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Inter-rater Reliability of the Anxiety Disorders Interview Schedule for DSM-IV in High Functioning Children and Adolescents with Autism Spectrum Disorder

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Inter-rater Reliability of the Anxiety Disorders Interview Schedule for DSM-IV

in High Functioning Children and Adolescents with Autism Spectrum Disorder

by

Danielle Ung

A thesis submitted in partial fulfillment
of the requirements for the degree of
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ABSTRACT

The present study examined inter-rater agreement on the Anxiety Disorder Interview Schedule DSM-IV Child and Parent Interview (ADIS-IV-C/P) in youth with autism spectrum disorder and if age and ASD diagnosis moderated agreement. Diagnoses established for 70 7-16-year-old youth with ASD during a live administration of the ADIS-IV-C/P were compared to diagnoses identified by a second rater after listening to audiotaped recordings of the interviews. Inter-rater agreement on parent and child reports was excellent (k=1.00). Inter-rater agreement on principal diagnoses (k=0.91), individual anxiety diagnoses (k=0.85-0.97), and other comorbid diagnoses (i.e., major depressive disorder, dysthymia, oppositional defiant disorder, attention deficit hyperactivity disorder-Inattention/Hyperactivity/Combined Type) (0.89-1.00) were excellent; agreement did not differ as a function of ASD diagnosis or age. Results suggest that the anxiety disorders and comorbid disorders assessed by the ADIS-IV-C/P can be diagnosed by pairs of clinicians with good reliability.

INTRODUCTION

Autism spectrum disorders (ASD), which are comprised of the diagnoses Autistic Disorder, Asperger's Syndrome, and Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS), are characterized by social and/or communication deficits and/or restrictive/repetitive behaviors (American Psychiatric Association, 2000). Individuals diagnosed with Autistic Disorder display qualitative impairments in social and communication skills and restrictive/repetitive behaviors prior to the age of 3 years. Their symptoms are not accounted for by Rett's Disorder or Childhood Disintegrative Disorder. Individuals diagnosed with Asperger's Syndrome display qualitative impairments in social interaction skills and restrictive/repetitive behaviors, and they have no significant delay in language and cognitive development. Individuals diagnosed with PDD-NOS display severe and pervasive impairment in the development of reciprocal social interaction, communication skills or restrictive/repetitive behaviors, and they do not meet the criteria for Autistic Disorder because of late age of onset, atypical symptomology, and/or sub-threshold symptomology (American Psychiatric Association, 2000).

Qualitative impairment in social interaction and communication skills include behaviors such as a lack of joint attention and emotional reciprocity, difficulty in understanding social cues, inability to share enjoyment with others, a reluctance or difficulty initiating or maintaining social interactions, a delay or lack of development of speech without any compensatory gesture, a failure to respond to others' speech (e.g., does not orient to his/her own name), stereotyped and repetitive use of language, pronoun

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reversal (e.g., referring to others as "I" and to themselves as "You"), and a failure to initiate or sustain conversation normally (American Psychiatric Association, 2000). Restrictive/repetitive behaviors may include excessive and intensive preoccupation with certain interests, inflexible adherence to rules and structure, and stereotyped or repetitive motor movements such as hand-flapping or complex body movements which can be displayed for hours or only briefly (DSM-IV-TR, 2000). Currently, ASD affects as many as 1 in 88 youth in the United States with higher incidence in boys (1 in 58 boys) (Center for Disease Control and Prevention, 2012; Fombonne, 2005).

Between 30 and 80% of children and adolescents with ASD also have clinically significant anxiety (de Bruin, Ferdinand, Meester, de Nijs, & Verheij, 2007; Gillot, Furniss, & Walter, 2001; Leyfer et al., 2006; Muris, Steerneman, Merckelbach, Holdrinet, & Meesters, 1998; Sukhodolsky et al., 2008; van Steensel, Bogels, & Perrin, 2011; see White, Oswald, Ollendick, & Scahill, 2009, for a review). Anxiety disorders are more prevalent in youth with ASD than in typically developing children and youth with ASD have similar or higher levels of anxiety than do clinically anxious samples (e.g., Bellini, 2004; Farrugia & Hudson, 2006; Giliot, Furniss, & Walter, 2001; Weisbrot, Gadow, DeVincent, & Pomeroy, 2005). Common comorbid anxiety disorders reported in children and adolescents with ASD include obsessive-compulsive disorder (OCD; 17-37%), separation anxiety disorder (SAD; 9-38%), specific phobia (26-57%), social phobia (13-40%), panic disorder (2-25%), and generalized anxiety disorder (GAD; 15-35%) (Leyfer et al., 2006; Simonoff et al., 2008; van Steensel et al., 2011; see White et al., 2009, for a review).

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Specific phobia, panic disorder, SAD, and GAD are more likely to be diagnosed in youth with PDD-NOS than in youth with Autistic Disorder or Asperger's Syndrome (Muris et al., 1998; van Steensel et al., 2011). Obsessive-compulsive disorder and specific phobia are more likely to be diagnosed in youth with Autistic Disorder than in youth with Asperger's Syndrome. Youth with Asperger's Syndrome often report the highest levels of anxiety when compared to youth with PDD-NOS and Autistic Disorder diagnosis, reflecting varying levels of anxiety across diagnoses (Weisbrot et al., 2005). This may be reflective of greater insight in youth with Asperger's Syndrome that enables them to communicate their anxiety and be more cognizant of their impairments than youth who have less insight (Gillott et al., 2001; Kim et al., 2000; Sukholdosky et al., 2008).

