

**The Development of a Social Anxiety Measure for Adolescents and Adults
with ASD**

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Abstract

Despite numerous studies documenting the high prevalence of social anxiety in children and adolescents with High Functioning Autism Spectrum Disorder (HFASD), there has been little empirical investigation into methods for the assessment of social anxiety in this population. The purpose of this study was to create an empirically derived screening instrument to measure subjective feelings of social anxiety in adolescents and adults with HFASD. Based on a thorough review of the literature in this area, items from all measures ($k = 15$) used to assess social anxiety in adolescents and adults with HFASD were compiled. After collapsing similar items into one composite item, a pool of 86 items were included in an electronic survey that was sent to experts ($n = 99$) in the field of anxiety disorders in ASD. Experts ranked the degree to which each item was indicative of social anxiety in HFASD. Based on expert responses, 30 items were selected as the most representative for assessing social anxiety in the target population. In the second phase of the study, experts were asked to rate the final pool of items comprised of the 30 derived from phase I and 10 additional items developed from expert feedback and coding of taped diagnostic interviews with adolescents with HFASD and social anxiety. A final screening measure was derived comprised of 31 items. Future directions and use of the newly formed measure are discussed.

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1.0 - Introduction

The frequency with which social anxiety occurs as a secondary psychiatric problem in people with High Functioning Autism Spectrum Disorder (HFASD) (e.g., individuals with ASD without co-occurring intellectual disability) denotes the importance of the availability of a valid screening tool. Several studies (e.g., Bellini, 2004; Kuusikko et al., 2008; Leyfer et al., 2006) have shown that social anxiety, in particular, is more prevalent in youth with ASD than in typically developing peers. Studies using population derived (Kuusikko et al., 2008; Simonoff, Pickles, Charman, Chandler, Loucas, & Baird, 2008), community (e.g., Chalfant, Rapee, & Carroll, 2007; Farrugia & Hudson, 2006; Leyfer et al, 2006), and clinical samples (e.g., Bellini, 2004; Cath, Ran, Smit, van Balkom, & Comijs, 2006; Gillot, Furniss, & Walter, 2001), utilizing a variety of measures of symptoms of social anxiety and diagnostic interviews demonstrate that between 9% and 57% of children and adolescents with HFASD exhibit clinical level symptoms of social anxiety. Social anxiety may also be common in adults with HFASD, but few studies have examined this (Hovfander et al., 2009; Ketelaars et al., 2008).

Clinically, the lack of availability of valid/reliable measures of social anxiety in this population is disconcerting, given the importance for clinicians to recognize and treat social anxiety in individuals with ASD so that such impairing co-occurring symptoms can be appropriately managed and treated. Interventions for people with ASD typically are not intended to treat the core symptoms of the disorder, or ‘cure’ the ASD per se; rather, treatment more often addresses specific symptoms and behaviors, such as aggression or anxiety. The assessment of social anxiety symptoms is particularly important, in light of literature showing that youth with HFASD are responsive to treatment of anxiety symptoms (Chalfant, Rapee, & Carol, 2007). Additionally, it is important to identify and treat social anxiety symptoms in individuals with ASD as excessive worry and distress in social situations may serve as a barrier to establishing relationships (Bellini, 2006). As social demands increase during adolescence and adulthood, the lack of close friends and support may be especially impairing for adolescents and adults with ASD and comorbid social anxiety.

Despite the importance of the accurate identification of social anxiety in individuals with HFASD, there is evidence that currently used measures may be insufficient in measuring social anxiety as it is presenting in individuals with ASD. There is currently limited information about the psychometric properties of the most commonly used measures of social anxiety in this

population; however, there is some evidence that currently used self-report measures may not be sensitive to measuring social anxiety. Further, the most commonly used measures may not be measuring components of social anxiety (e.g., behavior/avoidance and physiological symptoms), which may be key characteristics of social anxiety in individuals with HFASD.

The purpose of this study was to create an empirically derived screening measure of social anxiety in adolescents and adults with HFASD ($IQ \geq 70$). This instrument was created to measure subjective feelings of social anxiety in a clinical or research setting. The instrument was designed to be a brief measure of social anxiety that can be completed in a clinician's waiting room prior to treatment. Also, the instrument may be used as a brief measure of social anxiety in research settings.

In creating this measure, the aim was to measure subjective social anxiety globally (i.e., not according to subtype) and dimensionally (i.e., continuously, rather than for diagnostic criteria). This decision was made due to issues related to diagnostic distinction and the debate as to whether Social Phobia (SoP) is a true comorbidity in this population (Wood & Gadow, 2010). SoP is the Diagnostic Statistical Manual (DSM-IV-TR: APA, 2000) disorder, which is defined by "a marked and persistent fear of social or performance situations in which embarrassment may occur" (p. 450). Although ASD and SoP can be dually diagnosed, and ASD is not a 'rule-out' condition for SoP, the DSM-IV-TR stipulates that in order to diagnose an individual with SoP, the person must have at least one age-appropriate social relationship with a peer and the fear or avoidance of social or performance situations cannot be better accounted for by a Pervasive Developmental Disorder (PDD) (APA, 2000). For a diagnosis of ASD, on the other hand, an individual must exhibit at least two symptoms of social impairment, one of which is a failure to develop peer relationships appropriate to developmental level (APA, 2000). While an individual with ASD may not meet the criteria for receiving a diagnosis of SoP due to limitation in capacity to form appropriate peer relationships, it is still possible for such an individual to desire to form relationships and experience impairing anxiety in social or performance situations. Thus, we conceptualize social anxiety as including symptoms indicative of SoP, but not exclusive to DSM-based diagnostic criteria of SoP (e.g. capacity for same-age friends).

In the following sections, the clinical challenges associated with the accurate assessment of social anxiety in individuals with ASD will be reviewed. Additionally, the psychometric properties of the most commonly used measures of social anxiety in individuals with ASD will

be examined. Lastly, both a theoretical and psychometric rationale for the creation of a new measure of social anxiety for use in this population will be provided before summarizing the goals of the present study.

1.1 - Challenges in the Assessment of Social Anxiety in ASD

One of the greatest clinical challenges in assessing social anxiety in individuals with HFASD, is distinguishing whether certain surface similarities between ASD and social anxiety are indicative of the symptoms associated with ASD or are indicative of co-occurring social anxiety in these individuals. For example, individuals with ASD sometimes evade social situations due to a lack of desire to share enjoyment, interests, or achievement with others or a lack of social reciprocity (Bellini, 2004). However, social withdrawal does not always demonstrate a lack of interest in social relationships in individuals with ASD. Such avoidance of social situations and isolation may be due to co-occurring social anxiety, as is seen in typically functioning individuals with social anxiety (Beidel & Turner, 2007). Thus, it can be difficult to differentiate whether social avoidance behaviors are indicative of deficits associated with ASD or co-occurring social anxiety. For instance, an individual's avoidance of speaking in class or at work, going to social events, and extracurricular activities and lack of same age peers may be indicative of the core deficits associated with ASD or social anxiety. On the surface, an individual's avoidance of social interactions related to lack of desire or distress caused by environmental factors could look similar to avoidance of social interactions evoked by fear or rejection or peer judgment. Thus, it is important to investigate the process underlying withdrawal or social avoidance of interpersonal contact in determining if such behavior is related to social anxiety or better accounted for by a lack of interest in social relationships.

Another difficulty encountered in assessing social anxiety in individuals with HFASD is the possible unique symptom presentation of social anxiety in this population, which may be different from what is observed in typically developing individuals (those without ASD) with social anxiety. Because individuals with ASD often lack insight into their feelings and internal states, such individuals may lack the ability to identify their own feelings, such as anxiety, when asked. Such individuals may be able to better identify overt symptoms associated with anxiety (e.g., avoidance); however this has not been empirically examined. Anxiety may be expressed in behaviors such as increased rigidity or stereotyped behaviors (Weisbrot, Gadow, DeVincent, & Pomeroy, 2005), withdrawal, and heightened interest in restricted interests. Given this possible

unique presentation of symptoms, in utilizing evidence-based assessments designed for typically developing populations with individuals with ASD, it is possible that specific core symptoms of ASD may be misidentified as co-occurring anxiety. Specifically, self- and parent-report measures of social anxiety may include items that tap into core social skills deficits or avoidance of social situations unrelated to social anxiety.

Also, in assessing social anxiety in this population, limitations in both self and parent report measures must be considered. When using self-report measures, one primary difficulty is that individuals with ASD often having cognitive and communication deficits, such as impaired thought recognition (Lainhart & Folstein, 1994), difficulty understanding and expressing emotion, lack of insight into social and emotional problems (Capps, Yirmiya, & Sigagmn, 1992; MacDonald et al., 1989), lack of self-reflection, and inaccurate perception of how they differ from others (Tantam, 2003), making self-reporting on internal anxious states difficult for such individuals. Difficulties with these skills could suggest that self-reports of individuals with ASD may not provide an accurate portrayal of existing psychological problems.

When utilizing parent report measures, such measures are often preferred to self-report measures in individuals with ASD (Mazefsky, Kao, & Oswald, 2011) and there are several advantages to using parents as informants. Research has shown that parent-reported symptoms are at least as strongly related to diagnosis as are self-reported symptoms (Wood, Piacentini, Bergman, McCracken, & Barrios, 2002). As such, 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. In support, previous research has suggested that, in clinically anxious children with ASD, parents rate their children with significantly more social anxiety than children express themselves (Gillot, Furniss, & Walter, 2001; Russell & Sofronoff, 2005).

However, there are several limitations to the use of parent-reports. Limitations in using parent reports include parents' limited ability to report on their child's behavior at school and in other social situations, which may be particularly important, as the parent may not have the opportunity to observe his or her child in interactions with peers in which the child may be particularly anxious. Additionally, social anxiety may not always lend itself to observation by a third party. While a parent may observe his or her child engaging in avoidance of social situations, it may be difficult for him or her to comment on the internal experience of anxiety in his or her child. Another concern is the increased levels of anxiety and phenotypic expression of

autistic traits that has been observed in parents of individuals with ASD (Bailey, Palferan, Heavy, & Le Couteur, 1998). Parents experiencing high levels of anxiety may rate their child as having higher levels of anxiety (Briggs, Gowan, & Schwabb-Stone, 1996; Frick, Silverthorn, & Evan, 1994). Alternatively, it is possible that parents expressing phenotypical traits of ASD may have a difficult time recognizing and reporting symptoms of anxiety in their child, although this has not been empirically examined.

It is also notable that in addition to parent and child reports, structured clinical interviews have been used in order to diagnose SoP in individuals in this population (e.g., Blakeley-Smith et al., 2010; Chalfant, Rapee, & Carroll, 2007; Cruz et al., 2010; Multimodal Anxiety and Social Skills Intervention (MASSI) White: K01mh079945; Wood, Drahota, Sze, Har, Chiu, & Langer, 2009). Interviews are typically administered to parents; however, one ongoing study (MASSI) jointly administered the Anxiety Disorder Interview Schedule – Child Version (ADIS-C: Silverman & Albano, 1996) to parent and child. It is notable that at least one measure, the Autism Comorbidity Interview-Present and Lifetime Version (Leyfer et al., 2006) is a comprehensive, diagnostic measure that has been specifically developed for use with youth with ASD. Although the creation of such an interview is an important methodological advance in the field, such measures can be time-intensive and require highly trained staff to administer them, making them impractical for usual clinical practice.

In sum, there are several unique challenges in the assessment of social anxiety in individuals with HFASD. Such challenges include difficulties in differential diagnosis and the possible unique symptom presentation of social anxiety in this population. Also, there are unique limitations in both parent and child reports in this population, which may also pose difficulties in accurate assessment.

