Assessment of Social Anxiety in Children and Adolescents With Autism Spectrum Disorder

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Despite the high prevalence of social anxiety in individuals with autism spectrum disorder (ASD), there is little agreement on how to best assess such problems in this population. To inform evidence-based assessment, we conducted a comprehensive review of research that has assessed social anxiety in children and adolescents with ASD without co-occurring intellectual disability. Although some evidence in support of the reliability of existing measures exists, there are concerns about inflated estimates of the co-occurrence of social anxiety because of symptom overlap with ASD diagnostic criteria, and the diagnostic sensitivity of existing measures is questionable. Recommendations for clinical assessment of social anxiety in this population and future directions for research on this topic, including the development of new measures, are provided.

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Anxiety is recognized as a common co-occurring problem among individuals with autism spectrum disorder (ASD; van Steensel, Bögels, & Perrin, 2011; White, Oswald, Ollendick, & Scahill, 2009). Social anxiety, in particular, is common among individuals with ASD who do not have co-occurring intellectual disability (ID; e.g., Kuusikko et al., 2008; van Steensel et al., 2011). Indeed, in the recently published *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM-5*;

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American Psychiatric Association [APA], 2013), it is stated that social anxiety is a hallmark of ASD. Van Steensel et al. (2011), in a meta-analytic review of anxiety disorders in ASD, estimated that approximately 16.6% of people under 18 with ASD have comorbid social anxiety disorder (SAD). Considerable debate exists regarding the nosology of anxiety in people with ASD and whether social anxiety is better characterized as a part of ASD or a comorbid disorder (Wood & Gadow, 2010). Despite overlap in diagnostic criteria between SAD and ASD, there is little empirical guidance on how to most accurately assess symptoms of social anxiety in people with ASD. The uncertain reliability and validity of currently utilized measures to assess anxiety in individuals with ASD and the need for the development of measures that assess the unique and distinct features of anxiety in individuals with ASD (Grondhuis & Aman, 2012; Ollendick & White, 2013; van Steensel et al., 2011) underscore this debate.

Some people with ASD may experience symptoms of social anxiety, although they may not meet diagnostic criteria for SAD. The *DSM-IV* (APA, 2000) specified that symptoms of SAD could not be better accounted for by a developmental disorder. The *DSM-5* (APA, 2013) currently specifies that when symptoms of another disorder, including anxiety disorders, are present and fulfill diagnostic criteria for that disorder (e.g., SAD), the disorder is diagnosed and considered comorbid to the ASD; however, for a SAD diagnosis, symptoms (e.g., fear, avoidance) must not be better accounted for by ASD. Also, some individuals with ASD may not meet diagnostic criteria for SAD due to lack of interference with daily activities specifically attributable to the social anxiety. In light of debate in the scientific community as to whether

symptoms of anxiety are a part of ASD or novel presentation of ASD, throughout this article, the term "social anxiety" will be utilized when referring to continuous, co-occurring symptoms of social anxiety, and "SAD" will be reserved for *DSM-IV*-based (APA, 2000) diagnosis.

CAUSES OF SOCIAL ANXIETY IN INDIVIDUALS WITH ASD

There is evidence that the presence of anxiety and physiological hyperarousal contributes to, or exacerbates, social disability in ASD (Kleinhans et al., 2010; Myles, Barnhill, Hagiwara, Griswold, & Simpson, 2001). In turn, social disability (e.g., severe and pervasive lack of age-appropriate social skills) appears to contribute, perhaps directly as well as indirectly via negative interactions with peers and social rejection, to heightened anxiety in social situations (Bellini, 2004). This bidirectional, mutually exacerbating relationship may be especially relevant for social anxiety among adolescents and adults with ASD without co-occurring ID (Kuusikko et al., 2008). A realistic worry about social failure and negative evaluation from peers has been associated with greater cognitive ability in youth with ASD, who may have increased self-awareness and desire for social engagement and friendship, but experience social confusion and lack the ability to establish and maintain relationships successfully (Bauminger, Shulman, & Agam, 2003; White & Schry, 2011). As such, individuals' social deficits associated with ASD may contribute to symptoms of social anxiety, such as increased social avoidance due to realistic fears of negative evaluation, rejection, and victimization (Wood & Gadow, 2010).