Youth with ASD and clinical anxiety disorders experience significant impairment in school, home, and family functioning (Chamberlain et al., 2007). Specific domains of impairment that may be further exacerbated by the presence of clinical anxiety symptoms include functioning in school/academic domains, home life, and social relationships (Bellini, 2004; Kim et al., 2000; Muris et al., 1998; Sukhodolsky et al., 2008; Wood & Gaddow, 2010). Anxiety symptoms can compound functional impairments such as life skills, ability to work, and ability to be independent. As a result, youth with ASD may be at increased risk for peer rejection, depression, and loneliness (Attwood, 2003; Bauminger & Kasari, 2000; Kim et al., 2000; Storch, Masia-Warner, & Brassard, 2003; Tantam, 2003); however, information regarding long term outcomes related to anxiety in youth with ASD and typically developing youth is unknown. Consequently, early identification of clinical anxiety symptoms is crucial in this population.

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When assessing clinical levels of anxiety in youth with ASD, clinicians often are faced with the difficulties of separating subclinical anxiety symptoms from ASD symptoms given substantial symptom overlap, lack of clarity in differential diagnosis, poor agreement among informants, lack of child insight, difficulty of the parent reporting on child internal states, cognitive and language limitations of the child, and limitations of existing constructed clinical interviews (Campbell & Rapee, 1996; MacNeil, Lopes, & Minnes, 2009; Storch et al., 2013; van Steensel et al., 2011; see White et al., 2009, for a review; Wood & Gaddow, 2010).

Despite the known difficulties associated with diagnosing anxiety disorders in youth with ASD (e.g., separating subclinical anxiety symptoms from ASD symptoms given symptom overlap, lack of clarity in differential diagnosis, poor agreement among informants, lack of child insight, difficulty of the parent reporting on child internal states, cognitive and language limitations of the child) (van Steensel et al., 2011; White et al., 2009; Wood & Gaddow, 2010), few empirical studies have explored the psychometric properties of anxiety assessments in this population (see Nadeau et al., 2011). In particular, the Anxiety Disorder Interview Schedule DSM-IV Parent and Child Interview (ADIS-IV-C/P; Silverman & Albano, 1996), which is a structured diagnostic measure with complementary parent and child interviews, has received little attention regarding its psychometric properties despite its frequent use in typically developing children and increasing use in youth with ASD (e.g., Reaven, Blakeley-Smith, Culhane-Shelburne, & Hepburn, 2011; Storch et al., 2013; Wood et al., 2009). Among typically developing children and adolescents, the ADIS-IV-C/P has generally demonstrated strong reliable

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properties across time (Silverman et al., 2001) and poor to strong agreement among informants (Choudhury et al., 2003; Grills & Ollendick, 2003).

To date, four studies investigated inter-rater agreement of the ADIS-III-C/P and ADIS-IV-C/P (Lyneham, Abbott, & Rapee, 2007; Lyneham & Rapee, 2005; Rapee, Barrett, Dadds, & Evans, 1994; Silverman & Nelles, 1988). Lyneham and colleagues (2007) examined the inter-rater agreement of the ADIS-IV-C/P by comparing clinician ratings of 153 typically developing youth aged 7 to 16 years performed face-to-face with parents and their children, and clinician ratings performed after viewing a videotape of the assessment. Inter-rater agreement on principal diagnosis ranged from good to excellent (kappa [k] ranging from .80-1.0), individual anxiety disorders (k ranging from .80-1.0), and comorbid disorders (k ranging from .65-.77). Agreement for principal diagnosis and all anxiety disorders based solely on child information or solely on parent information ranged from good to excellent (k ranging from .72-.94 and k ranging from .78-.95, respectively). However, patterns of disagreement were noticed when clinicians tried to determine if GAD or social phobia was the principal diagnosis, which may reflect limitations of the ADIS-IV-C/P in separating GAD symptoms from those of social phobia.

Lyneham and Rapee (2005) examined the inter-rater agreement of the ADIS-IV-C/P by comparing clinician ratings of 73 typically developing youth aged 6 to 12 years performed face-to-face with parents and their children, and clinician ratings performed over the telephone. Inter-rater agreement was good to excellent for principal diagnosis (k = .86), individual anxiety disorders (k ranging from .63-.86), and other disorders (k ranging from .79-.91). Researchers concluded that telephone administration of the ADIS-

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IV-C/P was as reliable and valid as face-to-face administrations for determining the presence or non-presence of anxiety disorders in children, which suggests that formats other than face-to-face administration of the ADIS-IV-C/P may be reliable.

Rapee and colleagues (1994) examined the inter-rater agreement for the anxiety disorders in the ADIS-III-R-C/P by comparing clinician ratings of 161 typically developing youth aged 7 to 14 years performed face-to-face with parents and their children and clinician ratings obtained after viewing videotaped parent and child sessions. Inter-rater agreement on principal and additional diagnoses was fair to excellent (k ranging from .59 to .82). Inter-rater agreement also appeared to be higher for older children. Silverman & Nelles (1988) examined the inter-rater agreement for the anxiety and comorbid disorders in the ADIS-III-R-C/P by comparing clinician ratings of 51 typically developing youth. Inter-rater agreement on principal diagnosis and secondary diagnoses was moderate to high.

Moderators of Inter-rater Agreement

Some data suggest that certain variables moderate clinician inter-rater reliability and parent-child agreement on clinical anxiety diagnoses such as child's age (see Lyneham et al., 2007; Rapee et al., 1994; Storch et al., 2012a) and ASD diagnosis (see Muris et al., 1998; van Steensel et al., 2011). If these two variables are found to be significant moderators of inter-rater agreement, they may help to explain the varying degrees of agreement or disagreement among raters. For example, if inter-rater agreement is better for older children, this may suggest that older children are more aware of their symptoms and are better reporters of their symptoms than younger children. These findings may inform raters to continue to question the reliability of young children's

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responses. Similarly, if ASD diagnosis is found to be a significant moderator of inter-rater agreement, raters may want to take extra precautions in making sure their ratings are reliable or be wary of their conclusions when they are interviewing youth with a certain ASD diagnosis.