1.2 - Psychometric Properties of Currently Used Measures

Several measures have been used to evaluate social anxiety in individuals with ASD; however, little research has looked at the reliability and validity of such measures, and most assessment instruments utilized do not specifically measure social anxiety (i.e., most measures assess anxiety broadly and typically only have several questions specific to social anxiety). Table 1 summarizes the known psychometric properties of 19 measures of social anxiety that

have been utilized in published studies and abstracts in individuals with HFASD. The following section summarizes the psychometric properties of some of the most commonly used measures that have been used to assess social anxiety in individuals with HFASD.

The Multidimensional Anxiety Scale for Children (MASC: March, 1998), a self report measure of anxiety, is the most commonly used self report measure to assess social anxiety in this population. To date, six published studies and/or abstracts have used this measure, and 46.9% (15 out of 32) of experts in the field of social anxiety and ASD in this study indicated that the MASC is one of the measures of social anxiety that they most commonly use. Also, the parent report version of the measure (MASC-P) has been used in four different studies. This measure contains nine items related to social anxiety which compose a social anxiety subscale score containing two components of social anxiety: humiliation/rejection and performance fears. Table 1 summarizes the available psychometric properties of the MASC and MASC-P.

In examining the reliability of the MASC, acceptable internal consistency was found using data from an ongoing study (MASSI). In terms of rater agreement, low correlations between the MASC parent and child versions were found (MASSI). However, low parent and child agreement, in the range of .20, is consistent with meta-analyses of studies in typically functioning literature (e.g., Achenbach, McConaughy, & Howell, 1987; Duhig, Renk, Epstein, & Phares, 2000; Renk & Phares, 2004). Further, the low parent-child agreement is consistent with that reported in the use of the MASC social anxiety subscale in a typically functioning population. No other known studies have examined the reliability of the social anxiety subscale of the child or parent version of the MASC.

In terms of construct validity, no studies have examined concurrent validity of the MASC with other self-report measures of social anxiety. However, one study has shown that no significant relationship exists between the MASC social anxiety subscale with the Adolescent Symptom Inventory (ASI: Gadow & Sprafkin, 1998), which is a parent-report anxiety screener containing two items pertaining to social anxiety (MASSI). In examining divergent validity, scores on the MASC were not found to be strongly related to other measures such as parent reported adaptive behavior, other behavior problems (e.g., irritability, hyperactivity), or verbal IQ (MASSI). Further, two studies have found that the MASC is not related to social ability (MASSI; White & Robertson-Nay, 2009) and another study found a significant negative correlation between the MASC and a measure of assertion (Bellini, 2004). In examining

criterion validity, the sensitivity of the MASC in detecting clinically diagnosed SoP was weak (MASSI), identifying only 41% of cases of diagnosed SoP (MASSI). However, it is notable that the sensitivity may be hindered by the small sample size and low proportion of possibilities for ‘false positives’ or ‘true negatives’. In comparing the sensitivity of the MASC social anxiety subscale in this sample to a sample of typically functioning individuals, the sensitivity of the MASC in this sample of adolescents with ASD was more than 20% lower (Wood et al., 2002; $n = 186$, ages 8-17, sensitivity = 63%).

In examining the face validity of the MASC, upon inspection of the items, it appears that although items measure both performance fears and humiliation/rejection aspects of social anxiety, the nine items predominantly measure cognitive aspects of social anxiety (e.g., “I worry about other people laughing at me”, “I’m afraid that other kids will make fun of me”, and “I worry about what other people think of me”), only one item specifically measures an emotion (“I feel shy”), and none of the items measure behavioral avoidance or physiological symptoms of social anxiety. Although such items may accurately represent social anxiety symptoms for typically functioning populations, such items may not accurately reflect the range of symptoms and possible unique manifestation of social anxiety in individuals with HFASD.

The Spence Children’s Anxiety Scale (SCAS: Nauta, 2004), a broad measure of anxiety, is another commonly used measure of social anxiety in individuals with HFASD. Of the measure, six items form a subscale to assess social anxiety. To date, six published studies and/or abstracts have used this measure; however, no experts in the field of social anxiety and ASD in this study reported that this was one of the measures they most commonly used to assess for social anxiety in this population. Although this measure has been utilized in several studies with individuals with HFASD, no specific information has been reported in regard to reliability or validity of the social anxiety subscale (Table 1). In examining face validity, three of the items measure emotional aspects of social anxiety (e.g., “I feel scared when I have to take a test” and “I feel afraid if I have to talk in front of my class”) and three of the items measure cognitive aspects of social anxiety (e.g., “I worry that I will do badly at my school work” and “I worry what other people think of me”); however, none of the items measure behavioral avoidance or physiological symptoms of social anxiety.

The Screen for Child and Anxiety Related Emotional Disorders (SCARED; Birmaher, 1995) was also a fairly commonly used measure in this population with three published studies indicating that they had used this measure to assess social anxiety in this population. Also, three experts in the present study indicated that they commonly use this measure to assess for social anxiety in ASD. The SCARED contains a six item subscale that measures social anxiety. In regard to reliability, no information about internal consistency of the social anxiety subscale has currently been published; however, in support of rater agreement, one study reported a correlation between parent and child report on the social anxiety subscale approached significance (Kimel, 2009) (Table 1). In regard to concurrent validity, one study examining the relationship between the social anxiety subscale and a social anxiety subscale of another social anxiety subscale (Behavioral Assessment System for Children: Reynolds & Kamphaus, 2002) found a low non-significant correlation between the two (Kimel, 2009) (Table 1). In examining the face validity of the items, three items measured cognitive aspects of social anxiety (e.g., “I am shy” and “I worry about other people liking me”) and three items measured emotional aspects of social anxiety (e.g., “I feel shy around people I do not know well” and “I feel nervous about going to parties, dances, or any other place where there will be people I do not know well”); however, none of the items measure behavioral or physiological aspects of social anxiety.

The Anxiety Disorder Interview Schedule (ADIS) is the most commonly used interview format measure of social anxiety in individuals with HFASD. A total of nine studies have utilized this measure in some form (e.g., parent, child, or parent/child version) with individuals with HFASD. Also, 34.4% (11 out of 32) of experts in the field of social anxiety and ASD in this study indicated that the ADIS is one of the measures of social anxiety that they most commonly use with individuals with HFASD. In examining the reliability of the ADIS, acceptable inter-rater agreement has been found (MASSI; Wood, 2009) (Table 1). However, it is important to note that agreement across reporters on the ADIS-C/P in the MASSI study may be inflated due to the structure of the interview, in which parent and child were interviewed together, and the clinician ratings were based upon the child and parent report. In terms of concurrent validity, parent and child report on measures of social anxiety were not significantly correlated with severity ratings during the SoP module of the ADIS-C (MASSI) (Table 1); however this finding is not unexpected given the low concordance rate among assessment modalities typically found in the literature (Hodges, 1990). No other studies have examined the

construct validity of the ADIS in this population. In examining the face validity of the questions, the questions map onto the DSM-IV-TR (APA, 2000) criteria for SoP and measure cognitive, emotional, and behavior/avoidance aspects of social anxiety.

In summary, there is equivocal evidence of the reliability and validity of several measures that have been commonly used in measuring social anxiety in individuals with HFASD. Although there is some evidence of the reliability of the most commonly used measures (e.g., MASC and ADIS), there is an inconsistent pattern of the validity of these measures. There is no evidence in support of concurrent validity of the MASC, and the MASC had low sensitivity in identifying cases of clinically diagnosed SoP on the ADIS. However, scores on the MASC were not related to verbal IQ, adaptive behavior, or other behavioral problems, suggesting that the MASC is measuring something unique from these other constructs. Other commonly used measures, such as the SCAS and SCARED, have unknown internal consistency in this population: although there is some evidence of rater agreement of the SCARED. In regard to the validity of these measures, no information is available about the SCAS, and there is evidence of a lack of concurrent validity of the SCARED.

Also, in examining the face validity of the items included in commonly used measures, it appears that the self-report measures contain items which measure the cognitive and emotional aspects of social anxiety; however they do not contain items which measure the behavioral/avoidance and physiological symptoms of social anxiety. Due to the lack of items related to such components of social anxiety, there is reason to believe that such measures may not be measuring some of the key components of social anxiety in individuals with HFASD. As suggested by Wood and Gadow (2010), symptoms such as behavior/avoidance and physiological symptoms may be especially critical in distinguishing anxiety disorder diagnoses in ASD.

Therefore, although there is some limited evidence of reliability and validity of currently used measures and these currently used measures were selected in order to measure social anxiety in this population with good reason, there is sufficient distrust of the currently used measures' ability to adequately assess social anxiety in this population. Notably, the MASC, the most commonly used measure and measure about which we have the most psychometric information, demonstrated weak sensitivity in detecting clinical levels of social anxiety, suggesting that this measure may not be detecting important components of social anxiety in this population. Also, in examining the items included in these commonly used measures, it is

apparent that these measures may not be measuring important aspects of social anxiety as it is manifested in individuals with HFASD (e.g., behavior/avoidance and physiological symptoms). As these currently measures may be insufficient in measuring social anxiety as it is presented in this population, there is a need for the development of a practical, empirically-derived measure of social anxiety for individuals with HFASD and a further need for the evaluation of the validity of this measure and other currently used measures.

1.3 - Present Study

This study was conducted to develop an empirically derived screening instrument for use in identifying impairing symptoms of social anxiety in individuals with HFASD. It was my intention with this instrument to measure social anxiety globally (i.e., not according to subtype) and dimensionally (i.e., continuously, rather than for diagnostic criteria). As research suggests that social-evaluative anxiety tends to emerge during adolescence in people with HFASD (Bellini, 2004; Kuusikko et al., 2008), the measure was developed for use with adolescents and adults with ASD diagnoses without co-occurring intellectual disability. Given the age range for which the measure is designed, the measure was designed to be a self-report measure. Despite some of the previously mentioned limitations in self report in this population, the decision to use self-report was made for two reasons: 1) for older adolescents or adults a parent report measure may not be appropriate) and 2) in the use of self-report, information about the subjective experience of anxiety may be obtained. The research was carried out in three sequential phases, described in more detail below.

Phase I. Develop initial pool of items and expert review.

Relevant measures of social anxiety in ASD were identified and compiled in order to create a pool of items that may be used to measure social anxiety in individuals with ASD. The items were categorized and overlapping items were combined to reduce redundancy. The full item list (alpha version of measure) was sent to identified experts in the fields of ASD and social anxiety for review.

Phase II. Refine item pool and expert review.

Based on expert feedback as well as items created through a review of videotaped diagnostic interviews with adolescents dually diagnosed with ASD and SoP, the questionnaire was revised. Expert feedback was sought on the appropriateness of remaining items (beta version).

Phase III. Develop initial screening questionnaire.

Expert feedback was compiled on the beta version of measure, to assess preliminary face validity. The final measure was formed using the selected items and items created as a part of an inconsistency index.

2.0 - Method

2.1 - Setting and Participants

Participants in this study were identified experts in the areas of ASD and social anxiety as it is expressed and studied in ASD. All authors and co-authors of published studies and abstracts included in a literature search of all studies published since 1990 using the following keywords searched in PsychInfo, Medline, Google Scholar databases: “autism” and “social” and “anxiety”, published abstracts from the 2010 International Meeting for Autism Research (IMFAR), and authors that were frequently cited in the identified studies’ background sections were identified as ‘experts’ in the field of anxiety disorders and ASD ($n = 95$). Additionally, three colleagues involved in an ongoing treatment outcome study with adolescents with ASD and anxiety (MASSI) were identified as experts and one additional international researcher was identified as an expert. The final sample of experts ($n = 99$) was contacted to participate in the study via an electronic survey. Experts had a mean of 12 ($SD = 9.4$) years of experience with research in the area of social anxiety in ASD and had seen a mean of 79.10 ($SD = 83.42$) clients with social anxiety and ASD (Table 2). Of the experts contacted during the first phase of the study, three indicated that they were not interested in participating in the study and did not receive further emails.

