and play a role in how they interact with society. Further, gender differences in the clarity of ASD symptom presentation may be due to the Female Protective Effect (FPE). The FPE theory suggests girls need to display higher levels of symptoms associated with ASD in order for their symptoms to manifest in an ASD diagnosis. Indeed, data from two large twin studies suggests that a greater familial etiological load

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for ASD needs to be present for girls to display sufficient levels of atypical behavior to allow for the diagnosis of ASD [37]. As such, fewer girls may reach a clinical level of ASD symptom presentation due to FPE [37].

Additionally, studies have found girls exhibiting higher levels of camouflaging than males. Camouflaging is the use of specific behavioral or cognitive coping strategies used in social situations, which may include hiding behaviors commonly associated with ASD [20]. Girls may be masking their symptoms and mimicking those they see as appropriate based on societal expectations and behaviors (e.g., initiating conversations) which may lead to the discrepancy in diagnosis. Camouflaging also leads to a mental, physical and emotional exhaustion and may exacerbate some internalizing behaviors like depression, anxiety, self-perception and difficulties regulating one's own emotions. Moreover, the lack of recognition of symptoms in girls may exacerbate internalizing mental health challenges associated with camouflaging behaviors, such as depression [4]. Thus, it is important to understand internalizing behaviors in girls with ASD as it may be associated with behaviors such as camouflaging.

Boys with ASD, on the other hand, may exhibit more externalizing behaviors. For instance, they may demonstrate more aggression, conduct issues and bullying than girls due to the acceptability of boys engaging in rough housing and deemed 'gender appropriate' [3]. Furthermore, boys with ASD may demonstrate lower levels of emotional functioning than girls [25] and may also experience maladaptive emotion regulation leading to higher aggression, bullying others, tantrums or self-injury which impacts their overall emotional well-being [29, 39]. Boys experiencing poor emotional regulation may be more likely to exhibit externalizing behaviors that result in physical aggression [25]. It's important to note that exhibiting externalizing behaviors often leads to referral for a diagnosis [16]. Therefore, it is possible that the lack of awareness of symptomatology and a lower level of externalizing behavior presentation in girls may be a factor in the gap of research regarding gender differences in ASD.

Other aspects of behavior, such as social communication differences in boys and girls, are less understood in ASD which may be important with respect to gender differences in diagnosis. Social communication involves the expression of emotion through nonverbal and verbal communication like spoken language, gestures and expressions [34]. In other words, children who lack social communication skills are not able to participate in conversations with others which may stem from echolalia or repetitive language. The lack of ability to socially communicate with others may also negatively impact the ability to form friendships which may worsen internalizing behaviors like anxiety and/or depression [13]. Research investigating social communication symptoms in girls with ASD has had mixed findings. In a sample of girls with ASD and high IQ levels, one study found that social

communication symptoms were less pronounced than for boys [35]. It is possible that girls hide social communication difficulties, which results in clinicians not accurately diagnosing them despite parental concerns [35]. However, other samples of girls diagnosed with ASD have noted that girls demonstrate lower attained language and overall lower social-competence ratings than boys [8]. Thus, it is possible that girls need to demonstrate higher levels of social communication difficulties to meet criteria of ASD.

Based on the previous research, the study tested three hypotheses aligned to test the differences in externalizing and internalizing behaviors between boys and girls.

The three hypotheses are as follows:

Hypothesis 1 (H1): Boys will exhibit more externalizing behaviors than girls. Specifically, boys will demonstrate poorer anger control, more bullying towards others and have higher levels of misconduct than girls [3].

Hypothesis 2 (H2): Girls will exhibit more internalizing behaviors than boys. For example, girls will demonstrate higher anxiety, more negative emotions and less self-regulation than boys [3, 45].

Hypothesis 3 (H3): Girls will exhibit less evidence of social communication in comparison to boys [35]. In other words, girls will demonstrate lower levels of communication difficulties as reported by parents in comparison to boys.

## Methods

### Participants

The data used in this study were obtained from a previous longitudinal study of academic achievement in children with ASD, attention-deficit/hyperactivity disorder (ADHD), and neurotypical development (see [31, 41]). For the purpose of this study, only children with a diagnosis of ASD were included. To be included in this study, children met the criteria for ASD on the Autism Diagnostic Observation Scale, Second Edition (ADOS-2), had a full-scale IQ (FSIQ) greater than 64, and did not have a comorbid neurological condition or coexisting medical condition. A FSIQ cutoff of 64 or greater was used to include the full sample of girls with ASD. Boys and girls were matched on ADOS-2 symptoms and FSIQ. Participants included 89 children between the ages of 8 to 16 years: 17 girls ( $M_{age} = 11.5$  years,  $SD = 2.3$ ;  $M_{FSIQ} = 97.7$ ,  $SD = 16.6$ ) and 72 boys ( $M_{age} = 11.3$  years,  $SD = 2.2$ ;  $M_{FSIQ} = 97.4$ ,  $SD = 16.4$ ).

