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An Examination of the MASC Social Anxiety Scale in a Non-referred sample of Adolescents

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Abstract

Social phobia is prevalent during adolescence and is associated with negative outcomes. Two self-report instruments are empirically-validated to specifically assess social phobia symptomatology in youth: the Social Phobia and Anxiety Inventory for Children and the Social Anxiety Scale for Adolescents. The Multidimensional Anxiety Scale for Children is a broad-band measure of anxiety containing a scale assessing the social phobia construct. The present study investigated the MASC Social Anxiety Scale in relation to other well-established measures of social phobia and depression in a non-referred sample of adolescents. Results support the convergent validity of the MASC Social Anxiety Scale and provide some support for its discriminant validity, suggesting its utility in the initial assessment of social phobia. Receiver Operating Characteristics (ROCs) calculated the sensitivity and specificity of the MASC Social Anxiety Scale. Binary logistic regression analyses determined the predictive utility of the MASC Social Anxiety Scale. Implications for assessment are discussed.

Keywords

social phobia; anxiety; adolescence; assessment

Social phobia is a “marked and persistent fear of one or more social or performance situations in which the person is exposed to unfamiliar people or to possible scrutiny by others” (DSM-IV; American Psychological Association, 1994, p. 416). The average age of onset is during adolescence (Beidel, 1998), and prevalence rates of social phobia during this developmental period are approximately 5% for boys and 10% for girls (Wittchen, Stein, & Kessler, 1999). Adolescents diagnosed with social phobia are at risk for a number of negative outcomes including fewer and less fulfilling peer relationships (La Greca & Lopez, 1998), alcohol abuse (DeWit, MacDonald, & Offord, 1999), and suicidal ideation/attempts (Beidel & Turner, 1998). Epidemiological studies indicate that 25 to 31% of youth with social phobia have been diagnosed with or exhibit symptoms of depression (Last, Strauss, & Francis, 1987) and a

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significant number of these youth have comorbid anxiety disorders (Beidel, Turner, & Morris, 1999). Thus, accurate assessment of social phobia during adolescence is imperative. Early identification and treatment could prevent later morbidity and associated impairment.

Self-report questionnaires are a critical component in obtaining comprehensive information from multiple informants within a time and cost efficient manner. Two self-report measures are empirically-validated to assess social phobia symptomatology in youth: the Social Phobia and Anxiety Inventory for Children (SPAI-C; Beidel, Turner, & Morris, 1995) and the Social Anxiety Scale for Children-Revised (SASC-R; La Greca & Stone, 1993). A revised version of the SASC-R, the Social Anxiety Scale for Adolescents (SAS-A; La Greca & Lopez, 1998), has been made developmentally appropriate for adolescents. There is preliminary evidence that the Social Phobia Inventory (SPIN; Connor, Davidson, Churchill, Sherwood, Foa, & Weisler, 2000), developed for use with adults, also is a reliable measure in adolescents (Johnson, Inderbitzen-Nolan, & Anderson, 2006); however, further support is necessary.

Use of a measure designed to assess social phobia may be indicated when there is a clear question of whether or not social phobia is present. Narrow-band measures, however, pose some limitations. Most notably, there are high rates of comorbidity among childhood anxiety disorders (Beidel et al., 1999), which suggests that the full anxiety spectrum should be assessed. One method is to administer individual questionnaires for each category of anxiety (e.g., SPAI-C for social phobia, another questionnaire for generalized anxiety). In contrast, use of a broad-band measure taps into a wider array of anxious symptomatology and may signal need for further assessment in a particular domain. Thus, broad-band measures may be more practical and useful. Three broad-band self-reports of anxiety include subscales that assess social phobia: the Screen for Child Anxiety Related Emotional Disorders (SCARED; Birmaher, Khetarpal, Brent, Cully, Balach, Kaufman, et al., 1997), the Spence Children's Anxiety Scale (SCAS; Spence, 1998), and the Multidimensional Anxiety Scale for Children (MASC; March, Parker, Sullivan, Stallings, & Connors, 1997). Based on various dimensions (e.g., validity, reliability, and utility) Silverman and Ollendick (2008) concluded that the MASC has the strongest evidence-base for use as a diagnostic screener among the three broad-band measures. Moreover, limitations have been noted with the SCARED and the SCAS (Muris, 2002). For example, the discriminative power of the SCARED scales is less than satisfactory (Muris, Dreessen, Bogels, Weckx, & van Melick, 2004). Additionally, in contrast to the MASC, well-established norms and clinical-cut off scores are not presently available for the SCAS, which decreases its clinical utility.