Additionally, portions of video-recorded semi-structured interviews with adolescents with diagnosed HFASD and their parents were utilized during Phase II of the study ($n = 9$). The interviews were conducted as part of a treatment study for adolescents with HFASD and co-occurring anxiety (MASSI). Participants meeting criteria for SoP with the highest clinician severity ratings ($n = 8$) and one participant who did not meet criteria for SoP were selected from the total sample ($n = 30$). Of the nine participants selected for the present study, six were male and three were female, and participants’ ages ranged from 12 to 17 (Table 3).

2.2 - Measures

Expert Survey I. A survey was created in order to seek input on the appropriateness of a compilation of items ($k = 86$) in measuring symptoms of social anxiety in adolescents and adults

with HFASD. The survey asked experts to provide data about their experience with the population of interest, difficulties they have had with assessment of social anxiety with individuals with HFASD, and the types of measures they have used to assess social anxiety in individuals with HFASD. Also, they were asked to rate each item on a 4-point Likert scale based on how indicative items were of social anxiety in the population of interest (1 = Not at all indicative of social anxiety in individuals with HFASD, 2 = Unlikely indicative of social anxiety in individuals with HFASD, 3 = Likely indicative of social anxiety in individuals with HFASD, 4 = Very likely indicative of social anxiety in HFASD), and state any additional symptoms of social anxiety in individuals with HFASD that were not captured by the items included in the survey.

Expert Survey II. A second survey was created in order to seek input on a reduced number of compiled items ($k = 40$). The survey asked experts to rate each item on the same 4 – point Likert scale as was used in the first survey (1 = Not at all indicative of social anxiety in individuals with HFASD, 2 = Unlikely indicative of social anxiety in individuals with HFASD, 3 = Likely indicative of social anxiety in individuals with HFASD, 4 = Very likely indicative of social anxiety in HFASD) based on how indicative the symptom was of social anxiety in the population of interest. Also, experts were asked to rate how much they thought each item reflected a symptom of ASD, regardless of presence of social anxiety using a 3 – point (1 = Not likely indicative of ASD, 2 = Possibly indicative of ASD, 3 = Very likely indicative of ASD) scale. Experts were also asked to write any additional comments or feedback about the items or measure.

2.3 - Phase I

All measures that have been used to measure social anxiety in people older than 10 years of age with HFASD were compiled through an extensive literature review. A comprehensive search of the scientific literature was conducted to identify all studies published since 1990 with the following keywords searched in PsychInfo, Medline, and Google Scholar databases: “autism” and “social” and “anxiety”. Additionally, all published abstracts from the 2010 International Meeting for Autism Research (IMFAR) containing the previously mentioned keywords in their title were identified. After all studies yielded from the searches were obtained, the reference section of each study was reviewed and additional relevant studies cited were

obtained. The decision to include additional cited studies was made based upon the inclusion of previously mentioned keywords included in the title. Lastly, an ongoing experimental treatment was included in the compilation of studies (MASSI).

After all studies were obtained, the abstracts were reviewed. If it was evident that the study used any measure to assess social anxiety in individuals with HFASD ages 10 or older, the study was included. Any studies with younger samples, lower functioning samples, and samples with developmentally delayed populations other than ASD were excluded. A list of measures meeting criteria was developed. After all measures from studies meeting criteria were identified, efforts were made to access the items of each measure. If measures were not available online, the authors of the measures were contacted by email up to two times in order to request a copy of the measure. Items from interviews, parent report, and self report instruments were included.

Item Reduction. Items from all obtained measures were compiled into a database. The following modifications were made to items to make them all consistent in terms of wording and tense, and to make the measure appropriate for adolescents and adults: all items were changed into “I” statements (e.g., “He or she worries about presenting work to the class” was changed to “I worry about presenting work to the class”), interview format questions were changed into questionnaire items (e.g., “When your are in situations with other people do you worry about doing something embarrassing” was changed to “When I am in situations with other people I worry about doing something embarrassing”), items containing components of worry and avoidance were changed into two separate items (e.g., I fear and/or avoid participating in group activities” was changed into two items “I fear participating in group activities” and “I avoid participating in group activities”), and items were adapted so that they were age appropriate for both adolescents and adults (e.g., “It’s hard to ask other kids to play with me” was changed to “It’s hard for me to ask other people to hang out with me”).

After all items were adapted, individual items were categorized based upon broad symptom type (cognitions, emotions, behaviors, and physiological symptoms) by two independent raters with a goal of 90% Kappa agreement. Cognitions were defined as “any items related to thoughts,” emotions were defined as “any items related to feelings or emotions,” behaviors were defined as “any items related to action or avoidance,” and physiological symptoms were defined as “any items related to physical symptoms”. Examples of items categorized as cognitions include: “I am excessively shy with peers”, “I do not like to answer

questions in front of my class/co-workers”, and “I get more scared answering or talking on the phone than most peers my age”. Examples of items categorized as emotions include: “I get nervous when I talk to new people”, “I feel nervous when I’m around certain people”, and “I feel scared when I start to talk to people my age that I know”. Examples of items categorized as behaviors include: “I avoid taking a test”, “I try to avoid contact with strangers”, and “I am quiet when I’m with a group of people”. Examples of items categorized as physiological symptoms include: “When others ask me questions I feel sick in my stomach or nervous”, “When I am someplace (a party, school, soccer game, or anyplace where I will be with others) I feel sweaty”, and “Before I go someplace (a party, school, soccer game, or anyplace where I will be with others) I feel like I have to go to the bathroom”. When difficulty was encountered in distinguishing between categorizing an item as a cognition or emotion, raters were encouraged to consider if the item was a more general worried thought, in which case the item should be categorized as a cognition, or if the item referred to a certain instance in which an emotion was experienced, in which case the item should be categorized as an emotion. For instance the item “I feel afraid when I have to use public bathroom or toilets” was classified as an emotion, as it refers to an emotion experienced in a specific situation; whereas the item “I worry about using public toilets” was classified as a cognition, as it refers a more general worried thought. When there was disagreement between raters, a third independent rater was utilized in order to assign the item to the appropriate category.

Once sorted, items were grouped together and items with content overlap were compiled into one representative item by the experimenter in order to reduce redundancy. To begin, similar items were grouped together (e.g. behaviors related to avoidance of similar situations, cognitions related to fear of rejection). For instance, the following items related to avoidance of eating in public were grouped together: “I go out of my way to avoid eating in front of other people”, “I’m reluctant/refuse to eat in public”, and “I avoid eating in front of other people”. Then, similar items were evaluated for content overlap and redundant items were compiled into one representative item. Obviously, for grouping of items with identical items, the representative item was the item itself. In cases in which the items in the grouping were not identical, the representative item was selected and/or created based upon the following criteria: 1) clarity– the item that was the clearest and most easily understandable, and/or 2) comprehensiveness – for a grouping of similar items, the item that best encompassed the meaning of all items was selected

and/or an item was created in order to encompass the meaning of all similar items. Thus, for some item groupings, the clearest item was selected, for other item groupings, the most comprehensive item was selected or a comprehensive item was created based upon components of all items, and for other item groupings items were selected/created based upon both criteria. For example, in the grouping of items previously mentioned related to the avoidance of eating in public, using clarity criteria “I avoid eating in front of other people” was chosen as the representative item. In another example during this phase of item compilation, for the following similar items which were grouped together, “I’m afraid of going to a party”, “I’m afraid of going to a party”, “I fear going to a party or social event”, “I fear going to a party or social event”, the representative item that based upon clarity and comprehensiveness was: “I’m afraid of going to a party or social event”.

Next, items with strong overlap with primary symptoms of ASD were deleted. Items considered to have strong overlap with ASD symptoms were determined by the investigator and an expert based upon overlap with DSM-IV diagnostic criteria for Autistic Disorder (APA, 2000). Agreement between investigator and expert was required for deletion of items. Items deleted were related to the social interaction and communication domains of the disorder, as none of the items deleted were related to the restricted stereotyped patterns of behavior. Examples of items deleted include: “I avoid looking at people I don’t know very well in the eyes”, “I am quiet when I’m with a group of people”, and “I only talk to people I know really well”.

Items were then sorted into two dimensions of social anxiety (i.e., social avoidance and distress or fear of negative evaluation; Watson & Friend, 1969) by the experimenter. Watson and Friends (1969) definitions of the two dimensions were utilized in sorting the items: social avoidance and distress was defined as, “the experience of distress, discomfort, fear, anxiety, etc., in social situations and the deliberate avoidance of social situations”, and fear of negative evaluation was defined as, “a fear of receiving negative evaluation from others”. Examples of items categorized as social avoidance and distress included: “I am more anxious/uncomfortable in social situations than other people”, “I avoid being the center of attention”, and “I am too scared to answer questions in class”. Examples of items categorized as fear of negative

evaluation included: “I worry about what other people think about me”, “I worry that the other person will not like me if I get into an argument”, and “I worry about presenting to my class/co-workers”.

In order to further reduce the pool of items, items indicative of symptoms of Agoraphobia and OCD, and items that could not be appropriately adapted for the specified age range were deleted. Examples of items deleted to symptom overlap with Agoraphobia include: “I am afraid of leaving my home”, “When I am someplace where I will be with others, my heart beats fast”, and “When I am with other people I think scary thoughts”. The one item deleted due to overlap with OCD was “When I have to use a public bathroom, I feel sick in my stomach or nervous”. Items deleted because they could not be appropriately adapted for the age range were: “I get more nervous or scared walking in the hallways or hanging out by my locker than most people my age”, “I get more nervous or scared saying 'No' to drinking or using drugs because I want to fit in, or feel calm than most people my age” and “I get more scared taking tests such as college boards than most people my age”.

Also, similar items that took different forms were compiled into one more general representative item (e.g., an item related to fear of interacting with adults and an item related to fear of interacting with children in the same situations were combined into a more general item related to fear of interacting with people in that situation). For instance, the following three items: “If somebody starts arguing with me, I feel scared and do not know what to do if that person is a person my age who I know”, “If somebody starts arguing with me, I feel scared and do not know what to do if that person is a person my age who I don’t know”, and “If somebody starts arguing with me, I feel scared and do not know what to do if that person is an adult” were compiled into the more general item, “If somebody starts arguing with me, I feel scared and do not know what to do”. Lastly, all items related to specific social/performance fears (e.g., public speaking, performing, using the bathroom) were compiled into one representative item and all items related to avoidance of specific situations were compiled into one representative item. It is of note that the two criteria (clarity and comprehensiveness) were utilized in creating and/or selecting a representative item during this phase of compilation as well. For instance, the following items related to performance fears: “I’m afraid of acting, performing, or giving a talk in front of an audience”, “I am more uncomfortable public speaking than other people”, I feel scared when speaking (giving a report or reading aloud) in front of people”, I feel scared when I

am in a play, choir, music, or dance recital”, “I feel afraid/uncomfortable when I have to talk in front of the class/my co-workers”, “I feel nervous when I am being watched by other kids or adults and I have to do something in front of them (for example: read aloud, speak, play a game, play a sport)”, “I always feel anxious when public speaking”, “I worry about presenting work to my class/co-workers”, and “I worry about reading aloud in front of my class/co-workers”, were compiled into the representative item, “I fear acting, performing (e.g. choir, music, dance, sports performance, etc.), or speaking (e.g., giving a report, reading aloud, etc.) in front of an audience”.

Expert Survey I. Experts ($n = 99$) were contacted via email. The email introduced the purpose of the study and provided a link to the online survey. Experts consented to participate by clicking the link to the survey. Data were downloaded onto a secure computer. Up to two email reminders were sent to experts who did not complete the survey. A reminder was sent to those who did not complete the survey two weeks and four weeks from the time the initial email was sent. Those who chose to not participate in the survey were asked to respond to the email indicating that they did not wish to receive reminder emails.