Age of Child. In a meta-analysis performed on anxiety disorders in youth with ASD, van Steensel and colleagues (2011) identified 31 studies involving 2,121 youth (age < 18 years) with ASD. Results revealed that anxiety disorders were more likely to be diagnosed in older children than in younger children. Older youth with ASD were more likely to report anxiety symptoms, suggesting that rates of anxiety disorders may increase with age or that youth are better able to report their anxiety symptoms as they age. These results have been supported by several other studies using a variety of anxiety measures in typically developing children (DISC; Edelbrock et al., 1985; ADIS-III-C/P; Silverman & Eisen, 1992; Rapee et al., 1994), although some studies have found no significant moderating effect of age on inter-rater agreement (see Lyneham et al., 2007; Rapee et al., 1994).

Autism Spectrum Disorders Diagnoses. Autism spectrum disorders diagnoses are hypothesized to moderate agreement because of varying levels of deficits in communication (Buitelaar et al., 1999; Cohen et al., 1986; Prior et al., 1998; Sevin et al., 1995; Walker et al., 2004), abstract reasoning (de Bruin et al., 2006; Prior et al., 1998; Walker et al., 2004), and insight across ASD diagnoses such that lower functioning youth with ASD or youth with more severe ASD symptoms may have poorer insight into their anxiety symptoms than higher functioning youth with ASD (Gillott et al., 2001; Kim et al., 2000; Sukholdosky et al., 2008) and the presence of comorbid disorders across ASD

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diagnoses (Muris et al., 1998; van Steensel et al., 2011) can affect the ability of the clinician to accurately diagnose the presence of anxiety disorder(s) and agree upon a diagnosis. A youth with ASD who has difficulties reporting his or her anxiety symptoms and associated impairments or confuses ASD symptoms for anxiety symptoms will make it more difficult for a clinician to accurately diagnose an anxiety disorder. This can greatly affect inter-rater agreement. Furthermore, the presence of comorbid disorders can obscure anxiety symptoms, hinder anxiety assessments, and, overall, make it more difficult for a clinician to retrieve relevant information. For example, a youth with ASD who also has attention difficulties might struggle to pay attention to and answer the questions being asked and may need questions to be repeatedly clarified. As a result, a clinician may question the integrity of the answers and the diagnoses made from these reports.

To date, no study has investigated the inter-rater reliability of the ADIS-IV-C/P in children and adolescents with ASD despite its increasingly frequent use in youth with ASD (e.g., Storch et al., 2013; Wood et al., 2009). Investigating the reliability of a measure is essential because 1) reliable diagnoses lead to better treatment specificity, 2) in order for a measure to be valid, it must be reliable, and 3) it allows us to explore the extent to which bias and other relevant factors may impact raters' abilities to reach an objective diagnoses. Furthermore, researchers are increasingly studying anxiety and ASD and they must be able to reliably assess anxiety in youth with ASD to enroll appropriate participants for their studies. In light of the few studies that have examined the inter-rater agreement of the ADIS-IV-C/P, and the importance of reliable diagnoses, this study had the following aims: 1) examine the inter-rater agreement on the ADIS-IV-C/P with

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respect to principal diagnosis, individual anxiety disorders, and comorbid DSM-IV disorders as endorsed by the child and parent, and a clinician diagnosis and 2) determine whether clinician inter-rater agreement on clinician diagnoses is moderated by child's age and ASD diagnosis.

METHOD

Participants

       Participants were comprised of 70 parents and their children (ages 7-16 years) who have an autism spectrum disorder diagnosis, confirmed through the administration of the Autism Diagnostic Observation Schedule (ADOS; Lord, Rutter, DiLavore, & Risi, 2000) and Autism Diagnostic Interview-Revised (ADI-R; Rutter et al., 2003), and have completed an audio recorded or videotaped ADIS-IV-C/P at the screening visit. Participants were recruited for one of four studies examining the efficacy of cognitive behavioral therapy for anxiety in youth with ASD. These four studies have similar inclusion/exclusion criteria and study design. Inclusion and exclusion criteria of all four studies are presented in Table 1.

Measures

       Anxiety Disorders Interview Schedule for DSM-IV– Child and Parent Version (ADIS-IV-C/P). The ADIS-IV-C/P (Silverman & Albano, 1996) is a clinician-administered, structured interview used to assess the presence, severity and level of interference of anxiety disorders and common disorders in youths based upon the criteria set by the DSM-IV-TR (APA, 2000). Parent and child are interviewed separately and a list of diagnoses endorsed by the parent and child are recorded. Clinician diagnosis is determined by the clinician after considering the disorders endorsed by parent and child. Clinical diagnoses reflect endorsement of symptoms and a severity rating (patient impairment/distress) of at least 4 on a 0-8 scale. Principal diagnoses represent the most

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distressing/interfering anxiety disorder. The ADIS-IV-C/P has demonstrated strong

psychometric properties in typically developing youth, including test-retest reliability

(Silverman, Saavedra, & Pina, 2001), inter-rater reliability (Silverman & Albano, 1996),

and concurrent validity (Wood, Piacentini, Bergman, McCracken, & Barrios, 2002).

Autism Diagnostic Interview- Revised (ADI-R). The ADI-R (Rutter et al.,

2003) is a standardized semi-structured clinical diagnostic interview for assessing ASD in

children and adults based on the diagnostic criteria for autism in the DSM-IV-TR (APA,

2000). Caregivers are asked questions concerning their child's behavior through a

structured interview with a clinician. The ADI-R focuses on behaviors in the three

content areas or domains often displayed by children and adults with ASD: quality of

social interaction (e.g., emotional sharing, offering and seeking comfort, social smiling

and responding to peers); communication and language (e.g., stereotyped utterances,

pronoun reversal, social usage of language); and repetitive, restricted and stereotyped

interests and behavior (e.g., unusual preoccupations, hand and finger mannerisms,

unusual sensory interests) (Rutter et al., 2003). All questions ask about current behavior,

with the exception of a few behaviors that only occur during specific age periods. The

ADI-R has demonstrated strong psychometric properties, including test-retest reliability,

inter-rater reliability, and discriminant validity (Lord, Rutter, & Le Couteur, 1994). In the

child and adolescent studies, the ADI-R was administered at the screen visit.