Behavioral similarities between social anxiety and ASD make distinguishing whether some symptoms (e.g., behavioral avoidance) are better accounted for by ASD or are indicative of co-occurring SAD challenging. Individuals with ASD sometimes evade social situations due to a lack of desire to share enjoyment with others or a lack of social reciprocity (APA, 2000). However, social disinterest cannot be assumed to underlie all social avoidance in individuals with ASD. Some social avoidance and isolation may be due to fear of rejection or peer judgment, as is seen in typically functioning individuals with social anxiety (Beidel & Turner, 2007). Avoidance of speaking in class or at work, going to social events, and participating in extracurricular activities and a lack of same-age peers may be indicative of the core deficits associated with ASD or social anxiety. In some cases, reality-based fears of rejection fuel avoidance of such situations (Bellini, 2004). Thus, the processes underlying social avoidance should be considered when determining whether symptoms are better accounted for by ASD or social anxiety. Clinicians may be subject to a "diagnostic overshadowing bias," or the attribution of symptoms to the previously diagnosed condition (ASD) rather than a separate but co-occurring mental disorder, in situations such as this (Grondhuis & Aman, 2012; Mason & Scior, 2004). Conversely, clinicians may, in some cases, attribute ASD symptoms to previously diagnosed SAD (Towbin, Pradella, Gorrindo, Pine, & Leibenluft, 2005).

Another difficulty encountered in assessing social anxiety in individuals with ASD is the possible unique presentation of social anxiety symptoms in this population. Social anxiety in ASD may be different from what is observed in typically developing individuals (those without ASD; Kerns & Kendall, 2012). Individuals with ASD may exhibit special clusters of symptoms of anxiety (Grondhuis & Aman, 2012) due to phenotypic alteration of anxiety, possibly related to ASD pathogenic processes (Wood & Gadow, 2010). For instance, Wood and Gadow (2010) have proposed that fear of negative evaluation and rejection in social situations, the core cognitive symptom within the tripartite model of SAD (Clark & Watson, 1991), may lead to more severe ASD symptoms such as increased repetitive, stereotyped, or rigid behaviors or behavioral problems, such as tantrums and noncompliance, for individuals with ASD. Thus, the presenting symptoms of social anxiety in people with ASD may differ in form from social anxiety as presented in individuals without ASD and may also exacerbate the ASD pathology. Further, because individuals with ASD often lack insight into their own emotions, thoughts, and internal states (Berthoz & Hill, 2005; Capps, Yirmiya, & Sigman, 1992; Lainhart & Folstein, 1994; MacDonald et al., 1989), they may be unable to identify their own anxiety spontaneously or when explicitly asked. Based upon anecdotal evidence, they might instead report vague "bad feelings," describe forms of physiological arousal (e.g., heart pounding,

upset stomach), or describe patterns of avoidance of certain social situations.

PRESENT REVIEW

To inform best practice assessment of social anxiety in ASD, we conducted a comprehensive review of the published research from the last 23 years on social anxiety in children and adolescents with ASD. Findings related to the frequency of social anxiety and the psychometric properties of the most frequently utilized measures employed to assess social anxiety are presented.

A stepwise process was undertaken to identify and summarize all studies that assessed social anxiety in children and adolescents with ASD without co-occurring ID (IQ ≥ 70). The decision to include only those without ID was made because social anxiety occurs more often in individuals with average cognitive ability (e.g., van Steensel et al., 2011). The process began with searches of three electronic databases: PsycInfo, Medline, and Google Scholar (1990–April 2013). The following search terms were used: "autism" or "Asperger's" and "social" and "anxiety." Only studies published in peer-reviewed journals were included in the search, so that the fullest possible reports (e.g., with complete sample descriptions) were used and to minimize review of multiple reports utilizing the same dataset. After all studies were obtained, abstracts were reviewed to determine whether they met inclusion criteria. Studies were included if social anxiety was directly assessed, regardless of modality of assessment, in individuals with ASD. Studies with samples comprised solely of individuals with co-occurring ID, studies that included developmentally delayed populations other than ASD, or studies that exclusively included individuals ages 16 and older or specified that the sample was comprised of adults (i.e., in studies without published age ranges) were excluded. The references of all studies meeting inclusion criteria were then reviewed, and additional relevant cited studies were obtained.