2.4 - Phase II

Evaluation of Expert Ratings. After collecting expert feedback, items were evaluated based on representativeness of social anxiety in individuals with HFASD. The following criteria were used for selecting items rated as indicative of social anxiety in HFASD: 1) Average expert rating greater than or equal to 3 (Likely indicative of social anxiety in ASD), 2) No experts gave a rating of a 1 (Not at all indicative of social anxiety in ASD), and 3) At least 19.6% of the experts rated item as a 4 (very likely indicative of ASD). The criteria of at least 19.6% of experts rating the item as a 4 was established using the mean percent of experts that rated items as a 4 across all items ($M = 19.59$, $SD = 12.99$). In order to determine if ratings differed based on one’s past experience, or degree of expertise, the sample was divided based on number of clinical patients seen and a t -test was conducted to examine if the mean difference in ratings between those with more and less experience across items was significantly different than chance. Also, ten critical items were selected by two independent raters. Critical items were defined as items thought to be highly indicative of social anxiety in HFASD. Ratings for those

with more and less experience were compared using a Mann Whitney U test for each critical item that was selected by both raters. Also, experts' reports of commonly used assessment modalities and commonly used measures to assess for social anxiety in ASD were examined.

Creation of Additional Items. Additional items were created based upon expert feedback and coded portions of videotaped administrations of the ADIS-C administered to adolescents with diagnosed HFASD and SoP and their parents (MASSI). A coding scheme was developed using expert feedback and noted observations from the viewing of the first 20 minutes and the SoP module of the ADIS-C, administered to adolescents with diagnosed SoP. It was decided to view the first 20 minutes of the interview as during this portion of the interview the adolescent is first interacting with the interviewer and symptoms of social anxiety may be evidenced. Also, during this portion of the interview the adolescent and parent discuss primary anxiety concerns. As such, it was thought that during this portion of the interview, behavioral observations of social anxiety could be made and symptoms of anxiety may be reported. Tapes were coded for ten items with three rating options (not present, possibly present, or definitely present). Additionally, within each rating option, there were three options, which indicated the modalities in which the item was observed or described (O = behavior directly observed, P = behavior described by parent, or C = behavior described by child). Only one rating option could be selected per item; however, multiple modalities could be chosen within the selected rating option (Appendix A).

Two undergraduate psychology students were trained to code the taped sessions of the ADIS-C. As a part of training, the raters received a thorough description of the items in the coding scheme and jointly observed and coded an ADIS-C administered to an adolescent with diagnosed SoP and HFASD, along with the investigator. During the training, the investigator encouraged the raters to ask questions and noted behaviors possibly indicative of behaviors on the coding scheme. The raters' codes were discussed after the observation and the investigator provided feedback. The raters then independently watched and coded eight taped ADIS-C administrations to adolescents with diagnosed SoP and HFASD and one adolescent with HFASD without diagnosed SoP. Kappa agreement between the raters was calculated.

2.5 - Phase III

Expert Survey II. Experts from Phase II, regardless of whether or not they participated in that Phase so long as they did not indicate that they did not want to be contacted again ($n =$

96), were again consulted in order to confirm that the items selected and created during Phase II were indicative of social anxiety in individuals with HFASD and further narrow items to be included in the measure. As in the first round of the survey, the email introduced the purpose of the survey, and up to two email reminders were sent to experts who did not complete the survey one week after the survey was sent and two weeks after the survey was sent. Those who did not wish to participate in the survey were asked to respond to the email indicating that they did not wish to receive reminder emails.

Evaluation of Expert Ratings. In selecting final items rated as indicative of social anxiety in HFASD, similar criteria were used as during the evaluation of items from the first survey. Criteria were the following: 1) average rating greater than or equal to 3, and 2) 19.6% of the experts who rated the item rated it as a 4 and 3) no more than one expert rated as a 1. An additional criterion during this phase was: the average rating on the ASD 3-point scale was less than 2 (Possibly indicative of ASD). All items meeting criteria were included in the final questionnaire. Also, an inconsistency index in order to assess response inconsistency was created. To create the additional items to be included as a part of the inconsistency index, five items thought to be simply worded and easily understandable were selected by the experimenter and each item was re-worded in such a way to portray the opposite meaning of the original item.

3.0 - Results

The literature search yielded 324 articles. Based upon a review of the abstracts of the identified articles, eight met all specified criteria. A search of the IMFAR 2010 abstract archive yielded 10 abstracts with titles containing the aforementioned key words. Of the identified abstracts, seven met all criteria. A search of the reference sections of all articles and abstracts meeting criteria yielded eight additional articles, which met all criteria. A total of 24 studies meeting all criteria were identified, including MASSI (Table 4).

From these 24 studies, a total of 17 different measures used to assess social anxiety were identified (Table 5). All measures except for two were obtained and reviewed. One measure could not be obtained due to decision of the author to not distribute the measure without specialized training (Leyfer et al., 2006) and the other measure could not be obtained because the authors of the measure did not respond to two email contact attempts (Giel & Nienhuis, 1996). An initial item pool of 298 questions was obtained from all measures. A very good kappa agreement ($K = .87$) was obtained in dually sorting the items into the four categories (Altman,

1991). Of the items, 67 were categorized as assessing an emotion, 84 assessed behavior, 130 assessed cognition, and 17 assessed physiological symptoms. Once compiled for basic item overlap, 52 emotion, 64 behavior, 104 cognition, and 14 physiological symptom items remained ($k = 234$).

Of the 234 items, 26 were deleted due to obvious overlap with ASD symptoms. Once sorted, 67 of the items were categorized as avoidance/distress and 141 of the items were categorized as fear of negative evaluation. Nine items with overlap with symptoms of agoraphobia, one item with symptom overlap with OCD and three items that could not be adapted for the full, target age range were deleted. After items with similar content were compiled into one representative item, a total of 86 unique items were obtained. In reviewing the initial categorization of the final 86 items, it is important to note that not all items included in this final pool are identical to the initial items from which they were compiled due to modifications based upon comprehensiveness and clarity. As such, in examining the initial categorization of each item, efforts were made to identify the item(s) which most closely matched the final item. Of the 86 items obtained, 44 were initially categorized as cognitions, 20 were initially categorized as emotions, 6 were initially categorized as physiological items, and 16 were initially categorized as behaviors. In reviewing the initial dimensional categorization (e.g., fear of negative evaluation and social avoidance/distress) of the 86 items, 53 were initially categorized as social avoidance/distress and 33 were initially categorized as fear of negative evaluation. Figure 1 illustrates the process by which items were selected to be included in the survey.

Of the 96 experts invited to participate in Survey I, 41 began the survey (42.7%), of whom, 32 completed the survey (78% of those who began the survey). All analyses were conducted using listwise deletion. The overall mean rating across items on the 4 – point scale measuring how indicative each item is of social anxiety in individuals with ASD was 2.87 ($Mdn = 2.93$, $SD = .34$). The mean range across items was 1.91 to 3.49. Of the 86 items, 30 met all specified criteria (average rating greater than or equal to 3, no experts rated the item as a 1, and at least 19.6% of the experts who rated the item rated it as a 4). Of those that met all specified criteria, 19 were initially categorized as cognitions, 6 were initially categorized as emotions, 3 were initially categorized as physiological symptoms, and 2 were initially categorized as

behaviors. In reviewing the initial dimensional categorization (e.g., fear of negative evaluation and social avoidance/distress) of the 30 items, 15 were initially categorized as social avoidance/distress and 15 were initially categorized as fear of negative evaluation.

In comparing experts based on clinical experience, the mean and median number of clients with ASD and social anxiety seen was calculated ($M = 79.1$, $Mdn = 50$, $SD = 83.42$). Experts' years of experience with research in the field and number of clients with social anxiety and ASD were correlated ($r = .47$, $p = .002$) and there was a significant group difference between those who had seen at least 50 clients ($n = 21$) and those who had seen less than 50 clients ($n = 18$) in years of professional experience ($t(37) = -2.78$, $p = .008$), with those who had seen at least 50 clients having 15.57 mean years of experience ($SD = 9.62$) and those who had seen less than 50 clients having 7.83 mean years of experience ($SD = 7.39$). The experts were divided into two groups - those who had seen at least 50 clients with ASD and social anxiety (i.e., the 'more experienced' group) and those who had seen fewer than 50 clients with ASD and social anxiety (i.e., the 'less experienced' group). A *t*-test was conducted to determine if, on average, there was a significant difference in ratings for those with more and less experience across all items. A significant difference was found ($t(86) = 5.64$, $p < .001$), but the difference did not seem to be meaningful in determining if the items fit selection criteria, as the mean difference between groups was very small ($M = .11$, $SD = .18$) and would likely not change the decision made about items based upon selection criteria.

Independent raters selected 10 critical items, defined as items thought to be highly indicative of social anxiety in ASD. Of the 10 items selected by each independent rater, there were five overlapping items, which were selected by both raters. None of the five critical items had significantly different ratings when comparing ratings of those with more experience and less experience (Table 6). Because no significant differences in ratings were found for these critical items and because there was no meaningful difference in average item ratings across the two groups, it was assumed that there were no important differences in ratings for those with more and less experience and the ratings for all experts were equally considered. As such, there was no weighting based on the experiential level of the experts in analyzing their ratings.

Additionally, experts' reports of difficulty with assessment and use of various measures was examined. The majority of experts who completed the survey (97.3%) indicated that they have had difficulty in the assessment of social anxiety in individuals with ASD. The most

commonly used measures reported by experts were questionnaires (94.6%), followed by semi-structured clinical interviews (91.9%) and observation (75.7%). Experts identified 35 different measures they commonly use to assess for social anxiety in ASD (Table 7). The most commonly reported measures were the MASC (46.86% of experts reported frequent use) and ADIS-C/P (34.38% of experts reported frequent use).

Ten items to be used in the coding scheme were created based upon expert feedback and notes from observations of three ADIS interviews (Table 8). When calculating the Kappa agreement between coders on the rating scheme, items with ratings of possibly present or definitely present were collapsed into one rating. A behavior was counted as present if either “possibly present” or “definitely present” were endorsed in any of the three modalities. There was moderate agreement between the independent raters’ coding across the nine coded interviews ($K = .6$; Altman, 1991). All items were observed by at least one coder in at least one clinical interview (Table 9).

Of the experts who were sent Survey II ($n = 96$), 25 began the survey (26.04%), and of those, 20 completed the survey (80% of those who began). Three of the experts were individuals who had not completed the survey during the first phase. All other experts who completed the second survey had also completed the first survey. All analyses were conducted using listwise deletion. The overall mean rating across items on the 4 – point scale measuring how indicative each item is of social anxiety in individuals with ASD was 3.10 ($Mdn = 3.15$, $SD = .29$). The mean range across items was 2.38 to 3.55. The overall mean rating across items on the 3 – point scale measuring how indicative each item is of ASD, regardless of social anxiety, was 1.25 ($Mdn = 1.53$, $SD = .41$). During this phase, receiving an item rating of a 1 on the 4-point scale was not included as a criterion as 12 of the 30 items initially selected based upon criteria were rated by at least one expert as a 1 (Not at all indicative of social anxiety in ASD). Of the items rated as a 1 (of the 30 initial items), all were only rated as such by one expert. Further, one expert rated six (50%) of the items rated as a 1. Upon further examination, this expert had also completed the first survey, but had not rated the same items as 1 at that time. It appears that during this phase of the survey, some of the experts made a different use of the response categories. As such, during this phase the selection criterion of “no ratings of a 1” was not a reasonable criterion. It is possible that experts provided ratings in a relative way during this survey, comparing items to each other, thus providing some items with lower ratings than they

had initially provided during the first survey. Table 10 shows mean expert ratings for items during Survey I and II. Based on selection criteria, one of the 30 initial items selected based upon expert feedback from Survey I was deleted (“I worry about doing something new in front of others”; mean < 3, < 19.59% rated as a 4). Of the ten additional items created, eight were deleted based upon the aforementioned selection criteria (6 items had mean < 3, 5 items more than one expert rated as a 1, 5 items < 19.59% rated as a 4, and 6 items rated as a 2 on ASD scale). Two of the ten items were added to the list of items to include in the questionnaire (“I feel like I can’t talk or move when I’m with other people” and “I go out of my way to avoid seeing people I know in public”).

