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Are the components of social reciprocity transdiagnostic across pediatric neurodevelopmental disorders? Evidence for common and disorder-specific social impairments

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ABSTRACT

Deficits in social communication are a core feature of autism spectrum disorder (ASD), yet significant social problems have been observed in youth with many neurodevelopmental disorders. In this preliminary investigation, we aimed to explore whether domains of social reciprocity (i.e., social communication, social cognition, social awareness, social motivation, and restricted and repetitive behaviors) represent transdiagnostic traits. These domains were compared across youth ages 7–17 with obsessive-compulsive disorder (OCD; $N = 32$), tic disorders (TD; $N = 20$), severe mood dysregulation ($N = 33$) and autism spectrum disorder ($N = 35$). While the ASD group was rated by parents as exhibiting the greatest social reciprocity deficits across domains, a high proportion of youth with severe mood dysregulation also exhibited pronounced deficits in social communication, cognition, and awareness. The ASD and severe mood dysregulation groups demonstrated comparable scores on the social awareness domain. In contrast, social motivation and restricted and repetitive behaviors did not appear to be transdiagnostic domains in severe mood dysregulation, OCD, or TD groups. The present work provides preliminary support that social awareness, and to a lesser extent social communication and cognition, may represent features of social reciprocity that are transdiagnostic across ASD and severe mood dysregulation.

1. Introduction

The construct of social reciprocity includes several components: social communication (interaction), understanding how to react in social situations (social awareness), desire to interact with others (social motivation), ability to attribute perspective to others (social cognition), and appropriate management of atypical (restrictive and repetitive) behaviors in social settings (Constantino and Gruber, 2005). Social reciprocity deficits are considered a core feature of autism spectrum disorder (ASD; American Psychiatric Association, 2013). Yet social reciprocity difficulties may not be limited to ASD, as social problems have been demonstrated as a correlate of several neurodevelopmental conditions.

Very few studies have examined social reciprocity in youth with other neurodevelopmental disorders. In regard to obsessive-compulsive disorder (OCD) and tic disorder (TD), studies have only examined the affected group (Griffiths et al., 2017; McGuire et al., 2013; Stewart et al., 2016) or compared the affected sample to healthy controls (Guler et al., 2015). Across investigations, findings support the hypothesis that youth with OCD and TD experience elevations in social impairment relative to measurement norms and case controls. Unfortunately, little work has been done to examine social responsiveness impairments between youth with ASD, a group for which social impairments are a defining feature, and those with OCD and/or TD, who appear to have impairment in comparison to non-affected youth. Additionally, severe mood dysregulation, a condition characterized by excessive irritability, reactivity, and hyperarousal (Leibenluft et al., 2003; Brotman et al., 2006), has also been associated with pronounced impairment in social communication in youth (Pine et al., 2008; Rich et al., 2010). Given these findings that other neurodevelopmental disorders are associated with social impairment, social reciprocity has been proposed as a transdiagnostic construct (Constantino, 2011; Constantino and Frazier, 2013). This hypothesis has clinical significance for two reasons. First, it suggests that social reciprocity might be compared across neurodevelopmental conditions using standardized measurement. Second, it may indicate the degree to which social

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reciprocity should be assessed and targeted in intervention across neurodevelopmental disorders, and not only in ASD. Unfortunately, little work has been done to examine domains of social functioning across neurodevelopmental conditions.

The present study aims to explore domains of social reciprocity as putative transdiagnostic constructs in four pediatric psychiatric groups: ASD, OCD, TD, and severe mood dysregulation. Social reciprocity subdomains were defined as: social awareness, social communication, social cognition, social motivation, and restricted and repetitive behaviors. In this preliminary investigation, we defined "transdiagnostic" using two criteria: (Aim 1) whether diagnostic groups would demonstrate comparable mean scores and (Aim 2) whether a significant (50%) proportion of each group would endorse clinically significant scores on social reciprocity subdomains. To this end, we utilized the most common dimensional parent-report of youth social behavior as an initial evaluation of this question (Social Responsiveness Scale; Constantino and Gruber, 2005). For Aim 1, we hypothesized that OCD, TD, and ASD groups would demonstrate comparable scores in restricted and repetitive behavior due to the repetitive nature of compulsions and tics, and that severe mood dysregulation and ASD groups would demonstrate comparable scores on social awareness, communication, and cognition, areas in which youth with severe mood dysregulation have previously been found to show impairment (Pine et al., 2008). For Aim 2, we hypothesized that a significant proportion of OCD and TD groups would exhibit elevations in restrictive and repetitive behaviors, while a significant proportion of the severe mood dysregulation group would exhibit elevations in social awareness, communication, and cognition. Prior studies of the SRS in non-ASD psychiatric (e.g., anxiety, mood disorders) samples have found that over 50% of youth endorsed elevated scores on the SRS (e.g., Pine et al., 2008). Based on this, and the desire to select a proportion cutoff that would reflect a majority, we utilized a 50% cutoff when identifying the proportion of each group with elevated SRS subscale scores.