Autism Diagnostic Observation Schedule (ADOS)-Module 3. The ADOS–

Module 3 is a structured observation assessment used to elicit atypical language use,

social interaction, and stereotyped behaviors of individuals suspected of having ASD

(Lord, Rutter, DiLavore, & Risi, 2000). The ADOS has demonstrated strong

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psychometric properties, including test-retest reliability, inter-rater reliability, and discriminant validity (Lord et al., 1999; Lord et al., 2000).

Clinicians

Original raters who had audio-recorded their ADIS-IV-C/P were research assistants who were trained to reliably administer the ADIS-IV-C/P. Parent and child interviews were conducted by the same clinician. A second rater who was blind to the age and ASD diagnosis of the child and was trained to administer the ADIS-IV-C/P was used to establish inter-rater agreement. This rater had observed and rated multiple ADIS-IV-C/P under the supervision of a qualified and reliable rater of that ADIS-IV-C/P and had achieved an inter-rater agreement of 80% or above on all ADIS-IV-C/P observed.

Procedure

Following a telephone screening in which basic inclusion/exclusion criteria were assessed, families were invited for an in-person visit. At this visit, a written parent consent and child assent was obtained and the parents and their child were administered a series of measures by trained clinicians including the ADIS-IV-C/P at the screening visit. In all clinical studies, parents consented and children assented to the audio recordings of measures and for their use in research. ADIS-IV-C/P interviews were conducted with the child and parent separately. After completing the interview, the rater assigned diagnoses based upon parent and child interviews. The second rater listened to the audiotapes of previous ADIS-IV-C/P taken at the screen visit and scored the ADIS-IV-C/P based upon these recordings. The order that the parent and child recordings were rated was randomized. Parent, child and clinician diagnoses were compared to assess inter-rater agreement. All studies were approved by the local institutional review board.

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Data Analysis

Cohen's Kappa (Cohen, 1960) was calculated for each individual anxiety and comorbid diagnosis A 2x2 Cohen Kappa table was used to calculate a kappa coefficient for each individual anxiety and comorbid diagnosis. See Figure 1. A 4 x4 Cohen Kappa table was used to calculate a kappa coefficient for principal diagnosis. Per inclusion criteria, generalized anxiety disorder, social phobia, separation anxiety disorder, and obsessive-compulsive disorder were the anxiety disorders that could be chosen to represent principal diagnosis. The 95% confidence intervals for Cohen's Kappas were calculated using the following equation: k-1.96×standard error (k) to k+1.96×standard error (k) (Blackman & Koval, 2000).The following guidelines set by Mannuzza et al. (1989) were used to interpret kappa values: kappa values less than 0.40 are considered poor agreement, kappa values 0.40-0.60 are considered fair agreement, kappa values 0.60-0.74 are considered good agreement, and kappa values greater than 0.74 are considered excellent agreement.

Participants were split into two groups, the child group (aged 7-11, *n*=41) and adolescent group (aged 12-16 years, *n*=29) to investigate whether age was a moderator of inter-rater agreement. Participants were split into three groups, youth with Autistic Disorder, youth with Asperger's Syndrome, and youth with PDD-NOS to investigate whether ASD diagnosis was a moderator of inter-rater agreement. Overlaps in kappa confidence intervals were examined to determine moderator effects.

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RESULTS

Sample

Of the 70 participants, consisting mainly of male participants (n=51), 23 participants were diagnosed with Autistic Disorder, 32 participants were diagnosed with Asperger's Syndrome, and 15 participants were diagnosed with PDD-NOS. The mean age of the sample was 11 years (SD=2.26 years). Demographics and diagnostic characteristics are presented in Table 2. Demographic characteristics were not statistically different across ASD child studies and ASD adolescent studies from which the participants were recruited. See Table 3.

Principal Diagnosis

The kappa coefficient for inter-rater agreement on principal diagnosis was 0.91 which signified excellent agreement.

Anxiety Disorders/Comorbid DSM-IV Diagnoses

Kappa coefficients for inter-rater agreement on parent and child ratings for individual anxiety disorders and comorbid disorders were 1.00, which signified perfect agreement. No disagreements were found in clinician-to-clinician ratings of parent and child ratings. Inter-rater agreement on individual anxiety disorders was excellent (k= 0.85-1.00). Inter-rater agreement on mood disorders and externalizing disorders was excellent (k= 0.89-1.00). Kappa coefficients for individual anxiety disorders and other comorbid DSM-IV diagnoses are presented in Table 4.

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Moderators of Inter-rater Agreement

      Age. Age was not a significant moderator of inter-rater agreement. However, inter-rater agreement among the adolescent group varied more so than the child group, ranging from good to excellent agreement (k= 0.73-1.00) for the adolescent group versus excellent agreement for the child group (k= 0.90-1.00). In the adolescent group, good agreement was found on SAD (k= 0.73) while all other anxiety disorders and comorbid DSM-IV diagnoses had excellent agreement (k= 0.83-1.00). Excellent agreement was found across age group on principal diagnosis (child group: k= 0.88, adolescent group: k= 0.94). See Table 5 for inter-rater agreement on individual diagnoses using age as a moderator.