RESULTS

The initial literature search yielded 635 published articles, 32 of which met all specified inclusion criteria. The reference search yielded 13 additional articles that met all inclusion criteria. Additionally, a published article (Mazefsky, Kao, & Oswald, 2011) that was not found in the aforementioned search was added, as it met inclusion criteria. A total of 46 studies met all criteria (Table S1). These 46 articles used a total of 18 different measures to assess social anxiety. It is of note that although 46 separate studies were identified and efforts were made to omit redundant samples by only including the most comprehensive, or primary, report when multiple reports came from the same sample, it was not verified that all studies utilized completely unique or nonoverlapping samples.

Studies that utilized community or population-derived samples probably provide the most accurate and conservative estimate of the rate of SAD in the population of individuals with ASD. Results from such studies indicate that between 10.7% (Leyfer et al., 2006; ages 5–17) and 29.2% (Simonoff et al., 2008; ages 10–14) of individuals meet threshold or subthreshold *DSM-IV* criteria for SAD. Additionally, studies utilizing clinical or mixed community and clinical samples that did not intentionally recruit individuals with anxiety problems found that between 4% and 34.2% of their samples, spanning children and adolescents ages 5–18, met threshold or subthreshold *DSM-IV* criteria for SAD. Many studies included samples of quite a wide age range, given that SAD tends to emerge in adolescence. Mazefsky and colleagues' (2011) clinical sample (34.2% of whom met threshold or subthreshold criteria) and Simonoff and colleagues' (2008) population-derived sample, both of which restricted to individuals ages 10 and over, may provide the best estimate of the occurrence of SAD in clinical and population-derived samples with ASD, respectively (i.e., 34.2% and 29.2%).

Psychometric Properties of Currently Utilized Measures

Table S2 summarizes the psychometric properties of the 18 measures of social anxiety identified from the literature search. Internal consistency is measured across studies with Cronbach's alpha. When discussing Cronbach's alpha, the commonly used rules of thumb to describe internal consistency will be utilized (George & Mallory, 2003; $\alpha \geq .9$ excellent, $.9 > \alpha \geq .8$ good, $.8 > \alpha \geq .7$ acceptable, $.7 > \alpha \geq .6$ questionable, $.6 > \alpha \geq .5$ poor, $.5 > \alpha$ unacceptable). In examining rater agreement, interclass correlations (ICCs) will be

utilized, with Landis and Koch's (1977) qualitative descriptors (ICC > .80 outstanding, .79 ≥ ICC ≥ .60 substantial, .59 ≥ ICC ≥ .40 moderate, ICC < .40 poor). Correlation coefficients will be utilized in examining convergent and divergent validity. In describing the magnitude of relationships, Cohen's (1988) guidelines for the social sciences will be utilized ($r ≥ .5$ large, $.5 > r ≥ .30$ medium, $r < .30$ small). Not all included studies reported the specific statistics summarized below, so results are synthesized based on only those that were reported. Results are organized by assessment modality, namely, questionnaires and interviews.

Questionnaires. Questionnaires were the most commonly utilized method for assessing social anxiety. A total of 34 studies utilized 11 different self-report or parent-report questionnaires. The majority of studies utilized a combination of parent- and self-report questionnaires ($n = 13$), although many also utilized exclusively self-report questionnaires ($n = 10$) or exclusively parent-report questionnaires ($n = 11$). Only one study utilized a combination of parent-, self-, and other-report (teacher) questionnaires (Kalyva, 2010).