2. Methods

2.1. Participants

OCD, TD, and severe mood dysregulation: For the present study, deidentified data were compiled from separate research protocols approved by the UCLA Institutional Review Board. The OCD group was recruited for computerized intervention (R34 MH095885), the TD group for habit reversal training (P50 MH077248 02), and the severe mood dysregulation group for psychopharmacologic (R21 MH093582) studies. Youth age ranged between 7 and 17 years (severe mood dysregulation: 7–17, OCD: 8–17, TD: 9–14) and IQ was ≥80 across studies, and none had received a diagnosis of ASD. For this investigation, youth within each psychiatric group who received a secondary diagnosis of interest (e.g., youth with primary OCD who also had TD) were excluded. As all youth in the severe mood dysregulation group also had comorbid ADHD, we elected to exclude youth with comorbid ADHD from the OCD and TD groups. This yielded a final sample of 32 youth with OCD, 20 with TD, and 33 with severe mood dysregulation. Parents completed the Social Responsiveness Scale (Constantino and Gruber, 2005) and Child Behavior Checklist (Achenbach and Rescorla, 2001) during initial evaluation for each intervention trial. All youth met diagnostic criteria for respective diagnoses, determined through semi-structured interviews using the Kiddie-SADS (Kaufman et al., 1997; severe mood dysregulation, TD) or Anxiety Disorders Interview Schedule (Silverman and Albano, 1996; OCD). See Table 1 for demographic characteristics by group and Table 1 in supplementary materials for key inclusion/exclusion criteria for each study.

ASD: The ASD group ($N = 35$) was randomly sampled from youth with ASD in the Simons Simplex Collection (SSC; Fischbach and Lord, 2010) who were aged 7–17, had full scale IQ ≥ 80, and who fell below the CBCL Attention Problems subscale cut-off for clinical significance (t-score = 70; $N = 662$). Representativeness of the ASD subsample was evaluated by computing ordinary nonparametric bootstrap means (replications = 1000) and corresponding standard errors for each predictor and outcome of interest, and evaluating differences between bootstrap estimates and the subsample using Cohen's d. All differences between subsample means and bootstrap mean estimates fell below/within a small effect size difference ($d = 0.20–0.30$, $M = 0.06$), excluding FSIQ in girls with ASD ($d = 0.68$, $M_{bootstrap} = 103.23$, $SE_{bootstrap} = 2.15$, $M_{sample} = 93.57$, $SE_{sample} = 4.20$).

2.2. Measures

Social responsiveness scale (Constantino and Gruber, 2005) is a 65-item measure that dimensionally assesses five domains of social reciprocity: social cognition, social communication, social awareness, restricted and repetitive behaviors, and social motivation. In this study, subscale raw scores were used to maintain maximum variability in responses for general linear models, and t-scores were used for between-group comparison of clinical cut-offs.

Child Behavior Checklist (CBCL; Achenbach and Rescorla, 2001) is a parent-report measure of youth emotional and behavioral problems. In this study, we used the Anxious/Depressed subscale of the CBCL as a covariate in analyses given that each condition under study has been associated with internalizing symptoms and diagnoses, and others have found internalizing youth to experience social difficulties (e.g., Strauss, 1988).

FSIQ: Full scale IQ (FSIQ) was measured using two different instruments across the four study samples. The severe mood dysregulation, TD, and OCD groups were assessed using the Weschler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999). The ASD sample was assessed using the Differential Ability Scales-Second Edition Global Conceptual Ability (DAS; Elliott, 2007).

CGI-S: The clinical global impression severity scale (CGI-S; Guy, 1976) is presented to reflect disorder-related clinical severity in the severe mood dysregulation, TD, and OCD groups.

Analyses: Prior to conducting analyses, we compared diagnostic groups on relevant demographic (i.e., age, gender) variables and total social reciprocity scores using ANOVAs. For Aim 1, group differences on each of the five SRS subscale raw scores were tested using five separate general linear models in SPSS version 24. In each model, the respective SRS subscale was entered as the dependent variable, and group, age, CBCL Anxious/Depressed t-score, and interactions were tested as predictors. A family-wise Bonferroni correction was used to account for multiple comparisons ($\alpha = 0.05/5 = 0.01$) for each main effects analysis. Insignificant interactions were dropped from each analysis, however all main effects (i.e., age, Anxious/Depressed t-score) were retained regardless of significance. Post-hoc Bonferroni-corrected pairwise comparisons were conducted to evaluate differences between diagnostic groups. For Aim 2, likelihood ratio chi-square tests were conducted with SAS version 9.4 to evaluate whether the percentage of youth endorsing clinically significant symptoms in each social reciprocity domain differed by diagnostic group.

3. Results

Overall, youth with ASD were rated as having higher scores across SRS subscales in comparison to youth with OCD, TD, and SMD. There were significant group differences in age, $F(1,116) = 5.34$, $p < 0.01$, and therefore age was included as a covariate in general linear models.

For Aim 1 general linear models (see Table 2), the interactions between age and diagnostic group, and CBCL Anxious/Depressed subscale and group, were not significant ($p > 0.05$), and these interactions were dropped from subsequent analyses. For each domain, there was a significant effect of diagnostic group and post hoc tests were explored (see Fig. 1 for all post-hoc tests).