Families were recruited from several school districts in Northern California and enrollment in the study was voluntary. Parental consent and child assent were obtained from

all participants to ensure voluntary participation, and the research was approved by the university Institutional Review Board.

## Measures

### Diagnostic measures

ASD diagnosis was confirmed with Module 3 or 4 of the ADOS-2 [23]. Both Modules 3 and 4 have an interrater item reliability of 0.88 [23]. Parent report on the Social Responsiveness Scale (SRS [11], provided quantitative measures of differences in social communication. The SRS has an internal consistency of 0.86–0.89 and a test–retest reliability of 0.72–0.83 [7]. The Wechsler Abbreviated Scale of Intelligence, Second Edition (WASI-II [44], provided an IQ estimate for each participant. For the purposes of this study, individuals with scores above 64 were included. The WASI-II has well-established internal consistency and test–retest reliability for children aged 6–16 of 0.87–0.91 [30].

### Externalizing and internalizing behaviors

Parent Rating Scales from the Behavior Assessment System for Children (BASC-2; [36]) were used in this study to measure participants' externalizing and internalizing behaviors. The BASC-2 is designed to measure behavioral and emotional functioning in people aged 2–25 years [1]. The BASC-2 composite Internalizing and Externalizing scale scores were examined. Content subscales measuring Anger Control, Bullying others, Emotional Self-Control, and Negative Emotions were also examined as indexes of emotional regulation related to externalizing and internalizing behaviors problems. The internal consistency of the BASC-2 scales is greater than 0.80 [36].

Child report on the Multidimensional Anxiety Scale for Children, Second Edition (MASC-2; [28] was used as an additional measure of internalizing disorder. Self-report measures are especially important and valid for examining this symptom dimension in verbal children with ASD [38]. For this study, Physical Symptoms, Harm Avoidance, Social Anxiety, Separation Panic, and the Anxiety Disorder index subscales of the MASC-2 were analyzed. The internal consistency of the MASC-2 is 0.64–0.84 for each subscale [21], and the test–retest reliability is 0.80–0.94 [28].

The Conners 3rd Edition (Conners-3; [10]) is an assessment that allows researchers to better understand behavioral, social, and academic problems associated with ADHD. For this study, the Conners-3 was used to assess externalizing symptoms associated with ADHD using the Conduct, Defiance, and Peer Relation subscales to understand if externalizing behaviors associated with ADHD are reported

differently than those on the BASC-2. Internal consistency of the assessment is greater than 0.89 [10].

## Results

First, group differences on the BASC-2 Externalizing and Internalizing composite scales were examined using a 2 Gender Group (Boys, Girls) X 2 Composite Score (Internalizing, Externalizing scores) multivariate analysis of variance (MANOVA),  $F(2, 85) = 3.13$ ,  $p = 0.045$ ,  $\eta_p^2 = 0.07$ . However, unexpectedly, girls received higher externalizing scores than boys, ( $M_{Girls} = 64.3$ ,  $SD_{Girls} = 17.6$ ,  $M_{Boys} = 58.1$ ,  $SD_{Boys} = 10.1$ ),  $F(1, 86) = 5.81$ ,  $p = 0.02$ ,  $\eta_p^2 = 0.06$ . Groups did not differ on Internalizing ( $M_{Girls} = 58.1$ ,  $SD_{Girls} = 10.7$ ,  $M_{Boys} = 59.1$ ,  $SD_{Boys} = 13.9$ ),  $F(1, 86) = 0.03$ ,  $p = 0.86$ ,  $\eta_p^2 = 0$ . A 4 (Anger Control, Bullying, Emotional Control, and Negative Emotions) by 2 (Gender) MANOVA revealed significant gender group effects on BASC-2 externalizing subscales,  $F(4, 82) = 2.72$ ,  $p = 0.03$ ,  $\eta_p^2 = 0.12$ . Girls displayed more evidence of problems with Anger Control ( $M = 69.7$ ,  $SD = 12.4$ ) than boys ( $M = 62.5$ ,  $SD = 9.4$ ),  $F(1, 85) = 6.91$ ,  $p < 0.01$ ,  $\eta_p^2 = 0.08$ . Similarly, girls demonstrated higher scores in Bullying Others ( $M = 65.5$ ,  $SD = 18.2$ ) than boys ( $M = 55.2$ ,  $SD = 10.2$ ),  $F(1, 86) = 9.82$ ,  $p = 0.01$ ,  $\eta_p^2 = 0.10$  and on Emotional Control scale where girls ( $M = 69.6$ ,  $SD = 18.5$ ) scored higher than boys ( $M = 61.0$ ,  $SD = 11.3$ ),  $F(1, 86) = 6.62$ ,  $p = 0.01$ ,  $\eta_p^2 = 0.07$ . Interestingly, no differences were found between groups on Negative Emotion ( $p = 0.11$ ). Finally, differences in externalizing behaviors were assessed with a 3 (Conduct, Oppositional, Defiance) X 2 (Gender) MANOVA of Conner 3 variables. At the multivariate level, there were no differences between groups on Conners-3 variables,  $F(3, 85) = 1.75$ ,  $p = 0.16$ ,  $\eta_p^2 = 0.06$ .