The most commonly utilized questionnaires were broad multidimensional screening measures of anxiety that contain social anxiety subscales: Multidimensional Anxiety Scale for Children (MASC; March, 1998; $n = 9$), the Self-Report for Childhood Anxiety Related Emotional Disorders (SCARED; Birmaher, Khetarpal, Cully, Brent, & McKenzie, 1995; $n = 5$), and the Spence Children's Anxiety Scale (SCAS; Nauta et al., 2004; $n = 10$). Of studies that reported internal consistency statistics for social anxiety subscales, reliability for parent- and child-report was found to range from questionable to good. Cronbach's alpha for subscales is likely lower than full-scale statistics owing to the comparatively smaller number of items included in subscales (Gliem & Gliem, 2003). In terms of rater agreement, in the three studies examining parent and child agreement, parents tended to report higher social anxiety symptoms than their children did. On the SCARED social anxiety subscale, moderate agreement was found between parent and child (ICC = .59), with nonsignificant agreement between parent and child on whether symptoms met clinical cut-off for social anxiety ($\chi^2 = 1.23$, $p = .27$; Blakeley-Smith, Reaven, Ridge,

& Hepburn, 2012), and with parents reporting significantly higher scores than their children (van Steensel, Bögels, & Dirksen, 2012; *estimate* = −.37, $p < .001$). A small association between parent and child on the MASC social anxiety subscale was also found (Renno & Wood, 2013). Blakeley-Smith et al. (2012) found that parent-reported child metacognitive ability, but not verbal IQ, was significantly correlated with parent–child agreement on social anxiety ($r = .31$, $p < .01$).

In support of convergent validity, or the degree to which a measured construct converges with other constructs it should theoretically be related to, in the one study (Renno & Wood, 2013) that examined the relationship between child- and parent-report on social anxiety subscales and SAD severity as rated during clinical interview, the relationship between child- or parent-report and SAD severity (clinician rated) was small regardless of informant. For both child- and parent-report, most relationships to similar constructs (e.g., social skills [inverse relationship], ASD traits [both parent-report via questionnaire and diagnostic interview and directly observed], insistence on sameness/circumscribed interests, behavioral inhibition) indicated small to medium convergence; however, there was large convergence with loneliness (White & Roberson-Nay, 2009). Little exploration of the discriminant validity (i.e., whether theoretically unrelated constructs are indeed statistically unrelated) or the criterion validity (i.e., the degree to which measures are predictive of concrete criteria in the real world) of social anxiety subscales within broad-band measures has been carried out.

In examining the factor structure of anxiety in children with ASD utilizing broad measures of anxiety, there has been conflicting evidence regarding the distinctiveness of social anxiety as a construct separable from other manifestations of anxiety. Hallett et al. (2013), in an exploratory factor analysis of the Child and Adolescent Symptom Inventory (CASI; Gadow & Sprafkin, 1994, 1997) with an ASD sample, found that the two items from the social anxiety screen strongly loaded on a social anxiety factor (.63, .65), and not on other subdomains of anxiety (i.e., Generalized Anxiety, Separation Anxiety, Over-arousal), suggesting the discrimination of social anxiety from other subtypes of anxiety and general physiological arousal. However, Renno and Wood (2013), in a series of confirmatory

factor analysis models, found a lack of evidence of reliable discrimination among anxiety subtypes (i.e., SAD, separation anxiety disorder), although they found evidence of the discrimination between symptom domains (e.g., uniqueness of anxiety subscales and ASD severity).

