

Gender Differences in the Relationship Between Social Communication and Emotion Recognition

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Objective: To investigate the association between autistic traits and emotion recognition in a large community sample of children using facial and social motion cues, additionally stratifying by gender. **Method:** A general population sample of 3,666 children from the Avon Longitudinal Study of Parents and Children (ALSPAC) were assessed on their ability to correctly recognize emotions using the faces subtest of the Diagnostic Analysis of Non-Verbal Accuracy, and the Emotional Triangles Task, a novel test assessing recognition of emotion from social motion cues. Children with autistic-like social communication difficulties, as assessed by the Social Communication Disorders Checklist, were compared with children without such difficulties. **Results:** Autistic-like social communication difficulties were associated with poorer recognition of emotion from social motion cues in both genders, but were associated with poorer facial emotion recognition in boys only (odds ratio = 1.9, 95% CI = 1.4, 2.6, $p = .0001$). This finding must be considered in light of lower power to detect differences in girls. **Conclusions:** In this community sample of children, greater deficits in social communication skills are associated with poorer discrimination of emotions, implying there may be an underlying continuum of liability to the association between these characteristics. As a similar degree of association was observed in both genders on a novel test of social motion cues, the relatively good performance of girls on the more familiar task of facial emotion discrimination may be due to compensatory mechanisms. Our study might indicate the existence of a cognitive process by which girls with underlying autistic traits can compensate for their covert deficits in emotion recognition, although this would require further investigation. *J. Am. Acad. Child Adolesc. Psychiatry*, 2013;52(11):1148–1157. **Key Words:** autism spectrum disorder (ASD), Avon Longitudinal Study of Parents and Children (ALSPAC), emotion recognition, gender, social communication

Autism spectrum disorders (ASD) are characterized by impaired social reciprocity and communication, together with restricted and repetitive behaviors.¹ More prevalent in males than in females,² the average ratio is 4:1; increasing to 10:1 for a diagnosis of high-functioning autism.³ This gender bias may have a biological cause such as elevated exposure to fetal testosterone or mutations on either the X or Y chromosomes.^{4,5} Alternatively, current

diagnostic criteria may not adequately reflect the ASD phenotype in females, resulting in a diagnostic bias toward identification of males. Recent studies suggest that girls adapt better to traits associated with ASD, rendering those deficits less apparent in their day-to-day interactions.^{6,7} Research investigating the prevalence of autistic traits in a general population sample of schoolchildren found a male:female ratio of 2.1:1 on the basis of parent ratings but a ratio of 6:1 when using teacher ratings.⁸ A similar phenomenon was observed in children and adolescents with diagnosed ASD; teachers, but not parents, reported more severe psychopathology in males than in females.⁹ These studies suggest that there is systematic observer bias in recognizing autistic



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traits. In addition, a recent study has found that affected girls are less likely to be diagnosed with ASD, unless they present with additional difficulties such as low cognitive ability or behavioral problems.⁶

Autistic traits are continuously distributed in the general population, with the most severe end of the continuum being associated with clinical recognition.^{8,10-12} Given this continuous distribution, Constantino *et al.* suggest that the cut-offs used for research purposes are arbitrary.¹¹ Autistic traits, both within the normal range and at the extreme end of this continuum, appear to share a common etiology.¹³ Research into behavioral traits within the general population may be helpful in understanding ASD as a clinical disorder. Our study was predicated on the observation that ASD-associated cognitive deficits, such as weak central coherence and poor emotion recognition, have recently been found in general population samples that manifest autistic-like behaviors.^{14,15}

Deficits in emotion recognition have consistently been associated with clinically diagnosed ASD.¹⁶⁻²³ In this study, we investigated the association between autistic-type traits and emotion recognition, as well as possible gender differences in this association, in the Avon Longitudinal Study of Parents and Children (ALSPAC), a large population-based cohort in the United Kingdom. In addition, we investigated whether this association would extend to the recognition of emotion from 2 modalities, namely, facial cues and social motion cues. Based on the findings of previous studies, we first hypothesized that children identified from population screening as having poor social communication skills, with behavior traits characteristic of ASD,²⁴ would show poorer performance in the recognition of emotion than children without such behavioral characteristics. Because of the accepted gender differences associated with social emotion recognition²⁵ and ASD⁴ we analyzed the performance of boys and girls separately as well as together, predicting that when comparing boys high in social communication difficulties to boys without such difficulties, deficits in emotion recognition would be more substantial than when making the same comparison in girls.

METHOD

Participants

The Avon Longitudinal Study of Parents and Children (ALSPAC) is a transgenerational and longitudinal

population-based cohort of women (recruited during pregnancy) and the child with whom they were pregnant at the time. Women were eligible if they lived in the study area of Avon during pregnancy and if their expected date of delivery was between April 1, 1991, and December 31, 1992. The initial cohort consisted of 13,867 children, including 199 twin pregnancies.^{26,27} Children and parents have been followed up for the last 21 years through a series of questionnaires, biomedical samples, and physical and behavioral assessments. Behavioral assessments were conducted through clinics to which all parents were invited to bring their children: 7,488 children attended the clinic at 8.5 years of age when the Diagnostic Analysis of Non-Verbal Accuracy was conducted, and 5,844 children attended the clinic at age 13.5 years of age when the Emotional Triangles Task was conducted. Children were eligible for this study if they had completed both of the emotion recognition tasks; and if their parents had completed and returned the Social Communication Disorders Checklist, measuring autistic-like social communication deficits, at age 13.5 years ($n = 7,165$). The final sample of children with data on all 3 measures was 3,666.

Measures

Social Communication: Social Communication Disorders Checklist (SCDC). The SCDC²⁸ is a 12-item questionnaire that is designed to be completed by parents and that measures social reciprocity and other verbal/nonverbal social traits that are characteristic of ASD. A higher SCDC score is indicative of more deficits in social communication. Studies have found the measure to have good internal consistency (0.93), high test-retest reliability (0.81), and high heritability in both genders (0.74).²⁸ In addition, the SCDC has been found to be predictive of autism with a sensitivity of 0.88 and a specificity of 0.91, when using a score of ≥ 9 out of 24.¹⁰ Full descriptions of the measure have previously been published.^{10,28}

Facial Emotion Recognition: Diagnostic Analysis of Non-Verbal Accuracy (DANVA). Facial emotion recognition was assessed using the faces subtest of the DANVA.²⁹ This computerized task measures a child's ability to recognize emotion from facial cues. Participants were shown photographs of children expressing happiness, sadness, anger, or fear. Higher scores on this task represent more errors or misattributions. A total of 11 binary scores indicating whether children made more (above cut-off) or less (below cut-off) errors/misattributions are considered. These were derived by ALSPAC in collaboration with the creator of the task, Stephen Nowicki. Cut-offs for each of the variables was based on the distribution of results in the whole sample (Table 1).

Emotion Recognition From Social Cues: the Emotional Triangles Task. This computerized task measures the participant's ability to attribute an emotional mental

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