Finally, a 2 Gender Group (Boys, Girls) by 5 SRS (Awareness, Cognition, Communication, Mannerisms, Motivation) MANOVA was conducted to assess group differences on the SRS subscale scores. Groups did not differ on SRS subscale scores,  $F(2, 85) = 2.13$ ,  $p = 0.07$ ,  $\eta_p^2 = 0.12$ .

## Discussion

This study examined differences in internalizing and externalizing behaviors between school-aged boys and girls with ASD. Previous research has indicated that girls experience more internalizing behaviors in comparison to boys who exhibit more externalizing behaviors [3]. Therefore, it was hypothesized that girls in this study would exhibit more internalizing behaviors than boys. Alternatively, boys in this study would exhibit more externalizing behaviors than girls.

Contrary to the study's hypothesis, the analyses suggest that girls exhibited more negative emotional dysregulation

and marginally more externalizing behaviors. Girls also did not differ in their level of parent reported communication difficulties as compared to boys. Gender groups were well matched on IQ and did not differ on the proportion of individuals with IQ below 70,  $\chi^2(1)=0.92, p=0.34$ . Therefore, it is unlikely the gross differences in cognitive development contributed to these group differences.

Several post hoc reasons may be considered to explain this pattern of findings. First, girls with ASD reportedly have more sleeping problems and lower quality of sleep [18], (Holtman et al., 2007), which can contribute to difficulty stabilizing emotions and increased externalizing behaviors [40]. Alternatively, the level of negative emotions and/or the awareness of negative emotion could be higher in girls than boys leading to more difficulty with emotion regulation [46]. As discussed previously in the introduction, girls are more likely to exhibit camouflaging behaviors that may manifest in negative behavioral consequences [4, 20]. The cost of camouflaging-related behaviors in girls may be difficulty in managing the emotional stress of social interactions [35].

A consistent and reciprocal hypothesis is that boys have better emotion regulation than girls because they use avoidant coping mechanisms [33]. Boys are more likely to avoid stressors, which has been correlated with less depression and more emotional stability [33]. Similarly, despite research suggesting that boys exhibit more externalizing behaviors than girls, boys might engage in less bullying and have greater anger control. This may be due to engaging in more repetitive behaviors that can act as a way of calming down their own emotions and may also use avoidant coping strategies rather than being confrontational [33]. For example, boys may engage in stimming or breathing rituals to regulate their emotions and avoid confrontations, focusing their time and effort into a different activity.

Groups did not differ on SRS subscale scores, including the communication subtest. The SRS has shown to screen for social and communicative deficits associated with symptoms of ASD [5]. Previous research has found both [19] evidence for higher levels of social communication difficulties in girls diagnosed with ASD [8] as well as lower levels of social communication difficulties than boys [35]. While some research has indicated that girls only receive a diagnosis of ASD when they present with more severe symptoms [42], boys and girls in this study had similarly rated parent reported ASD symptoms as measured by the SRS, as well as similar scores on the ADOS-2. Further, it is important to note that all participants in this study had previously received a diagnosis of ASD. Previous research has indicated that girls meeting diagnostic criteria for ASD often have higher behavioral difficulties than boys [14]. Therefore, it is possible that while girls may have a similar level of ASD symptoms to boys, their increased level of

externalizing behaviors may have ultimately aided in their referral for diagnosis.

The findings of this study are important to consider with regard to the diagnosis of girls with ASD. The sample of girls in this study exhibited more externalizing behaviors than boys, which may indicate that girls are more likely to receive a diagnosis of ASD if they exhibit increased levels of behavioral difficulties. While externalizing behaviors may be more easily recognizable, teachers often do not feel capable of identifying internalizing behaviors in their students, which prevents referral to services [32]. Thus, girls who exhibit higher internalizing behaviors may still be at higher risk of delayed diagnosis. The discrepancies in behavior found in this study are important to consider with regard to how children are referred for diagnosis and what behaviors have been traditionally associated with ASD.