Several studies also utilized questionnaires specifically designed for the assessment of social anxiety: Social Anxiety Scale for Adolescents (SAS-A; La Greca & Lopez, 1998; $n = 2$), Social Anxiety Scale for Children–Revised (SASC-R; La Greca & Stone, 1993; $n = 2$), Social Worries Questionnaire (SWQ; Spence, 1995; $n = 3$), Social Anxiety and Anxiety Inventory–Child Version (SPAI-C; Beidel, Turner, & Fink, 1996; $n = 3$). Internal consistency estimates for these social anxiety measures for both child- and parent-report ranged from good to excellent (αs range from .82 to .96), but no data on inter-rater agreement could be found. All but one study utilized measures in their original form. Kuusikko et al. (2008) removed several items, deemed to have overlap with symptoms of ASD, from two measures. In support of construct validity of the altered scales, both the original and revised forms were found to strongly correlate with one another. Across measures, most relationships to similar constructs indicated small to medium convergence (e.g., social skills [inverse relationship], internalizing disorders); however, there was large convergence with resting lateral frontal electroencephalography (EEG) asymmetry (Sutton et al., 2005). No studies utilizing social anxiety questionnaires reported on the relationship between social anxiety and other unrelated measures, nor did they report statistics related to criterion validity.

In examining face validity, the degree to which a test appears to assess the construct it is intended to assess, item-level examination of the most commonly utilized questionnaires (i.e., MASC, SCAS, SCARED) shows that both parent- and self-report questionnaire-format measures contain items that assess cognitive and emotional components of social anxiety, but do not contain items indicative of behavioral avoidance and physiological symptoms (examples of cognitive components of social anxiety include "I worry about people laughing at me" and "I am shy"; examples of emotional components of social anxiety include "I feel shy around people I don't know well" and "I feel afraid when I have to talk in front of the class").

Interviews. A total of 24 studies utilized seven different interviews to assess for SAD in individuals with ASD. A combination of parent interviews and child interviews was most commonly utilized ($n = 14$), and several studies utilized exclusively parent interviews ($n = 10$). The interviews were primarily semi-structured ($n = 5$), and two were structured. The majority of studies have utilized original versions of existing semi-structured interviews (e.g., Anxiety Disorder Interview Schedule–Child/Parent Version [ADIS-C/P]; Silverman & Albano, 1996; $n = 14$)); one these studies administered the interview jointly to parent and child to accommodate for difficulties with self-report in this population (White et al., 2013). Several of the studies that utilized original versions of interviews specified that to receive a SAD diagnosis, avoidance had to be better accounted for by anxiety (e.g., fear of evaluation) as opposed to ASD symptomatology (e.g., disinterest in social situations; e.g., White et al., 2013), and in several studies, exclusionary rules in *DSM-IV* with regard to ASD were not applied in the diagnosis of Axis I disorders (e.g., Mattila et al., 2010; Mukaddes, Herguner, & Tanidir, 2010). Two studies (Leyfer et al., 2006; Mazefsky et al., 2011) utilized an interview that was specifically developed for use with individuals with ASD (Autism Comorbidity Interview Present and Lifetime Version [ACI-PL]; Leyfer et al., 2006).

In terms of inter-rater reliability, outstanding agreement between interviewer and a clinician (not the interviewer) and consensus team ratings on severity ratings and diagnosis has been reported (Reaven, Blakeley-Smith, Culhane-Shelburne, & Hepburn, 2012; van Steensel et al., 2012; Wood et al., 2009). In regard to convergent validity, aside from the weak relationship between semi-structured SAD clinician severity rating (CSR) and self- and parent-report on questionnaires previously mentioned, small to medium convergence between SAD CSR and ASD severity (positive relationship with observed impairment, negative relationship to parent-reported impairment) was found. With respect to discriminant validity, no difference was found in the IQ level of those who met diagnostic criteria for SAD in clinical interview and those who did not (Mazefsky et al., 2011), although it is notable that there was a restricted range of IQ in this sample (i.e., > 70),

potentially accounting for nonsignificant differences in this domain.

DISCUSSION

The frequency with which social anxiety presents as a clinical problem among adolescents and adults with ASD makes its accurate assessment critical. We sought to determine the psychometric soundness of measures currently utilized to assess social anxiety in this clinical population. Several measures have been used for the assessment of social anxiety in ASD. There is not, however, any measure that has been consistently used and demonstrated to have superior (or even uniformly strong) psychometric properties. There is preliminary evidence that some of the most commonly used measures of social anxiety in non–ASD children may not be as valid when used with young people who have ASD (e.g., Renno & Wood, 2013). Some investigators have made modifications to existing measures for use with individuals with ASD (Kuusikko et al., 2008), and one measure has been developed specifically to assess for comorbid diagnoses in individuals with ASD (Leyfer et al., 2006).