The final measure contains the 31 items meeting all inclusion criteria and 5 items that were created to be included as a part of the inconsistency index (Appendix B). The measure was titled Virginia Tech Social Anxiety Scale for People on the Spectrum (VT-SASS). The measure asks individuals to rank each item on a 4-point scale (1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree). It is designed to be scored by summing all 31 items measuring social anxiety. Inconsistency is designed to be determined by subtracting the scores on the inconsistency items from the initial corresponding items and summing the absolute value of the differences (Appendix B).

4.0 - Discussion

Given the high prevalence of social anxiety in individuals with HFASD, valid and reliable assessment tools are needed. Multiple measures, including empirically derived self- and parent-reports and structured clinical interviews have been utilized in adolescents and adults with HFASD; however, little information is available about the psychometric properties of such measures with the HFASD population. Studies have primarily relied upon parent report measures. Reliance on parent report may be problematic, however, as symptoms of social anxiety may not readily lend themselves to third-party observations. Additionally, as social anxiety in individuals with ASD tends to arise in late adolescence or even adulthood (Bellini, 2004), parent report measures may not always be appropriate or practical.

A review of the psychometric properties of currently used parent- and self-report measures of social anxiety in ASD shows that there is equivocal evidence of the reliability and validity of several self-report measures that have been commonly used in measuring social anxiety in individuals with HFASD. Although there is some evidence of the reliability of the

most commonly used measures (e.g., MASC and ADIS), there is an inconsistent pattern of the validity of these measures. There is no evidence in support of concurrent validity of the MASC, and the MASC had low sensitivity in identifying cases of clinically diagnosed SoP on the ADIS. However, scores on the MASC were not related to verbal IQ, adaptive behavior, or other behavioral problems, suggesting that the MASC is measuring something unique from these other constructs. Other commonly currently used measures, such as the SCAS and SCARED, have unknown internal consistency in this population, although there is some evidence of rater agreement of the SCARED. In regard to the validity of these measures, no information is available about the SCAS, and there is evidence of a lack of concurrent validity of the SCARED. Also, in examining the face validity of the items included in commonly used measures, it appears that the self-report measures contain items which measure the cognitive and emotional aspects of social anxiety; however they do not contain items which measure the behavioral/avoidance and physiological symptoms of social anxiety.

Thus, it is possible that most existing measures of social anxiety are truly not valid for use in assessing people with HFASD because social anxiety manifests itself in unique ways in HFASD and because of the diagnostic overlap between ASD and SoP. If this is true, then measures specifically designed for this population are necessary. In the survey of experts conducted in this study, 97% reported experiencing difficulty with accurate identification and diagnosis of SoP in people with HFASD. As such, there is a continued need to examine currently used measures to determine if such instruments are measuring social anxiety as it is uniquely expressed in ASD and to develop an ASD-specific measure to screen for symptoms of social anxiety.

In the present study, based upon expert ratings of items compiled from measures previously used in individuals with ASD, 31 items were demonstrated to have face validity. Specifically, all items retained were rated, on average, as likely indicative of social anxiety in ASD by experts in the field. Moreover, they were considered to not highly overlap with ASD symptoms. Of the 29 items which were selected from the initial pool of items, 18 were initially categorized as cognitions, 6 were initially categorized as emotions, 3 were initially categorized as physiological symptoms, and 2 were initially categorized as behaviors. In reviewing the initial dimensional categorization of the items (e.g., fear of negative evaluation and social avoidance/distress) of the 30 items, 15 were initially categorized as social avoidance/distress and

14 were initially categorized as fear of negative evaluation. The final 36-item measure, including 5 items created as a part of an inconsistency index, is designed to be a dimensional self-report measure of social anxiety in high-functioning adolescents and adults with ASD (IQ \geq 70; age 13 and older). This measure, The Virginia Tech Social Anxiety Scale for People on the Spectrum (VT-SASS) (Appendix B), is an empirically derived screening measure of social anxiety in individuals with HFASD. The screener was designed with the purpose of creating a brief self-report measure, which may be useful in clinical practice and in applied research in identifying impairing levels of social anxiety. This may be potentially useful in clinical practice given the high proportion of high functioning individuals who struggle with social anxiety and the availability of treatments for anxiety in individuals with HFASD. Recent studies have demonstrated that HFASD youth are responsive to treatment of anxiety symptoms (Chalfant, Rapee, & Carol, 2007; White et al, 2009a). Given the clinical need, it appears that a high proportion of experts would be likely to utilize a screening measure if it were demonstrated to be useful and valid. Of the sample of experts who initially participated in the current study, 96.9% indicated that they would be likely or very likely to utilize a measure of social anxiety designed for individuals with ASD.

4.1 - Limitations

Although the 31 empirically derived items have face validity, no information is available about the psychometric properties of the newly created measure. As research has demonstrated that individuals with ASD often have difficulty understanding and expressing emotion, show a lack of insight into social and emotional problems, and have difficulty with self-reflecting (Capps, Yirmiya, & Sigagmn, 1992; MacDonald et al., 1989), it is unknown if adolescents and adults with HFASD would be able to provide an accurate portrayal of existing problems in their self-report on this measure. Also, it is unknown if individuals' responses on this measure will work to serve as a screen of existing social anxiety. As the majority of the measures from which the items were compiled were initially designed for children and adolescents, it is not known if the existing measure will be appropriate for both adolescents and adults. It may be the case that the measure will need to be modified for different age ranges.

Additionally, a limitation in the methodology related to item selection is the reliance upon a small sample of studies obtained through a search of the literature. Although the expert sample was comprised of those who self-identified as clinicians (72% identified as primary or

secondary role) and researchers (90% identified as primary or secondary role), the sample was biased towards those who have published research in the area of social anxiety in ASD. Through this methodology, clinicians who work with clients with ASD and social anxiety, but do not engage in research, are underrepresented in the sample. Also, it is possible that those experts who choose to participate in the survey may be different than those who did not chose to participate in the survey. As such, the sample may not be representative of all experts familiar with social anxiety in ASD. When relying upon this sample to select appropriate items, the selected items may be sample dependent, meaning that the selected items are specialized to the opinions of the included experts. As seen in the change in the utilization of the rating scale during the second survey, some of the selection criteria used with results of the first survey (no experts rated the item as a 1) may have been too strict and specialized to the opinions of the included experts who responded to the survey.

Another limitation in the present study was the use of a small pool of taped diagnostic interview administrations to generate additional items to be included in the final survey. Although the interviews were selected based upon particularly high SoP ratings on a validated diagnostic interview, as only one interview with an adolescent without diagnosed SoP was included in the sample of coded interviews, it is difficult to tell if the coded items are unique of individuals with HFASD and SoP, or rather more general symptoms of individuals with HFASD. Also, rater agreement was only moderate, suggesting confusion and/or difficulty among raters in accurately coding observed behaviors and reports. In order to more effectively code interviews to obtain information about behaviors indicative of social anxiety in individuals with HFASD, a larger sample of tapes must be viewed, with a range in participant age, level of functioning, and level of social anxiety. Also, it may be necessary to utilize raters with an expertise in the area of ASD and anxiety in coding, given the complexity of symptom presentation in this population and the moderate level of agreement obtained in coding in this study.

4.2 - Future Directions and Implications

The first step toward evaluating the psychometric properties of the measure is piloting the measure with a sample of adolescents and/or adults with HFASD. The reliability of the measure, including inter-item correlations, Cronbach's alpha, and Cronbach's alpha with each item removed, should be examined. Also, stability should be assessed through the administration of the measure at multiple time points in order examine test-retest reliability. It may be useful to

create a parent- or other-report version of the measure by changing the stems of the items (from “I” to “My child” or “This person”), in order to compare the individual’s report with the report of someone who knows the person well. This may be useful in examining the ability of individuals to report on symptoms of anxiety on the measure. If shown to be a valid and reliable measure for use with parents and other informants, the use of an other-report measure may prove to be clinically useful given the utility of obtaining information from multiple informants (Achenbach, McConaughty, & Howell, 1987).

In evaluating the validity of the measure, the current measure should be administered jointly with other measures of social anxiety frequently used with individuals with ASD. Correlations between the newly formed measure and other measures should be examined. The newly formed measure should also be administered with measures of different clinical problems (ADHD, depression, behavioral problems) to examine divergent validity. It would be expected that the measure would be more related to other measures of social anxiety than measures of other clinical problems. Also, participants’ scores on the inconsistency index should be examined in order to examine the validity of participants’ responses. Highly inconsistent responses can compromise the validity of a scale. The measure should also be administered with accompanying items related to the desire of the individual to form friendships and socialize and the degree of impairment (in school, work, home, etc.) caused by anxiety in social situations in order to examine whether scores on the measure are related to clinical impairment and desire to socially interact. Given the previously mentioned limitation of possibly overly relying upon this small pool of experts in selecting the final items, the final measure should be administered to one subsample and the initial pool of 86 items should be administered to another subsample in order to compare the performance of the final measure to the measure with the larger pool of items.

In piloting the measure, the validity and guidance on interpretation of the inconsistency index for clinical and research purposes should be examined. Because the measure has not yet been piloted, the rules for the interpretation of the inconsistency index are unclear. In order to examine the validity of the inconsistency index, two versions of the measure, one including the inconsistency index and one not including the inconsistency index should be administered to different subsamples to examine if the measure performs differently when the inconsistency

index is included. Also, the inconsistency index should be examined as a moderator to determine if the inclusion of the inconsistency index aids in the measure's prediction of clinical levels of social anxiety.

Also, in order to examine the ability of the measure to identify individuals with potentially clinically significant social anxiety, the measure should be administered in conjunction with clinical interviews. Item Response Theory (IRT; Emberton & Reise, 2000) should be used in order to examine the discriminative ability of items. In order to determine if the measure demonstrates differential item function for different sub-populations with HFASD, an item bias analysis should be conducted among those with various age ranges, IQs, levels of functioning (IQ and adaptive behavior), and social impairment. It would be hypothesized that this measure would be both sensitive and specific in discriminating the presence or absence of problematic social anxiety among people with HFASD, identifying positive cases while not over-identifying social anxiety when not actually present, respectively. Based upon findings from studies that have examined the sensitivity and specificity of currently available measures with typically functioning populations, it would be expected that sensitivity would be in the range of .80-.90 and specificity would be in the range of .65-.75 (Hodges, 1990; Wood et al., 2002)

If this measure is found to be valid and reliable for adolescents and adults with HFASD, the use of this measure may be an efficient way to identify those at risk for clinically impairing social anxiety who may be in need of a more thorough diagnostic assessment. The accurate assessment and treatment of social anxiety is important as, in typically developing populations, heightened anxiety has been related to reduced social networks, poor self esteem, and reduced performance in social interactions (Neal & Edelman, 2003). In individuals with HFASD, it is likely that social anxiety may have a similar adverse impact on functioning, above the core symptoms of ASD. Research has demonstrated that high anxiety covaries with ASD (more social deficits and core ASD symptoms), suggesting that social anxiety may be related to avoidant behavior, 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 disorders leads to ASD symptom declines as anxiety symptoms remit (Wood et al., 2009), the treatment of co-occurring anxiety, such as

social anxiety, may be an important step in addressing common behavioral problems and social deficits in individuals with ASD.

