Investigating Measure Bias in Autism Spectrum Disorder Between Sexes
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Background
- Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder that impairs an individual’s social, communication, and behavioral skills.
- Males are 4.5 times more likely to be diagnosed with ASD compared to females (Christensen et al., 2016).
- One possible reason for the difference in diagnostic rates is that females may be better able to mask their symptoms and therefore go undiagnosed more often than males (Mandy et al., 2012).
- The goal of this study is to understand the potential gender bias in two types of measures of ASD severity (ADOS-2 and SRS-2) by examining consistency between parent (SRS-2) and clinician (ADOS-2) reports of ASD symptoms.
- If there is evidence of gender bias, this study will also explore if these findings are the same in a group of children who did not reach research criteria for a diagnosis of autism.
- Based on the hypothesis that females are better at masking their autistic traits, we expect less agreement between clinician and parent ratings of autism symptoms in females compared to males.

Methods
- Participants: Primary analysis: 164 children (91 males, 73 females) aged 8-17 years with a confirmed diagnosis of autism participated in the study. All participants have an IQ over 70 and have a diagnosis of ASD confirmed via the ADOS-2 and ADI-R.
  - Exploratory analysis: 14 children (8 males, 6 females) aged 8-17 years who have a community diagnosis of autism but did not meet research criteria on ADOS-2 for ASD.

- Measures:
  - A clinician-child interaction measure that scores the child’s communication, social skills, and restricted interests and repetitive behaviors (RRB). Calibrated severity scores (CSS) were calculated and used in these analyses.
  - Social Responsiveness Scale, Second Edition (SRS-2) (Constantino et al. 2012)
  - A survey completed by the parent about their child’s social and autism-related impairments provides a total score as well as subscale scores for social awareness, social cognition, social communication, social motivation, and restricted interests and repetitive behavior.
  - Autism Diagnostic Interview, Revised (ADI-R) (Sa Couteur et al. 2003)
  - An interview conducted by a clinician that is administered to the parent of a child with symptoms of ASD.

Results
- Question 1: Do the ADOS-2 and SRS-2 share similar patterns in autism severity scores in males and females?
  - A series of independent-samples t-tests were run comparing genders (M, F) on ADOS-2 Calculated Severity Score (Total Severity, Social Affect [SA] and Restricted and Repetitive Behaviors [RRB]) and SRS-2 subscale and total raw scores.
  - Females scored significantly lower than males on ADOS-2 CSS Total [(162≤2.55, p = 0.012)] and ADOS-2 CSS Social Affect [SA] ([(162≤2.58, p = 0.010)], indicating less autism severity in females compared to males as rated by clinicians. There were no significant differences between genders on the SRS-2 total score or any of its subscales.

- Question 2: Do the correlations between ADOS-2 and SRS-2 differ between genders?
  - Correlations were run between ADOS-2 CSS (Social Affect and Total) and SRS-2 (all subscales) separately for males and females.
  - The chi squared tests show that clinician and parent reports of autism severity are more consistent between males and females than between clinician and clinician or parent and parent reports.
  - A chi-squared test was calculated to look for any gender differences in the distribution between groups.

Discussion
- Based on parent and clinician reports, there is inconsistency in the patterns of gender differences, with females performing better than males on the ADOS-2, but males on the SRS-2, showing no difference in autism severity. One explanation for these findings could be, like predicted, females are better at masking their autism symptoms when outside of home. This would mean clinicians may not see the full extent of female’s symptoms, resulting in lower ratings of autism severity compared to males.
- SRS Motivation was significantly correlated with CSS SA and CSS Total for males but not for females. Not all subscales follow the same pattern of higher correlation of measures for males than females, but this finding follows the hypothesis that there is more agreement in parent and clinician report for males than for females.
- The chi-squared tests show that clinician and parent reports of autism severity are more consistent in males than in females, and females are more likely to be reported as having higher autism severity by parents than clinicians.
- The chi-squared tests show that there is a significant difference between the distribution of groups 1 and 2 (p < 0.025). Females are more likely to be identified as having autism severity when scored by parents compared to clinicians (50%) compared to females (29%); males (34%) and females (38%) are equally likely to be rated as having higher autism severity by clinicians than parents.