      ASD Diagnosis. ASD diagnosis was not a significant moderator of inter-rater agreement. Excellent agreement on individual anxiety diagnoses and comorbid DSM-IV diagnoses was found within each ASD diagnosis with the exception of good agreement for SAD in the youth with PDD-NOS. Kappa coefficients in Autistic Disorder group ranged from 0.81- 1.00 signifying excellent agreement, the Asperger's Syndrome group ranged from 0.93- 1.00 signifying excellent agreement and the PDD-NOS group ranged from 0.73-1.00 signifying good to excellent agreement. Excellent agreement was found across ASD diagnosis on principal diagnosis (Autistic Disorder: k= 0.93, Asperger's Syndrome: k= 0.85, PDD-NOS: k= 1.00). See Table 5 for inter-rater agreement on individual diagnoses using ASD diagnosis as a moderator.

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DISCUSSION

The present study examined the inter-rater reliability of the ADIS-IV-C/P in youth with ASD. Clinician inter-rater agreement on principal diagnosis (k=0.91) was excellent. This indicates that when raters are presented with a number of anxiety diagnoses in a youth with ASD, they can reliably agree on the most severe and interfering anxiety diagnosis which would become the primary focus of treatment. Notably, Cohen kappa for clinician inter-rater agreement on principle diagnosis could be lower if a larger number of diagnoses could be chosen to be the principal diagnosis (e.g., all anxiety disorders examined by the ADIS-IV). However, as others have reported (e.g., Lyneham et al., 2007), discrepancies were noticed in clinician ratings when deciding whether social phobia or GAD was the principal diagnosis. One possible explanation is that the overlap in the diagnostic criteria of specific anxiety disorders may contribute to inter-rater disagreements on the principal diagnosis (Lyneham et al., 2007). For example, clinicians may disagree about whether social phobia stands alone as the primary diagnosis or is subsumed under GAD in a youth with ASD. Clinician disagreements underscore the notion that anxiety in youth with ASD is a dimensional construct that cannot always be easily mapped onto a categorical system of classification, as specified by the DSM-IV on which the ADIS-IV-C/P is grounded.

Clinician agreement on the presence of individual anxiety diagnoses (k= 0.85-0.97) and other comorbid diagnoses (k= 0.89-1.00) was excellent but not perfect. Disagreement on the presence of anxiety and comorbid diagnoses among clinicians may

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arise due to specific clinician, child and ASD variables. These variables will be reviewed below.

Clinician Variables

Several clinician variables may present challenges to clinician inter-rater agreement. First, it is important to note that anxiety in youth with ASD has been operationalized through many different measures (e.g., physiological manifestations, behavioral observations, number of presented symptoms to meet DSM-IV criteria) (Grondhuis & Aman, 2012; Storch et al., 2013; White et al., 2009). Clinicians may also vary on how they determine whether or not anxiety symptoms are clinically significant despite the categorical approach of the DSM-IV, which has symptoms endorsed as present or absent. Clinicians can differ on how they interpret anxiety. Second, clinicians have to use their clinical judgment about whether or not the anxiety causes *clinically significant distress or impairment* to meet criteria for a clinical disorder since these terms are not specified by the DSM-IV or the ADIS-IV (Beals et al., 2004) which can lead to disagreements about the presence or absence of a disorder. Clinical judgment may be informed by previous experience of working with youth with anxiety and/or clinical training, which inevitably differs among clinicians. As a result, disagreements about whether anxiety symptoms meet the threshold to be classified as clinical anxiety may arise. Third, when interviewing parents and their children separately, clinicians may vary on their beliefs about who is apt to provide more useful information, the parent or the child. For example, a clinician may more readily agree with the parent's reports of an anxiety disorder than the child's report whereas another clinician may give equal weight to parent and child reports. These differences in the evaluation of parent's and child's

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insight may result in raters' disagreements about the presence, severity and level of interference of an anxiety and/or comorbid disorder. Moreover, whereas others have reported that children are better reporters than their parents on internalizing symptoms (e.g., Reich, 2000), this does not appear to hold true in youth with ASD (Storch et al., 2012a). Lastly, similar conditions seen in youth with ASD are also seen in youth with ASD and anxiety (e.g., sleep disturbance, irritability, restlessness, avoidance) (Kim et al., 2000; Mayes, Calhoun, Murray, Ahuja, & Smith, 2011; Tsai, 1996). Consequently, a phenomenon known as "diagnostic overshadowing bias" in which the clinician attributes comorbid mental health problems (e.g., anxiety symptoms) to the ASD diagnosis rather than a separate clinical disorder may explain differential diagnoses (Mason & Scior, 2004). Our finding of excellent agreement across anxiety and comorbid diagnoses was not significantly impacted by these possible clinician variables.

Child Variables

Youth with anxiety and ASD present a number of challenges to diagnostic assessments of anxiety. First, although two children can have the same anxiety disorder, the presentation of their symptoms can widely vary. For example, two children can be diagnosed with GAD but differ substantially on the content (e.g., one child excessively worries about his/her performance and impressions while another child is excessively concerned about his/ her health and ongoing world events) and the somatic expressions of their worries (e.g., irritability versus restlessness). Consequently, clinicians are faced with the challenge of deciding which clinical anxiety diagnosis best represents these symptoms. Second, youth can have varying levels of insight into their anxiety symptoms (Lewin et al., 2010), which makes it difficult for clinicians to formulate a diagnostic

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evaluation based upon their reports. Lastly, comorbidity is highly prevalent in youth with ASD who seek treatment for anxiety (Ung et al., in press; Wood et al., 2009) and may complicate diagnostic assessments of anxiety by blurring the lines between what is anxiety-driven and what is caused by a comorbid condition. For example, a youth with anxiety who acts aggressively towards others and is defiant may be diagnosed as having oppositional defiant disorder. However, these behavior problems may stem from the child's anxiety rather than a separate clinical disorder. For example, the child may express rage as a way to cope with his/her anxiety or to avoid anxiogenic triggers (Storch et al., 2012b). Excellent but not perfect agreement may reflect clinicians' disagreements about the underlying reason for these comorbid conditions.