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Table 1

Psychometric Properties of Measures Used to Measure Social Anxiety in Individuals with ASD

Measure	Number of Studies	Study(s)	Sample Size	Reporter	Sample	Type of Sample	Prevalence of Clinically Significant Social Anxiety	Reliability Data	Validity Data
Autism Comorbidity Interview Present and Lifetime Version (ACI-PL: Leyfer, 2006)	1	Leyfer et al., 2006	<i>n</i> = 94	Parent and Clinician	<i>n</i> = 94 (5-17 years)	Community and participants recruited from an ongoing study of language and social function	7.5% met DSM criteria; 3.2% met subsyndromal criteria	Not available	Not available
Anxiety Disorders Interview Schedule for Child and Parent Version (ADIS-C/P: Silverman, 1996)	5	Chalfant, Rapee, & Carroll, 2007	<i>n</i> = 47	Parent, self	<i>n</i> = 47 (8-13 years)	Community	3.6% (<i>N</i> =28) in treatment group and 10.5% (<i>N</i> =19) in waitlist control	Not available	Not available
		Farrugia & Hudson,	<i>n</i> = 34	Parent, self	<i>n</i> = 34 (12-16 years)	Community	18% (ADIS-C/P)	Not Available	Not available
		White:K01mh079945	<i>n</i> = 30	Parent, self	<i>n</i> = 30 (12 to 17 years)	Community	76% met diagnostic criteria; 97% had sub-threshold social anxiety	ICC (severity rating agreement) = .78	Severity ratings not significantly correlated with any self-report (MASC: <i>r</i> = .10) or parent report (MASC-P <i>r</i> = .29; ASI <i>r</i> = .25) measures of social anxiety.
		White et al., 2009	<i>n</i> = 4	Parent, self	<i>n</i> = 4 (12-14 years)	Community	50%	Not available	Not available
		Wood, 2009	<i>n</i> = 40	Parent, self	<i>n</i> = 40 (7 to 11 years)	Outpatient	87.50%	ICC (severity rating agreement) = .86; K (diagnosis agreement) = .84	Not available
Anxiety Disorders Interview Schedule for Child and Parent Version (ADIS-P: Silverman, 1996)	4	Blakely Smith et al., 2010	<i>n</i> = 41	Parent report	<i>n</i> = 12 (8 to 14 years)	Outpatient	Not reported	Not available	Not available
		Cruz et al., 2010	<i>n</i> = 22	Parent, self	<i>n</i> = 22 (7 -14 years)	Community	73%	Not available	Not available
		McNally Keehn, Brown, Chavira, & Lincoln, 2010	<i>n</i> = 22	Parent interview	<i>n</i> = 22 (7 to 14 years)	Outpatient	Not reported	Not available	Not available
		Reaven, Blakely-Smith, Culhane-Shelbourne, &	<i>n</i> = 47	Parent, self	<i>n</i> = 47 (8 to 14)	Outpatient	Not reported	Not available	Not available

Adolescent Symptom Inventory (ASI: Gadow & Sprafkin, 1998)	1	White:K01mh079945	n = 30	Parent report	n = 30 (12 to 17 years)	Community	60% met cut-off	Not available – only 2 items that measure social anxiety	Two items of social anxiety positively correlated with MASC-P social anxiety ($r = .59$); not significantly correlated with MASC social anxiety ($r = -.03$). Sensitivity in detecting clinically diagnosed SoP (based on ADIS) was weak (45%).
Child and Adolescent Psychiatric Assessment – Parent Version (CAPA-P: Andgold, 1995)	1	Simonoff et al., 2008	n = 112	Parent	n = 112 (10 to 14 years)	Epidemiological, population derived sample	29.20%	Not available	Not available
Child and Adolescent Symptom Inventory (CASI: Gadow & Sprafkin 1997)	1	Sukhodolsky et al., 2008	n = 171	Parent report	n = 171 (5 to 17 years)	Outpatient, medication free	19.90%	Not available	Children with IQ<70 were less likely to meet criteria for disorder. Significant correlations were found between the CASI-20 and subscales of the Aberrant Behavior Checklist (ABC) (r 's between .17 and .42), subscales of the Vineland Adaptive Behavior Scale (r 's between .16 and .24), and subscales of the Autism Diagnostic Interview-Revised (ADI-R) (r 's between -.15 and .22).
Child Symptom Inventory (CSI-4: Gadow, 2008) for 6 to 12 year olds ^c	1	Weisbrot et al., 2005	n = 301	Parent report	n = 301 (6 to 12 years)	Community	Not available	Not available	Not available
Early Childhood Inventory-4 (ECI-4: Gadow, 2008) for 3-5 year olds ^c	1	Weisbrot et al., 2005	n = 182	Parent report	n = 182 (3 to 5 years)	Outpatient	Not available	Not available	Not available
Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime version (K-SADS-PL: Kaufman, 2000)	1	Tyson et al., 2010	n = 171	Parent interview	n = 20 (mean age 12.8)	Outpatient	Not available	Not available	Not available

Liebowitz Social Anxiety Scale (L-SAS; Liebowitz, 1987)	1	Cath et al., 2008	<i>n</i> = 48	Self-report	<i>n</i> = 48* (mean age 35.2 years)	Outpatient	Not available	Not available	Significant positive correlations between the L-SAS and Autism Questionnaire (AQ) total (<i>r</i> = .64) and several AQ subscales (Social Skills (<i>r</i> = .82), Attention Switching (<i>r</i> = .53), Communication (<i>r</i> = .46), and Imagination (<i>r</i> = .40)) and L-SAS and the Beck Anxiety Inventory BAI (<i>r</i> = .39). ⁴
Multidimensional Anxiety Scale for Children (MASC; March, 1998)	6	Bellini, 2004	<i>n</i> = 41	Self report	<i>n</i> = 41 (12-18 years)	Outpatient	Not available	Not available	Significant negative correlation found between SSRS Assertion subscale and MASC social anxiety subscale (<i>r</i> = -.31) and subscale of Performance Fears (<i>r</i> = -.33)
		Cruz et al., 2010	<i>n</i> = 22	Self report	<i>n</i> = 22 (7-14 years)	Community	73%	Not available	Not available
		White & Robertson-Nay, 2009	<i>n</i> = 20	Self report	<i>n</i> = 20 (7 to 14 years)	Outpatient	Not available	α = .92 for MASC total; mean inter-item correlation for total scale = .238; not available for	MASC total score not significantly correlated with SCQ, SRS, or SCI
		White:K01mh079945	<i>n</i> = 30	Self report	<i>n</i> = 30 (12 to 17 years)	Community	40% had elevated social anxiety on the MASC	α = .87 for social anxiety subscale	MASC social anxiety subscale correlated with subscale of performance fears (<i>r</i> = .82) and humiliation/rejection subscale (<i>r</i> = .93). Not significantly correlated with MASC-P social anxiety subscales or ADIS SoP severity ratings. Not significantly correlated with parent reported adaptive behavior (<i>r</i> = .31), other behavior problems (e.g., irritability (<i>r</i> = -.25), hyperactivity (<i>r</i> = -.36)), social disability (<i>r</i> = .16) or verbal IQ (<i>r</i> = -.04). Sensitivity in detecting clinically diagnosed SoP (based on ADIS) was weak (41%).
		White et al., 2009	<i>n</i> = 4	Self report	<i>n</i> = 4 (12-14 years)	Community	Not available	Not available	Not available

		Wood, 2009	<i>n</i> = 40	Parent report	<i>n</i> = 40 (7 to 11 years)	Outpatient	Not available	α = .88 for MASC total; not available for social anxiety subscale	Not available
Social Anxiety Scale for Adolescents (SAS-A: La Greca,	1	Bellini, 2004	<i>n</i> = 41	Parent report	<i>n</i> = 41 (12-18 years)	Outpatient	48.80%	Not available	Not available
The Social Anxiety Scale for Children-revised (SASC-R: La Greca, 1993)	1	Kuusikko et al., 2008	<i>n</i> = 58	Self report	<i>n</i> = 58 (8-15 years)	Community and population-derived	Age \leq 12, 20%; Age \geq 12 57%	α = .92 (with items removed)	Significant correlation between SPAI-C SASC-R total scores (r = .76) and between revised SPAI-C and SASC-R total scores (r = .74). Moderate association with parent reported Internalizing symptoms on the CBCL (r = .22). [*]
Schedules for Clinical Assessment in Neuropsychiatry (SCAN-2.1: Giel, 1996)	1	Ketelaars et al., 2008	<i>n</i> = 15	Adult	<i>n</i> = 15 (18-24 years)	Outpatient	20%	Not available	Not available
Screen for Child and Anxiety Related Emotional Disorders (SCARED: Birmaher, 1995)	3	Kimel, 2009	<i>n</i> = 19	Parent, self	<i>n</i> = 19 (7 - 16 years)	Treatment seeking community	Not available	α ranged from .61 to .90 for various subscales	Significant positive correlation between SCARED total score and FSSC-R child reports (r = .59); SCARED and BASC social anxiety subscale were not significantly correlated (r = .17). Correlation between parent and child report on social anxiety subscale of SCARED approaching significance (r = .42).
		Reaven, Blakely-Smith, Culhane-	<i>n</i> = 47	Self report	<i>n</i> = 47 (8 to 14)	Outpatient	Not available	Not available	Not available
		Weiss et al., 2010	<i>n</i> = 10	Parent report	<i>n</i> = 10 (8 to 12 years)	Outpatient	Not available	Not available	Not available
Spence Children's Anxiety Scale (SCAS: Nauta, 2004)	6	Chalfant, Rapee, & Carroll, 2007	<i>n</i> = 47	Parent, self	<i>n</i> = 47 (8-13 years)	Community	Not available	Not available	Not available
		Cruz et al., 2010	<i>n</i> = 22	Parent, self	<i>n</i> = 22 (7 -14 years)	Community	Not available	Not available	Not available
		Farrugia & Hudson, 2006	<i>n</i> = 34	Parent, self	<i>n</i> = 34 (12-16 years)	Community	Not available	Not available	Strong correlation between parent and child report on total score (r = .70)
		Gillot, Furniss, &	<i>n</i> = 15	Parent, self	<i>n</i> = 15 (8-12 years)	Outpatient	Not available	Not available	Not available
		Libove et al., 2010	<i>n</i> = 22	Parent report	<i>n</i> = 22 (3 to 12)	Community	Not available	Not available	Not available

		Russell & Sofronoff, 2005	<i>n</i> = 65	Parent, self	<i>n</i> = 65 (10 to 13 years)	Participants recruited from ongoing study of anxiety interventions for children with ASD	Not available	Parent and child versions internal reliability coefficients = .92 and .91, respectively. Internal reliability coefficients for the six subscales ranged from adequate to excellent.	Strong association between parent and child report (<i>r</i> = .53)
The Social Phobia and Anxiety Inventory-Child Version (SPAI-C; Beidel, 1996)	1	Kuusikko et al., 2008	<i>n</i> = 58	Self report	<i>n</i> = 58 (8-15 years)	Community, epidemiological	Age ≤ 12, 30%; Age ≥ 12, 57%	<i>r</i> = .96 (with items removed)	*Strong association between SPAI-C SASC-R total scores (<i>r</i> = .76) and between revised SPAI-C and SASC-R total scores (<i>r</i> = .74). Moderate association with parent reported Internalizing symptoms on the CBCL (<i>r</i> = .26).
Social Worries Questionnaire	2	Gillot, Furniss, &	<i>n</i> = 15	Self report	<i>n</i> = 15 (8-12 years)	Outpatient	Not available	Not available	Not available
		Russell & Sofronoff, 2005	<i>n</i> = 65	Self report	<i>n</i> = 65 (10 to 13 years)	Participants recruited from ongoing study of anxiety interventions for children with ASD	Not available	Parent and child versions internal reliability coefficients = .82 and .85, respectively.	Not available
Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I; First, 2002)	1	Hovfander et al., 2009	<i>n</i> = 122	Self report interview	<i>n</i> = 122 (16 to 60 years)	Outpatient	13%	Not available	Not available

* Sample included participants without ASD diagnoses (N=36).