Almost without exception, measures used to assess social anxiety in ASD have demonstrated acceptable to excellent internal consistency. However, concordance between parent- and self-report on questionnaires of social anxiety tends to be quite weak (e.g., Renno & Wood, 2013), with parents tending to report higher levels of social anxiety (van Steensel et al., 2012), and nonsignificant agreement between parent and child in regard to whether symptoms meet clinical cut-off for social anxiety (Blakeley-Smith et al., 2012). There has been very little examination of the temporal stability of any of the measures. Moreover, the construct validity of currently utilized assessment measures is unclear. Although strong concordance was found between different measures of social anxiety, and social anxiety was moderately to strongly related to other theoretically related constructs (e.g., social deficits, loneliness), weak relationships between self- and parent-report ratings on questionnaires and severity ratings in structured clinical interviews were noted. In examining the structure of anxiety in ASD populations, there is evidence to suggest the discriminability of social anxiety from ASD severity; however, there is mixed evidence on the discriminability of subtypes of anxiety (e.g., Hallett et al.,

2013; Renno & Wood, 2013). Although several interviews have been used with this population, at times with modifications made to administration, minimal information regarding the validity of these clinical interviews has been reported. The only diagnostic interview developed specifically for youth with ASD, the ACI-PL (Leyfer et al., 2006), has been used less often than other semi-structured interviews, and there have been no studies comparing sensitivity of interviews with the same sample.

Reported reliability estimates of the most commonly utilized questionnaires and interviews are comparable to reliability estimates obtained from typically functioning populations (e.g., La Greca & Stone, 1993; March, 1998). Although weak parent–child concordance was noted among self-report questionnaires, similarly low parent–child agreement is also noted in non–ASD samples (e.g., Achenbach, McConaughy, & Howell, 1987; Duhig, Renk, Epstein, & Phares, 2000; Renk & Phares, 2004). However, it is notable that parent–child agreement on social anxiety among individuals with ASD was substantially lower as compared to typically functioning children with anxiety disorders in one study (van Steensel et al., 2012). Additionally, among ASD samples, parent–child agreement was substantially lower for social anxiety as compared to other anxiety subscales (i.e., separation anxiety) and total anxiety (Renno & Wood, 2013). This may be due in part to the reliance on self-report and introspection in assessing social anxiety, whereas some other forms of anxiety have clearer behavioral indicators (e.g., tantruming upon separation in the case of separation anxiety). Minimal information regarding the validity of existing measures with individuals with ASD is available. There is some evidence of convergent validity of measures of social anxiety, consistent with estimates reported in the typically functioning literature (e.g., La Greca & Lopez, 1998; La Greca & Stone, 1993). The fairly weak correlations seen across assessment modalities have also been noted in the non–ASD child anxiety literature (Silverman & Ollendick, 2005).

The largely adequate internal consistency estimates of measures suggest that items comprising the various measures are assessing some fairly unified construct; however, it is not clear whether the measured construct is, in fact, social anxiety as it is expressed in individuals with ASD. Taken together, the poor agreement

between child- and parent-report, such that parents report higher levels of social anxiety, the lack of convergence between child- and parent- report in regard to clinical threshold (e.g., Blakeley-Smith et al., 2012), mixed evidence of the discriminability of social anxiety from other subtypes of anxiety, and the lack of convergence between questionnaires and CSRs for SAD suggests that youth with ASD are perhaps unable to report their own symptoms on self-report measures at a level adequate for diagnostic purposes, or the possibility that currently utilized measures are not assessing some of the key features of social anxiety in individuals with ASD.

The majority of social anxiety measures that have been utilized in this population were designed, normed, and validated with typically functioning populations. This is potentially problematic for two reasons: Items from existing measures may not fully capture social anxiety as manifested in individuals with ASD and/or some of the items on existing measures may actually assess behaviors characteristic of the core domains of ASD. Such limitations can, respectively, underestimate (fail to detect) or overestimate (lead to false positives) truly comorbid social anxiety in ASD.