ASD Variables

Characteristics unique to youth with ASD also create challenges to the assessment and diagnosis of clinical anxiety and can lead to clinician inter-rater disagreement. First, deficits that characterize ASD symptomology (i.e., impairments in social, communication and/or cognitive functioning and restricted interests/repetitive behaviors) may restrict the youth's level of insight and ability to reliably convey his/her emotional states. For example, a youth with ASD who has difficulty answering questions because he/she is preoccupied with his/her restricted interests may not provide reliable and/or valid responses which make it difficult for the clinician to come to a conclusive diagnosis based upon the child's report. Moreover, cognitive deficits may lead youth with ASD to misinterpret or take phrases or common sayings literally. For example, when asked if he/she feels "butterflies in his/her stomach" when encountering anxiety provoking situations, a youth with ASD may be confused about what this saying intends to convey

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and may look confuse and/or respond with a "no". These core deficits of ASD make it difficult for clinicians to accurately assess clinical disorders in youth with ASD and anxiety and can lead to poor inter-rater disagreement. Second, youth with ASD struggle with the interpretation and communication of their emotions and behaviors and understanding the emotions and behaviors of others (Hill, Berthoz, & Firth, 2004). Many youth with ASD also show severe impairments of or a lack of the theory of mind (Yirmiya et al., 1998). For example, youth with ASD may not fully comprehend what it means to be anxious or depressed, despite being given examples of other children who may experience these types of emotions, which is a common procedure in the ADIS-IV-C. Consequently, clinicians may have more difficulties determining the presence or absence of a disorder in youth with ASD and these decisions can lead to poorer inter-rater agreement. Lastly, overlap in ASD and anxiety symptomology presents a frequent challenge to clinicians and parents. Anxiety symptoms may be mistaken for symptoms of ASD or vice versa (e.g., obsessive-compulsive symptoms may be mistaken for restricted interests or repetitive behaviors) by clinician, parent and child, resulting in differential anxiety diagnoses among raters.

Inter-rater Agreement on Parent and Child Ratings

Inter-rater agreement on parent and child ratings was excellent suggesting that information gathered from parent and child interviews can be reliably captured by two separate clinicians. The interview structure of the ADIS-IV-C/P allows for a clear and direct report of parent and child ratings of the severity and level of interference of individual anxiety and comorbid disorders (e.g., clear cut-off severity score to meet

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diagnosis). Consequently, raters are more likely to agree that the parent and the child reported an individual anxiety or comorbid condition to be clinically significant.

Moderators of Agreement

Consistent with previous findings (e.g., Lyneham et al., 2007; Rapee et al., 1994), age and ASD diagnosis were not significant moderators of clinician inter-rater agreement. Overall, excellent agreement was found across age groups and ASD diagnoses. Inter-rater agreement did not vary across ASD diagnoses, indicating that ASD diagnosis does not significantly impact rater agreement. As a spectrum disorder, youth with ASD can vary on the frequency and severity of ASD symptomology and may not be best categorized as belonging to one category versus another. Although not statistically significant, inter-rater agreement varied more so in the adolescent group (ages 12-16 years) than the child group (ages 7-11 years). One possible explanation is that because children may be less reliable at reporting their anxiety symptoms, clinicians may rely more heavily on parents' report. In contrast, adolescents may be better reporters of their anxiety, which consequently present more information for clinicians to consider. With more information available, clinicians may be more likely to differ on what information they use to decide the presence or absence of a disorder, resulting in greater inter-rater disagreement.

Limitations

Although excellent inter-rater agreement on principal diagnoses, individual anxiety diagnoses, and comorbid DSM-IV diagnoses was found, several limitations should be noted. First, due to the use of archival tapes, a second face-to-face ADIS-IV-C/P interview could not be performed by the second rater to obtain inter-rater reliability. Face-to-face interviews may provide clinicians with further details about anxiety

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symptoms and the reliability of parent and child reports. For example, facial or body cues such as expressions of boredom or a need to quickly finish the assessment may inform clinicians about the reliability of parent and child reports. Second, given the low sample size in some groups, low statistical power may explain why age groups and ASD diagnosis were not found to be significant moderators of inter-rater agreement. Third, a majority of the sample were Caucasian youth with ASD, limiting the generalizability of the results. Lastly, concerns about how the new changes of the DSM-5 in the specific area of autism spectrum disorders and anxiety disorders may affect the generalizability of this results which are based upon the DSM-IV should be noted. Minor changes to the criteria of anxiety disorders within the DSM-5 may not affect the interpretation of the results of this study; however, the restructure of the criteria needed to meet an autism spectrum diagnosis may exclude a number of youth who had previously been diagnosed with ASD, specifically youth with Asperger's Syndrome and thereby, limiting the generalizability and interpretation of our moderation results.

Clinical Implications

The present study is the first to indicate the reliable use of the ADIS-IV-C/P in youth with ASD. Study results have several clinical implications. First, disagreements among clinicians indicate that identifying, assessing and diagnosing clinical anxiety in youth with ASD present several unique challenges (e.g., overlap in anxiety and ASD symptomology, communication deficits, low levels of insight, difficulty understanding and expressing emotions in themselves and others). Clinicians' awareness of these challenges is critical to the success of reliable and valid assessments of anxiety in youth with ASD. For example, clinicians who are aware that youth with ASD have difficulty