**Sample not included in present study because of exclusion criteria

^aValidity calculations included a control group (*n* = 353; ages 8-15) without autism.

^bValidity calculations included individuals without ASD diagnoses (*n* = 36).

^cMeasure not included in present study because of exclusion criteria.

Table 2

Expert Characteristics

Measure	<i>M</i>	<i>SD</i>	<i>%</i>
Number of cumulative years experience with research in area*	12	9.4	
Number of clients with ASD and SoP treated or supervised*	79.10	83.42	
Primary or secondary role of clinical*			71.79
Primary or secondary role of physician or psychiatrist*			15.35
Primary or secondary role of researcher*			89.74
Primary or secondary role of graduate student*			10.26
Primary or secondary role – other*			7.69
Difficulty in diagnosing anxiety disorders in individuals with ASD**			97.30
Difficulty in diagnosing social anxiety in individuals with ASD**			97.30

Note. This information was obtained from experts through Expert Survey I.

% was calculated using experts who responded to each item

*(*n* = 39)

**(*n* = 37)

Table 3

Demographic Data for Participants Used in Coding

	<i>M</i>	<i>SD</i>	<i>Range</i>	<i>n</i>
Autistic Disorder				2
Asperger's Disorder				4
PDD-NOS				3
Verbal IQ	94.33	15.97	73 to 121	
Vineland II adaptive behavior score	69.67	11.27	59 to 92	
Clinician Severity Rating on SoP module of ADIS	5.44	1.33	2 to 6	
Age	14.62	1.89	12 to 17	

Note. These participants were obtained from the MASSI study.

Table 4

Studies Identified Meeting Criteria

Bellini, 2004^a
Blakely-Smith et al., 2010^b
Cath et al., 2008^c
Chalfant, Rapee & Carroll, 2007^c
Cruz et al., 2010^b
Farrugia & Hudson, 2006^c
Gillot, Furniss, & Walter, 2001^a
Hovfander et al., 2009^a
Ketelaars et al., 2008^c
Kimmel & Kepeliov, 2009^a
Kuusikko et al., 2008^a
Leyfer et al., 2006^c
Libove et al., 2010^b
McNally Keehn, Brown, Chavira, & Lincoln, 2010^b
Reaven, Blakely-Smith, Culhane-Shelbourne, & Hepburn, 2010^b
Russell & Sofronoff, 2005^c
Siminoff et al., 2008^a
Sukhodolsky et al., 2008^c
Tyson et al., 2010^b
Weiss et al., 2010^b
White & Roberson-Nay, 2009^a
White:K01mh079945^d
White et al., 2009^c
Wood, 2009^a

Note. Inclusion criteria were: 1) HFASD sample, 2) Sample included individuals ≥ 10 years of age, 3) Measured social anxiety.

^a = article identified via initial literature search; ^b = article identified via search of IMFAR 2010 abstracts;

^c = article identified via search of references; ^d = ongoing treatment study.

Table 5

Measures of Social Anxiety in Adolescents and Adults with HFASD

Adolescent Symptom Inventory (ASI)
Anxiety Disorder Interview Schedule - Child/Parent Version (ADIS-C/P)
Autism Comorbidity Interview Present and Lifetime Version (ACI-PL)*
Child and Adolescent Psychiatric Assessment-parent version (CAPA-P)
Child and Adolescent Symptom Inventory-20 (CASI-20)
Child Symptom Inventory (CSI-4)
Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime version (K-SADS-PL)
Liebowitz Social Anxiety Scale (L-SAS)
Multidimensional Anxiety Scale for Children (MASC)
Schedules for Clinical Assessment in Neuropsychiatry (SCAN)*
Social Anxiety Scale for Adolescents (SAS-A)
Social Anxiety Scale for Children - Revised (SASC-R)
Self-Report for Childhood Anxiety Related Emotional Disorders (SCARED)
Social Phobia and Anxiety Inventory for Children (SPAI-C)
Social Worries Questionnaire (SWQ)
Spence Children's Anxiety Scale (SCAS)
Structured Clinical Interview for DSM Disorders - Axis I (SCID-I)

Note. * Measure was not able to be obtained.

Table 6

Comparison of More and Less Experienced Experts across Five Critical Items

Item	Experience		<i>U</i>	<i>df</i>
	More	Less		
I feel so scared at parties, social gatherings, school or anyplace where there will be more than two other people that I go home early.	3.47 (.51)	3.50 (.89)	129.5	33
I avoid meeting people because it makes me nervous.	3.37 (.56)	3.44 (.81)	133.0	33
I worry about being teased, ignored, or made fun of by people.	3.11 (.83)	3.27 (.80)	121.5	31
I feel scared starting or joining in on a conversation.	3.33 (.49)	3.40 (.51)	126.0	31
I worry about doing something stupid or embarrassing.	3.06 (.75)	3.53 (.52)	83.0	30

Note. Those with 'more' and 'less' experience were determined using the median number of clients seen (*Mdn* = 50).
None of the *p* – values were significant. Standard deviations are in parentheses below means.

Table 7

Experts' Reported Use of Measures to Assess Social Anxiety in ASD

Type of Measure Used (<i>n</i> = 37)	%
Questionnaire	94.6
Semi-structured clinical interview	91.9
Observation	75.7
Physiological measure	27.0
Novel or exploratory measure	8.1
Commonly Used Measures (<i>n</i> = 32)	<i>n</i>
Multidimensional Anxiety Scale for Children (MASC)	15
Anxiety Disorder Interview Schedule - Child and/or Parent Version (ADIS-C/P)	11
Behavioral Assessment System for Children (BASC)	3
Child and Adolescent Psychiatric Assessment (CAPA)	3
Clinical interview	3
Screening for Childhood Anxiety and Related Emotional Disorders (SCARED)	3
Child Behavior Checklist (CBCL)	2
Multidimensional Anxiety Scale for Children - Parent Version (MASC - P)	2
Kiddie Schedule for Affective Disorders and Schizophrenia for School Age Children - Present and Lifetime Version (KSADS-PL)	2

Adapted Multidimensional Anxiety Scale for Children	1
Autism Comorbidity Interview	1
Child and Adolescent Symptoms Inventory	1
Child Manifest Anxiety Scale	1
Children’s Interview for Psychiatric Symptoms, Parent Version	1
Clinical Observation	1
Cortisol Measurement	1
Developmental Behavior Checklist (DBC – Parent and Teacher Version)	1
Diagnostic checklists	1
Diagnostic clinical interviews	1
DSM- based questions about social anxiety (unstructured)	1
Eye tracking (scan paths and pupillometry) of faces with emotions	1
Hamilton Anxiety Scale	1
Liebowitz Social Anxiety Scale	1
Modified Kiddie Schedule for Affective Disorders and Schizophrenia for School Age Children (K-SADS)	1
Nisonger Child Behavior Rating Form	1
Parental descriptions	1
Profile of Neuropsychiatric Symptoms (PONS)	1
Redpath Social Anxiety Questionnaire	1

Researcher developed stress thermometer	1
Structured Clinical Interview for DSM Disorders - Axis I (SCID-I)	1
Self report of Personality	1
Skin Conductance	1
Social Anxiety Inventory for Children (SPAI-C)	1
Social Anxiety Scale for Children – R (SASC-R)	1
Spence Children’s Anxiety Scale (SCAS)	1

Note. This information was obtained from Expert Survey I. Experts were asked to list up to three measures they most frequently use to assess social anxiety in individuals with ASD.

Table 8

Items Created via Expert Feedback and Observations from ADIS-C

Items Created For Coding Scheme
Increase in repetitive behavior during social interactions ^{ab}
Increase in interest in restricted interest during social interactions ^a
Increase in ritualized behavior during social interactions ^a
Use of attachment objects in social situations ^b
Freezing (behaviorally and/or verbally) during social situations ^a
“Meltdowns” or tantruming in social situations ^b
Avoidance of seeing individuals he/she knows in public ^{ab}
Anger and/or aggression in social situations ^{ab}
Greater fear of talking to children and/or teens than adults ^{ab}
Cover face and/or attempt to hide self in social situations ^b

Note. ^a= item created through expert feedback; ^b = item created through observations of the Anxiety Disorder Interview Schedule – Child Version (ADIS-C) administered to teen with diagnosed ASD and SoP (Multimodal Anxiety and Social Skills Intervention (MASSI); White: K01mh079945).

Table 9

Coding Results

Item	% coded by both raters	% coded by only one rater	Total % coded
Increase in repetitive behavior during social interactions	62.5	25.0	62.8
Increase in interest in restricted interest during social interactions.	0.0	12.5	13.0
Increase in ritualized behavior during social interactions	12.5	25.0	37.5
Use of attachment objects in social situations	12.5	37.5	50.0
Freezing (behaviorally and/or verbally) during social situations	37.5	0.0	37.5
“Meltdowns” or tantruming in social situations*	12.5	12.5	25.0
Avoidance of seeing individuals he/she knows in public	25.0	12.5	37.5
Anger and/or aggression in social situations*	25.0	12.5	37.5
Greater fear of talking to children and/or teens than adults*	25.0	25.0	50.0
Cover face and/or attempt to hide self in social situations	62.5	0.0	62.5

Note. A behavior was counted as present if either “possibly present” or “definitely present” were endorsed in any of the three modalities.

*Item was coded in interview with adolescent without diagnosed SoP.

Table 10

Mean Expert Ratings for Items selected from Initial Expert Feedback during Survey I and Survey II

	Survey I			Survey II		
	(n = 41)			(n = 25)		
	<i>M</i>	<i>SD</i>	<i>Range</i>	<i>M</i>	<i>SD</i>	<i>Range</i>
1. I feel shy around people I don't know.	3.11	.58	2 to 4	3.09	.81	1 - 4
2. I get nervous when I meet new people.	3.37	.60	2 to 4	3.50	.60	2 - 4
3. I am more anxious/uncomfortable in social situations than most people.	3.29	.75	2 to 4	3.55	.67	2 - 4
4. I am too scared to ask other people questions.	3.17	.70	2 to 4	3.45	.60	2 - 4
5. Answering questions in front of others makes me feel sick in my stomach or nervous	3.23	.65	2 to 4	3.27	.83	1 - 4
6. When I speak to people I don't know, I feel sick in my stomach or nervous.	3.17	.62	2 to 4	3.18	.80	1 - 4

7. Being the center of attention makes me feel sick in my stomach or nervous.	3.29	.67	2 to 4	3.09	.81	1 - 4
8. I feel so scared at parties, social gatherings, school, or anyplace where there will be more than two other people that I go home early.	3.49	.70	2 to 4	3.50	.80	1 - 4
9. When I am addressed by another, I become so nervous I cannot speak more often than not.	3.26	.61	2 to 4	3.32	.78	2 - 4
10. I'm afraid of going to a party	3.26	.61	2 to 4	3.05	.65	2 - 4
11. I fear acting, performing (e.g. choir, music, dance, sports performance, etc.), or speaking (e.g., giving a report, reading aloud, etc.) in front of an audience.	3.17	.57	2 to 4	3.05	.67	2 - 4
12. I fear participating in group activities.	3.15	.57	2 to 4	3.38	.74	2 - 4
13. I fear talking to persons I don't know well (e.g. strangers, new or unfamiliar people).	3.18	.53	2 to 4	3.19	.81	1 - 4
14. I worry about being teased, ignored, or made fun of by people.	3.18	.81	2 to 4	3.14	.85	2 - 4
15. I feel scared starting or joining in on a conversation.	3.36	.49	3 to 4	3.38	.67	2 - 4
16. I worry about what other people will think of me.	3.27	.67	2 to 4	3.14	.79	1 - 4
17. I worry about what others say about me.	3.18	.73	2 to 4	3.14	.79	1 - 4