All these post hoc possibilities raise issues for future research. Primary here is the need to better understand the role that emotion regulation may play either in the presentation of ASD in girls with ASD or in increasing the likelihood of identification among girls. Here, the study of the contributions of differences in sleep, awareness of negative emotions, and coping styles to emotion regulation in ASD will all likely add to the understanding of gender differences in ASD symptom presentation. Of course, the possibility of different thresholds in symptom intensity or an ascertainment bias is as critical as any other issue to explore, but perhaps the most difficult to approach.

## Research limitations

There are two limitations of this study that should be considered in future research. First, there was a small sample of girls in comparison to boys. The small sample size ( $N=17$ ) significantly limits the ability to rule out false null findings and was a major limitation with regard to the goals of this study. Further, uneven sample sizes between boys and girls limits the power of group comparisons. Future research should seek to recruit larger and more comparable samples of boys and girls to more accurately detect group differences.

Similarly, it should be noted that parent-report measurements, despite good reliability, may still bring possible small consequences. For example, parents might be responding favorably or not as accurately in regard to their child's behavior. While self-report and other objective measures of such behaviors have their own limitations, future research should incorporate multiple measures to better understand the observed constructs (Table 1).

**Table 1** Demographic, symptom and behavioral data for gender subgroups

| Variable                        | Girls       | Boys        | F    | $\eta_p^2$ | p-value |
|---------------------------------|-------------|-------------|------|------------|---------|
| Age (years)                     | 11.5 (2.3)  | 11.4 (2.2)  | 0.09 | 0.001      | 0.76    |
| Full-Scale IQ                   | 97.7 (16.6) | 97.4 (16.4) | 0.18 | 0.002      | 0.67    |
| ADOS- 2                         |             |             |      |            |         |
| Social Affect                   | 8.5 (3.5)   | 8.8 (3.6)   | 0.06 | 0.001      | 0.82    |
| Restricted Repetitive Behaviors | 2.3 (1.0)   | 2.6 (1.3)   | 0.96 | 0.01       | 0.33    |
| SRS Total                       | 85.2 (10.1) | 80.8 (11.3) | 2.2  | 0.03       | 0.14    |
| Communication                   | 85.1 (8.9)  | 78.4 (11.6) | 4.9  | 0.05       | 0.03*   |
| Awareness                       | 76.9 (13.8) | 71.0 (13.8) | 2.2  | 0.03       | 0.14    |
| Cognition                       | 81.7 (10.2) | 77.8 (12.9) | 1.4  | 0.02       | 0.25    |
| Motivation                      | 73.6 (14.7) | 74.3 (1.7)  | 0.04 | 0.0005     | 0.85    |
| Mannerisms                      | 84.1 (10.3) | 81.1 (13.0) | 0.79 | 0.01       | 0.38    |
| Conners-3                       |             |             |      |            |         |
| Inattention/Hyperactivity       | 74.3 (13.4) | 73.4 (11.7) | 0.08 | 0.001      | 0.77    |
| Conduct                         | 66.6 (17.9) | 57.6 (14.2) | 4.9  | 0.05       | 0.03*   |
| Opposition                      | 70.6 (16.4) | 65.7 (15.2) | 1.1  | 0.01       | 0.30    |
| BASC                            |             |             |      |            |         |
| Externalizing                   | 64.3 (17.6) | 58.1 (10.1) | 5.8  | 0.07       | 0.02*   |
| Internalizing                   | 58.1 (10.7) | 59.1 (13.9) | 0.03 | 0.00       | 0.86    |
| MASC                            |             |             |      |            |         |
| Anxiety                         | 52.4 (15.5) | 55.9 (11.9) | 0.96 | 0.01       | 0.33    |

$p < .05$ ; T scores are reported for the SRS, Connor-3, BASC, and MASC. The groups did not differ on SRS total scores or SRS subscales as indicated by a MANOVA of the five subscales,  $F(5, 81) = 2.13$ ,  $p < .07$ ,  $\eta_p^2 = .12$ . A MANOVA of the Conners subscales also indicated no difference in subscales at the multivariate level,  $F(3, 85) = 1.75$ ,  $p = .16$ ,  $\eta_p^2 = .06$

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s00787-022-02036-0>.

**Funding** The research reported in this paper was supported by IES Grant # IES R324A120168, and the UC Davis Department of Psychiatry Lisa Capps Endowment for Research on Education and Neurodevelopmental Disorders.

## Declarations

**Conflict of interest** Current authors declare no conflict of interest.

**Ethical approval** All procedures done in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee (UC Davis Office of Research Institutional Review Board (IRB) Protocol 236498–14). Procedures performed were also in accordance with the 1964 Helsinki declaration and its later amendments.

**Informed consent** Informed consent from parents and informed assent from children were acquired from all participants included in the study.

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