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understanding their emotions may rephrase their questions to best fit the cognitive abilities of the youth with ASD (e.g., explain anxiety in terms of physical symptoms or thoughts rather than using the emotion word "anxiety"). Second, it is impossible to develop treatment goals and treatment plans without a reliable case conceptualization of the child (Cormier, Nurius, & Osborn, 2009). Inaccurate or incomplete assessment of a child's anxiety symptoms can lead to an inappropriate and ineffective treatment (e.g., King et al., 2009). For example, a clinician who mistakes restricted interests and repetitive behaviors for OCD symptoms may administer a treatment protocol that is inappropriate for the youth or does not follow the recommended treatment. Lastly, researchers are increasingly studying anxiety in youth with ASD using the ADIS-IV-C/P, and they must be able to reliably assess anxiety in youth with ASD to enroll appropriate participants for their studies and to assign treatments that appropriately match each child's clinical characteristics. For example, if a youth with ASD can be reliably diagnosed with an anxiety disorder and a comorbid diagnosis such as ADHD, treatment targeted at reducing ADHD symptoms prior to or in conjunction with the anxiety treatment may maximize treatment efficacy by removing treatment barriers associated with comorbid conditions (e.g., increasing attention) (Storch et al., 2008). Consequently, understanding the functionality and impairments associated with anxiety and comorbid conditions in youth with ASD through reliable assessments and matching patient characteristics to certain interventions is critical to the success of individualized treatments for youth with ASD and anxiety (e.g., cognitive-behavioral therapy) (Wood & Gadow, 2010).

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APPENDICES

Rater 1

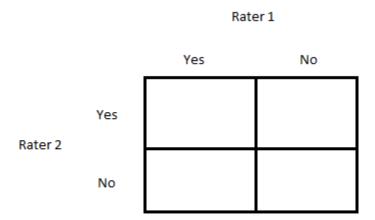|	Yes	No
Yes		
No		

Rater 2

Figure 1. Cohen Kappa table for each individual anxiety and comorbid disorder.

Appendix B: Tables

Table 1

Inclusion and Exclusion Criteria

	ASD Child Study #1	ASD Child Study #2	ASD Adolescent Study #1	ASD Adolescent Study #2
Inclusion Criteria	·Ages 7-11 years	·Ages 7-12 years	·Ages 11-16 years	·Ages 11-14 years
	·Meets criteria for ASD	·Meets criteria for ASD	·Meets criteria for ASD	·Meets criteria for ASD
	·Meets criteria for separation anxiety disorder, generalized anxiety disorder, social phobia, or obsessive-compulsive disorder according to the ADIS-IV-P/C	·Meets criteria for separation anxiety disorder, generalized anxiety disorder, social phobia, panic disorder or specific phobia according to the ADIS-IV-P/C	·Meets criteria for separation anxiety disorder, generalized anxiety disorder, social phobia, or obsessive-compulsive disorder according to the ADIS-IV-P/C	·Meets criteria for a clinically significant anxiety disorder as assessed by the ADIS-IV-P/C
	·Has a full scale IQ equal or above 70 as assessed by the Wechsler Intelligence Scale for Children-Fourth Edition or a similar standardized test	·Has a full scale IQ equal or above 85 as assessed by the K-BIT-2 (Kaufman Brief Intelligence Test, 2nd edition)	·Has a full scale IQ equal or above 80 as assessed by the WISC-IV	·Has a full scale IQ equal or above 85
	·Has a minimum score of 14 on the Pediatric Anxiety Rating Scale	·Has a minimum score of 12 on the Pediatric Anxiety Rating Scale	·Has a minimum score of 13 on the Pediatric Anxiety Rating Scale	
Exclusion Criteria	·Does not meet criteria for bipolar disorder, schizophrenia or schizoaffective disorder within the past 6 months	·Does not meet criteria for bipolar disorder, schizophrenia or schizoaffective disorder within the past 6 months	·Does not meet criteria for bipolar disorder, schizophrenia or schizoaffective disorder within the past 6 months	·Does not meet criteria for bipolar disorder, schizophrenia or schizoaffective disorder within the past 6 months

Table 1
(continued)

·Currently receiving psychotherapy, social skills training or behavioral interventions at the same time as the cognitive-behavioral psychotherapy	·Currently receiving psychotherapy, social skills training or behavioral interventions at the same time as the cognitive-behavioral psychotherapy	·Currently receiving psychotherapy, social skills training or behavioral interventions at the same time as the cognitive-behavioral psychotherapy	·Currently receiving psychotherapy, social skills training or behavioral interventions at the same time as the cognitive-behavioral psychotherapy
·Displays clinically significant suicidality or engages in suicidal behaviors within the last 6 months	·Displays clinically significant suicidality or engages in suicidal behaviors within the last 6 months	·Displays clinically significant suicidality or engages in suicidal behaviors within the last 6 months	·Displays clinically significant suicidality or engages in suicidal behaviors within the last 6 months
·Initiates an antidepressant within the 12 weeks preceding study enrollment or an antipsychotic within 8 weeks prior to study enrollment, or made any changes in established psychotropic medication (e.g., antidepressants, anxioloytics) within 8 weeks before study enrollment or during psychotherapy	·Initiates an antidepressant within the 12 weeks preceding study enrollment or an antipsychotic within 8 weeks prior to study enrollment, or made any changes in established psychotropic medication (e.g., antidepressants, anxioloytics) within 8 weeks before study enrollment or during psychotherapy	·Initiates an antidepressant within the 12 weeks preceding study enrollment or an antipsychotic within 8 weeks prior to study enrollment, or made any changes in established psychotropic medication (e.g., antidepressants, anxioloytics) within 8 weeks before study enrollment or during psychotherapy	·Initiates an antidepressant within the 12 weeks preceding study enrollment or an antipsychotic within 6 weeks prior to study enrollment, or made any changes in established psychotropic medication (e.g., antidepressants, anxioloytics) or an established medication within 8 weeks before study enrollment or during psychotherapy
·Parents are unwilling to accompany their children for multiple study visits	·Parents are unwilling to accompany their children for multiple study visits	·Parents are unwilling to accompany their children for multiple study visits	·Parents are unwilling to accompany their children for multiple study visits
·Has a significant and/or unstable medical condition that would interfere with therapy or needed constant medical attention	·Has a significant and/or unstable medical condition that would interfere with therapy or needed constant medical attention	·Has a significant and/or unstable medical condition that would interfere with therapy or needed constant medical attention	·Has a significant and/or unstable medical condition that would interfere with therapy or needed constant medical attention