18. I worry about doing something new in front of others.*	3.09	.58	2 to 4	2.95	.67	2 - 4
19. I worry about people laughing at me.	3.30	.64	2 to 4	3.14	.73	2 - 4
20. I worry about getting called on in class/meetings.	3.03	.64	2 to 4	3.05	.86	1 - 4
21. I worry about doing something stupid or embarrassing.	3.28	.68	2 to 4	3.14	.85	1 - 4
22. I worry about meeting new people.	3.16	.63	2 to 4	3.24	.70	2 - 4
23. I worry about entering a room full of people.	3.09	.69	2 to 4	3.19	.60	2 - 4
24. I'm afraid of calling someone I don't know very well.	3.16	.63	2 to 4	3.00	.77	2 - 4
25. I'm afraid of being the center of attention.	3.34	.55	2 to 4	3.19	.68	2 - 4
26. I'm afraid of speaking up at a meeting.	3.19	.54	2 to 4	3.19	.68	2 - 4
27. When I'm with other people, sometimes I think whatever I say will sound stupid.	3.25	.62	2 to 4	3.10	.70	2 - 4
28. Before I go to a party or I go some place where others will be, I think about what might go wrong.	3.03	.70	2 to 4	3.10	.70	2 - 4

29. Before I go to a party or I go someplace where others will be, I think, "Will I make a mistake and look stupid?"	3.16	.68	2 to 4	3.29	.72	2 - 4
30. Before I go to a party or I go some place where others will be, I think, "What if somebody talks to me and I can't think of what to say?"	3.13	.61	2 to 4	3.19	.60	2 - 4

Note. Items were rated on a Likert scale from 1 to 4 (1 = Not at all indicative of social anxiety in HFASD, 2 = Unlikely indicative of social anxiety in HFASD, 3 = Likely indicative of social anxiety in HFASD, 4 = Very likely indicative of social anxiety in HFASD).

Statistics were calculated using listwise deletion.

* indicates that item was not included in the final pool of items as it did not meet criteria.

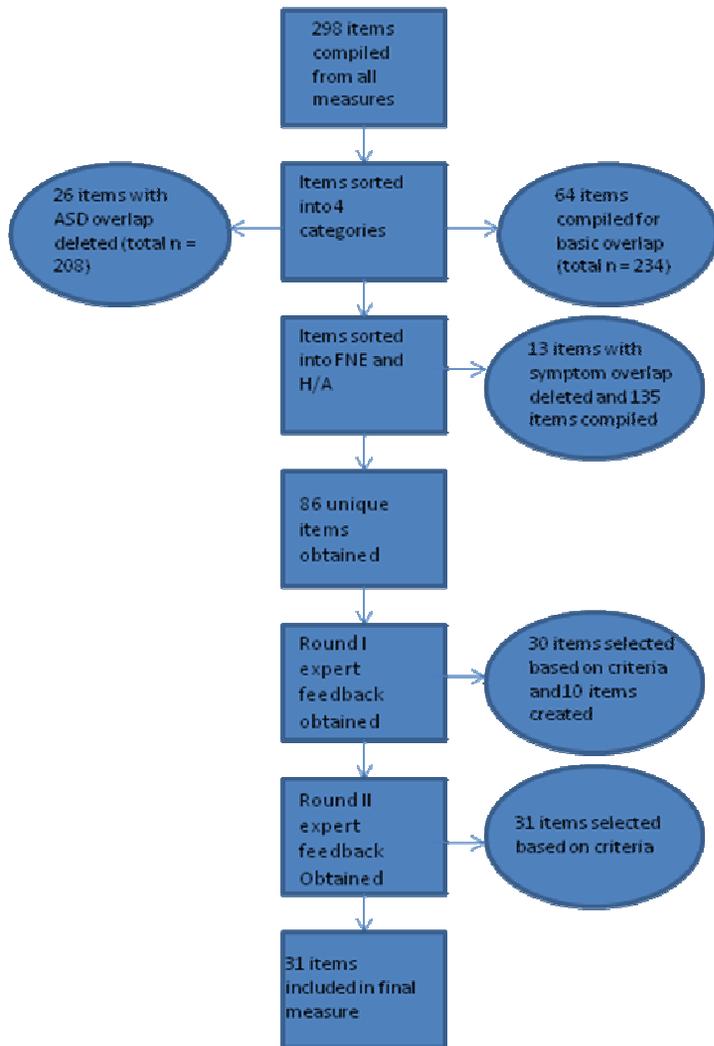


Figure 1. Flowchart of Item Reduction.

Appendix A

Coding Sheet

ID Number: _____

Time for SoP module: _____

Please watch the first 20 minutes of the ADIS video as well as the full Social Phobia Module. Check the appropriate box (note – only one box per item should be checked) if you observe and/or hear the teen or parent describe the following behaviors. Be sure to indicate in what capacity the item was observed or described by circling O (behavior directly observed), P (described by parent), or C – described by child (note: you may circle multiple letters in a box).

Observed directly or described as such in interview:	Not present	Possibly present	Definitely present
Increase in repetitive behavior during social interactions	O P C	O P C	O P C
Increase in interest in restricted interest during social interactions	O P C	O P C	O P C
Increase in ritualized behavior during social interactions	O P C	O P C	O P C
Use of attachment objects in social situations	O P C	O P C	O P C
Freezing (behaviorally and/or verbally) during social situations	O P C	O P C	O P C
"Meltdowns" or tantruming in social situations	O P C	O P C	O P C
Avoidance of seeing individuals he/she knows in public	O P C	O P C	O P C
Anger and/or aggression in social situations	O P C	O P C	O P C
Greater fear of talking to children and/or teens than adults	O P C	O P C	O P C
Cover face and/or attempt to hide self in social situations	O P C	O P C	O P C

Notes for Coding:

Repetitive behavior: repeating the same act over and over, saying the same words/sayings over and over, etc.

*Look for an increase in repetitive behavior when beginning the interview with the clinician, talking about anxiety provoking social situations, or description of increased repetitive behavior in social situations by parent or child.

Restricted interest: a topic in which the teen expresses intense interest, the topic may be unusual in nature or unusual in intensity

*Look for an increase in talk about the restricted interest when beginning the interview, talking about anxiety provoking situations, or a description of increase interest in restricted interest in social situations by parent or child

Ritualized behavior: may be a routine (certain way of doing things) performed by teen in social situations

Attachment objects: teen may carry certain attachment objects in social situations

Freezing: teen may feel unable to talk or act in anxiety provoking social situations

Meltdowns/tantruming: teen may cry, yell, etc. in anxiety provoking social situations

Avoidance: teen may go out of his/her way to avoid seeing people he/she knows in public

Anger and/or aggression: expressing anger or "blowing-up" in anxiety provoking social situations or describing verbal or physical examples of aggression in social situations

Appendix B

Virginia Tech Social Anxiety Scale in People on the Spectrum (VT-SASS)

Please rate the following items on this 4 – point scale based on how well each item describes you:

- 1 = strongly disagree
- 2 = disagree
- 3 = agree
- 4 = strongly agree

	Strongly Disagree	Disagree	Agree	Strongly Agree
1. I feel shy around people I don't know.	1	2	3	4
2. I get nervous when I meet new people.	1	2	3	4
3. I am more anxious/uncomfortable in social situations than most people.	1	2	3	4
4. I am too scared to ask other people questions.	1	2	3	4
5. Answering questions in front of others makes me feel sick in my stomach or nervous.	1	2	3	4
6. I feel comfortable around people I don't know.	1	2	3	4
7. When I speak to people I don't know, I feel sick in my stomach or nervous.	1	2	3	4
8. Being the center of attention makes me feel sick in my stomach or nervous.	1	2	3	4
9. I like getting called on in class/meetings.	1	2	3	4
10. I feel so scared at parties, social gatherings, school, or anyplace where there will be more than two other people that I go home early.	1	2	3	4
11. When I am addressed by another, I become so nervous I cannot speak more often than not.	1	2	3	4
12. I'm afraid of going to a party.	1	2	3	4
13. I fear acting, performing (e.g. choir, music, dance, sports performance, etc.), or speaking (e.g., giving a report, reading aloud, etc.) in front of an audience.	1	2	3	4
14. I fear participating in group activities.	1	2	3	4
15. I am more comfortable in social situations than most people.	1	2	3	4
16. I fear talking to persons I don't know well (e.g. strangers, new or unfamiliar people).	1	2	3	4
17. I worry about being teased, ignored, or made fun of by people.	1	2	3	4
18. I feel scared starting or joining in on a conversation.	1	2	3	4
19. I worry about what other people will think of me.	1	2	3	4
20. I worry about what others say about me.	1	2	3	4
21. I am comfortable asking other people questions.	1	2	3	4
22. I worry about people laughing at me.	1	2	3	4
23. I worry about getting called on in class/meetings.	1	2	3	4
24. I worry about doing something stupid or embarrassing.	1	2	3	4
25. I worry about meeting new people.	1	2	3	4
26. I worry about entering a room full of people.	1	2	3	4
27. I'm afraid of calling someone I don't know very well.	1	2	3	4
28. I'm afraid of being the center of attention.	1	2	3	4
29. I'm afraid of speaking up at a meeting.	1	2	3	4
30. When I'm with other people, sometimes I think whatever I say will sound stupid.	1	2	3	4
31. Before I go to a party or I go some place where others will be, I think about what might go wrong.	1	2	3	4
32. Before I go to a party or I go someplace where others will be, I think, "Will I make a mistake and look stupid?"	1	2	3	4
33. Before I go to a party or I go some place where others will be, I think, "What if somebody talks to me and I can't think of what to say?"	1	2	3	4
34. I feel like I can't talk or move when I'm with other people.	1	2	3	4
35. I go out of my way to avoid seeing people I know in public	1	2	3	4
36. I like being the center of attention.	1	2	3	4

Inconsistency Index

Copy the circled score for the item into the appropriate box. For each pair of items, subtract the lower value from the higher value and write the difference in the box beneath. Sum the differences and write the total in the Inconsistency Index Total box.

Item 1 Item 6

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Item 3 Item 15

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Item 4 Item 21

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Item 9 Item 23

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Item 8 Item 36

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Appendix C

IRB Approval Letter



Office of Research Compliance
Institutional Review Board
2000 Kraft Drive, Suite 2000 (0497)
Blacksburg, Virginia 24060
540/231-4606 Fax 540/231-0859
e-mail irb@vt.edu
Website: www.irb.vt.edu

MEMORANDUM

DATE: January 24, 2011

TO: Susan White, Nicole Kreiser

FROM: Virginia Tech Institutional Review Board (FWA00000572, expires October 26, 2013)

PROTOCOL TITLE: The Development of a Social Anxiety Measure for Adolescents and Adults with ASD

IRB NUMBER: 10-520

Effective January 24, 2011, the Virginia Tech IRB Chair, Dr. David M. Moore, approved the amendment request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at <http://www.irb.vt.edu/pages/responsibilities.htm> (please review before the commencement of your research).

PROTOCOL INFORMATION:

Approved as: Expedited, under 45 CFR 46.110 category(ies) 7

Protocol Approval Date: 6/15/2010

Protocol Expiration Date: 6/14/2011

Continuing Review Due Date*: 5/31/2011

*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

FEDERALLY FUNDED RESEARCH REQUIREMENTS:

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals / work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

Date*	OSP Number	Sponsor	Grant Comparison Conducted?

*Date this proposal number was compared, assessed as not requiring comparison, or comparison information was revised.

If this IRB protocol is to cover any other grant proposals, please contact the IRB office (irbadmin@vt.edu) immediately.

cc: File
Department Reviewer:David W. Harrison