Challenges in the Assessment of Social Anxiety in Individuals With ASD

The assessment of social anxiety in individuals with ASD presents unique clinical challenges. To address difficulty in disentangling symptoms of social anxiety and ASD, some researchers have removed items from social anxiety measures that overlap with ASD (Kuusikko et al., 2008). However, caution must be taken in simply removing items that have overlap with ASD traits. In particular, items related to behavioral avoidance have particularly high overlap with ASD. However, such items may truly be more indicative of social avoidance due to fear and, as such, more related to comorbid social anxiety than reflective of ASD. Thus, it is important to assess whether social avoidance, when endorsed, is related to social disinterest or social anxiety and fear. This point highlights the need for multimodal assessment for diagnostic purposes and the benefit of following brief screening measures with more in-depth examination.

Also, given potential difficulties experienced by individuals with ASD in accurate symptom reporting (e.g.,

Berthoz & Hill, 2005; Capps et al., 1992; MacDonald et al., 1989), further research is necessary to determine observers' ability to recognize behavioral aspects of social anxiety in people with ASD (e.g., perspiration, physical restlessness), in light of the typical reliance on others' (e.g., parents) reports (Mazefsky et al., 2011). Research has shown that parent-reported symptoms are at least as strongly related to diagnosis as are self-reported symptoms among children without ASD (Wood, Piacentini, Bergman, McCracken, & Barrios, 2002). It may be the case that parents of youth with ASD have more insight into the social worries and anxiety of the child than does the child him- or herself. Indeed, previous research has suggested that, among clinically anxious children with ASD, parents rate their children with significantly more social anxiety than the children themselves express (Gillott, Furniss, & Walter, 2001; Russell & Sofronoff, 2005). However, clinicians should be cautious when relying on parent-report. Parents have limited ability to report on their child's internal cognitions (e.g., fear of negative evaluation) or behavior in multiple contexts (e.g., school or other social contexts), which may be particularly important given the influence of social anxiety on peer relationships. An observational measure, in which specific behaviors indicative of social anxiety in ASD are coded objectively, could have great clinical and scientific potential. However, anxiety may not always lend itself to observation by a third party, and there are unobservable features of anxiety (e.g., rejection fears) that are impossible for another person to report on (e.g., Grills & Ollendick, 2002), much less code accurately during brief observations.

Implications and Recommendations for Assessment and Future Research

The accurate assessment of social anxiety is important as, in typically developing populations, heightened anxiety has been related to limited social networks, poor self-esteem, and depressed performance in social interactions (e.g., Neal & Edelmann, 2003). In individuals with ASD, it is likely that social anxiety exerts a similar adverse impact on functioning. Some research has demonstrated that high anxiety covaries with ASD severity (more social deficits and core ASD symptoms; e.g., Cath, Ran, Smit, van Balkom, & Comijs, 2008), suggesting that social anxiety may be related to

behavioral avoidance, social deficits, hostility, tantrums, rigidity, and an exacerbation of speech fluency problems (Kelly, Garnett, Attwood, & Peterson, 2008). As it has been demonstrated that cognitive behavioral therapy targeting anxiety leads to ASD symptom decline as well as anxiety symptom reduction (e.g., Chalfant, Rapee, & Carroll, 2007; White et al., 2013; Wood et al., 2009), the treatment of co-occurring social anxiety may be an important step in addressing common behavioral problems and social deficits in individuals with ASD. In clinical practice, it is recommended that clinicians regularly assess for the presence of clinically impairing social anxiety in individuals with ASD, especially in adolescent clients without ID.