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Table 2

Demographic and Diagnostic Characteristics of the Sample

	No.	%
Age, years		
7-11 years	41	59%
12-16 years	29	41%
Gender		
Male	59	84%
Female	11	16%
Ethnicity		
Caucasian	65	93%
Hispanic	3	5%
Asian	1	1%
Other	1	1%
Principal Diagnosis		
Social Phobia	33	47%
Obsessive-Compulsive Disorder	23	33%
Generalized Anxiety Disorder	9	13%
Separation Anxiety Disorder	5	7%

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Table 3

Demographic and Diagnostic Characteristics of the Sample by ASD Study

Study	Sample Size	Age (years) (Mean, Standard Deviation, Range)	Gender (n, %)	Ethnicity (n,%)	ASD Diagnosis (n, %)
ACH	21	Mean= 8.90, SD= 1.02, range= 7-11	Males= 17 (81%), Females= 4 (19%)	Caucasian: 18 (86%), Hispanic: 2 (10%), Asian: 1 (5%), Other: 0 (0%)	AD: 9 (43%), AS: 10 (48%), PDD: 2 (9%)
CCAL	8	Mean= 8.63, SD= 1.65, range= 7-11	Males= 8 (100%), Females= 0 (0%)	Caucasian: 8 (100%), Hispanic: 0 (0%), Asian: 0 (0%), Other: 0 (0%)	AD: 4 (50%), AS: 3 (38%) PDD: 1 (12%)
USF	19	Mean= 12.05, SD= 1.10, range= 11-13	Males= 14 (74%), Females= 5 (26%)	Caucasian: 18 (95%), Hispanic: 0 (0%), Asian: 0 (0%), Other: 1 (5%)	AD: 4 (21%), AS: 10 (53%), PDD: 5 (26%)
AASD	22	Mean= 12.95, SD= 1.40, range= 11-16	Males= 20 (91%), Females= 2 (9%)	Caucasian: 21 (95%), Hispanic: 1 (5%), Asian: 0 (0%), Other: 0 (0%)	AD: 6 (27%), AS: 9 (41%), PDD: 7 (32%)

Note: AD= Autistic Disorder, AS= Asperger's Syndrome, PDD= Pervasive Developmental Disorders- Not otherwise specified

Table 4

Kappa Coefficients for Inter-rater agreement on Parent and Child ADIS and Clinician

Diagnoses

	Inter-rater agreement on Parent ADIS	Inter-rater agreement on Child ADIS	Inter-rater agreement on Clinician Diagnoses (95% CI)
Separation Anxiety Disorder	1.00	1.00	0.85 (0.71-0.97)
Social Phobia	1.00	1.00	1.00
Specific Phobia	1.00	1.00	0.94 (0.85-1.00)
Panic Disorder	1.00	1.00	1.00
Generalized Anxiety Disorder	1.00	1.00	0.96 (0.89-1.00)
Obsessive-Compulsive Disorder	1.00	1.00	0.97 (0.91-1.00)
Posttraumatic Stress Disorder	1.00	1.00	1.00
Depressive Disorders	1.00	1.00	0.89 (0.74-1.00)
ADHD- Inattentive	1.00	1.00	1.00
ADHD- Hyperactivity	1.00	1.00	1.00
ADHD- Combined Type	1.00	1.00	1.00
Oppositional Defiant Disorder	1.00	1.00	0.97 (0.90-1.00)

*Note: CI= Confidence Interval, Depressive Disorders= Major Depressive Disorder and Dysthymia, ADHD= Attention Deficit Hyperactivity Disorder

Table 5

Kappa Coefficients for Inter-rater Agreement on Clinician

Diagnoses by Age and ASD Diagnosis

	Ages (7-11) (*n*=41)	Ages (12-16) (*n*=29)	Autistic Disorder (*n*=23)	Asperger's Disorder (*n*=32)	PDD-NOS (*n*=15)
Separation Anxiety Disorder	0.90 (0.76-1.00)	0.73 (0.44-1.00)	0.81 (0.56-1.00)	0.93 (0.79-1.00)	0.73 (0.39-1.00)
Social Phobia	1.00	N/A	1.00	1.00	N/A
Specific Phobia	0.94 (0.83-1.00)	0.93 (0.79-1.00)	0.86 (0.60-1.00)	0.94 (0.82-1.00)	1.00
Panic Disorder	1.00	1.00	N/A	1.00	1.00
Generalized Anxiety Disorder	1.00	0.89 (0.67-1.00)	1.00	1.00	0.87 (0.62-1.00)
Obsessive-Compulsive Disorder	1.00	0.93 (0.79-1.00)	0.91 (0.73-1.00)	1.00	1.00
Posttraumatic Stress Disorder	1.00	1.00	1.00	1.00	N/A
Depressive Disorders	1.00	0.83 (0.60-1.00)	N/A	1.00	1.00
ADHD- Inattentive	1.00	1.00	1.00	1.00	1.00
ADHD- Hyperactivity	1.00	1.00	1.00	1.00	N/A
ADHD- Combined Type	1.00	1.00	1.00	1.00	1.00
Oppositional Defiant Disorder	1.00	0.92 (0.77-1.00)	1.00	0.93 (0.80-1.00)	1.00

*Note: CI= Confidence Interval, Depressive Disorders= Major Depressive Disorder and Dysthymia, ADHD= Attention Deficit Hyperactivity Disorder, PDD-NOS= Pervasive Developmental Disorders- Not Otherwise Specified, N/A= data were not available due to sufficient data to find variability and low base rate