Given the prevalence and clinical significance of social anxiety in individuals with ASD, the availability of psychometrically sound measures of social anxiety that are practical to use for this population is crucial. We conclude that more research is needed to examine the psychometric properties of measures of social anxiety with individuals with ASD. Although several different measures have been used across a number of studies, limited data on the sensitivity and validity of such measures make comparison of findings (e.g., of reported rates of co-occurrence) across studies difficult. It is also notable that while social anxiety tends to emerge in adolescence (e.g., Bellini, 2004; Kuusikko et al., 2008), in the present review, only 10 of the 46 studies concentrated exclusively on individuals over the age of 10. Although this review concentrated on children and adolescents, more research investigating the psychometric properties of currently utilized measures is needed with adults with ASD in particular.

As has been emphasized in recent reviews of anxiety presentation and classification in individuals with ASD (Kerns & Kendall, 2012; Wood & Gadow, 2010) and the assessment of anxiety in this population (Grondhuis & Aman, 2012; van Steensel et al., 2011), a shift toward measure development and validation is needed. Careful examination of the psychometric properties, particularly the criterion validity, of existing commonly utilized assessment tools is essential. Given the inconsistent support for the utility and validity of existing measures of social anxiety when used with people who have ASD and the potentially unique symptom manifestation of social anxiety in this population, a logical next step in social anxiety research in individuals with ASD is the development and subsequent validation of an empirically derived measure designed specifically to assess social anxiety as is manifested in this population. A bottom-up approach in selecting items relevant to the potential unique manifestation of social anxiety in individuals with ASD is warranted. Given aforementioned difficulties in accurate self-report in this population and low rater agreement seen in existing measures, efforts to create a questionnaire measure with versions for both parent and child and other informants (e.g., teacher) are necessary. The utilization of other informants may inform diagnosis, given that the behavior of children and adolescents in social situations may be more clearly seen by teachers, who witness the child's interactions with peers on a daily basis. The authors have endeavored to develop an empirically derived self-report screening measure of social anxiety designed for adolescents and adults with ASD based upon feedback from experts in anxiety disorders and ASD and behavioral coding of individuals diagnosed with comorbid ASD and social anxiety (Kreiser & White, 2011); however, at present, no information regarding the psychometric properties of this newly created measure is available (measure may be obtained by contacting first author). If such measures are found to be reliable and valid, their use may help to efficiently identify individuals at risk of clinically impairing social anxiety who require a more comprehensive diagnostic assessment.

As the field awaits further research examining psychometric properties of existing measures and the development and validation of newly designed measures, clinicians and researchers should proceed with caution in the assessment of social anxiety in individuals with ASD. Given the questionable psychometric properties of existing measures, the potential unique manifestation of anxiety, and difficulties in self-reporting subjective symptoms in this population, a multi-method and multi-informant approach to assessment is strongly encouraged. The administration of existing self- and parent-report questionnaires may be a useful starting point to screen for potential behavioral, emotional, or cognitive indicators of social anxiety. In our experience, the adaptation of semi-structured interviews may be necessary (e.g., to accommodate difficulties with accurately reporting on the time-course

and history of events and symptoms). Interviews such as the ADIS-C/P may be administered jointly with both parent and child together to assist with difficulties the individual with ASD may have in reporting, while still obtaining valuable information from multiple perspectives. Clinicians may wish to supplement existing semi-structured interview questions with additional questions to discern whether avoidance is related to evaluative fears or lack of social motivation. Important considerations include the individual's awareness of how others perceive them, desire to socially interact or have friends, and fears of negative evaluation or embarrassment in social situations versus anxiety related to other aspects of social situations (e.g., overarousal, environmental stimulation; White, Schry, & Kreiser, in press). The course of symptoms should also be assessed to determine whether anxiety symptoms represent a change from prior functioning. Given the possibility that anxiety may present uniquely in individuals with ASD (e.g., Wood & Gadow, 2010), unique behavioral indicators of social anxiety in this population (e.g., increase in repetitive behaviors or restricted interests, tantrums, or noncompliance) should be considered in addition to behavioral avoidance, as assessed by existing measures.

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SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article:

Table S1. Studies Measuring Social Anxiety in Children and Adolescents with ASD.

Table S2. Psychometric Properties of Measures Used to Assess Social Anxiety in Children and Adolescents with ASD.