The MASC is the best normed and psychometrically strongest broad-band anxiety scale (Baldwin & Dadds, 2007; Wood, Piacentini, Bergman, McCracken, & Barrios, 2002). In contrast to scales designed to assess specific DSM-IV diagnostic categories, such as the SCAS and SCARED, the MASC assesses a wide range of anxiety symptoms (March, 1998) and is touted to represent the population factor structure of anxiety. MASC items and scales were derived based on an analysis of characteristics that differentiate anxiety-disordered and non-anxiety disordered children. The MASC consists of four main scales, three of which have subscales: Physical Symptoms (Tense/Restless, Somatic/Autonomic), Social Anxiety (Humiliation/Rejection, Performance Fears), Harm Avoidance (Perfectionism, Anxious Coping), and Separation/Panic (March, 1998). The MASC also yields a Total Scale score and an Anxiety Disorder Index score to identify youth who may meet criteria for an anxiety disorder (March, 1998).

The MASC factor structure is valid and reliable in community and clinical samples (Grills-Taquechel, Ollendick, & Fisak, 2008; March et al., 1997; Rynn et al., 2006). The MASC Total Scale and scales have good to excellent test-retest reliability (March et al., 1997; March, Sullivan, & Parker, 1999) and rather good internal consistencies (March et al., 1997; March &

Parker, 1999). In nonclinical samples the MASC has demonstrated good convergent validity with the Revised Children's Manifest Anxiety Scale (RCMAS; $r = .63$; March et al., 1997), the State Trait Anxiety Inventory for Children (STAI-C; $r = .79$; Muris, Merckelbach, Ollendick, King, & Bogie, 2002), the SCARED ($r = .81$; Muris et al., 2002), and the SCAS ($r = .71$; Muris et al., 2002). Similar correlations have been found in a clinical sample of youth (RCMAS, $r = .61$; STAIC, $r = .60$; Rynn et al., 2006). The MASC has fair predictive power with regard to anxiety diagnoses, including social phobia (Dierker et al., 2001). The MASC discriminates between anxious children, normal children, and children with other types of psychopathology (March et al., 1999). In an initial investigation the MASC was not significantly correlated with the Children's Depression Inventory (CDI; $r = .19$; March et al., 1997). The MASC, however, was significantly correlated with the CDI in other nonclinical and clinical samples ($r = .60$, Muris et al., 2002; $r = .47$, Rynn et al., 2006), which is not surprising, given the high comorbidity of anxiety and depression (Brady & Kendall, 1992). Correlations between the MASC and CDI, nonetheless, are weaker than correlations between the MASC and other measures of anxiety, supporting its validity.

While identifying general elevations in anxiety is useful, it is important to determine the utility of MASC scales in identifying particular domains of elevated symptomatology, such as social phobia, especially given that scale items are not directly tied to specific DSM-IV diagnostic criteria. Some valuable work has examined the MASC Social Anxiety Scale in comparison to the other MASC scales and with regard to other measures of social phobia and depression. The MASC Social Anxiety Scale was significantly correlated with the MASC Physical Symptoms Scale (r s from .43 to .63), the Harm Avoidance Scale (r s from .23 to .48), and the Separation/Panic Scale (r s from .31 to .44; March et al., 1997; Muris et al., 2002), which is not surprising given the overlap of anxiety symptomatology (Beidel et al., 1999). Correlations between the MASC Social Anxiety Scale and the MASC Physical Symptoms Scale are higher than correlations between the MASC Social Anxiety Scale and the other two scales. Convergent validity of the MASC Social Anxiety Scale has been demonstrated through significant positive correlations with the SCARED Social Phobia Subscale ($r = .72$) and the SCAS Social Phobia Subscale ($r = .70$) in school children (Muris et al., 2002). Support for the discriminant validity of the MASC Social Anxiety Scale has been mixed. This scale was significantly correlated with the CDI in clinical and nonclinical samples ($r = .56$; Rynn et al., 2006; $r = .59$; Muris et al., 2002), contrary to findings of March and colleagues (1997; $r = .14$).

Other work has examined the predictive utility of the MASC Social Anxiety Scale. Scores on this scale were significantly higher among clinically-referred youth diagnosed with social phobia compared to youth diagnosed with other anxiety disorders (Wood et al., 2002). In a large sample of mixed clinical outpatients, the MASC Social Anxiety Scale was the only significant predictor of the four MASC scales with regard to social phobia diagnoses, further supporting its specificity (Grills-Taquechel et al., 2008). The MASC Social Anxiety Scale, however, had only fair predictive accuracy with regard to social phobia diagnoses in another clinical sample (AUC = .76; van Gastel & Ferdinand, 2008). There is preliminary evidence that a raw score cutoff of 13.5 differentiates socially anxious from non-socially anxious youth (Wood et al., 2002); however, more research is necessary to evaluate the sensitivity/specificity of this scale.

Although a number of studies examined the MASC Social Anxiety Scale, there are several gaps in the extant literature which we sought to address. First, we investigated the convergent validity of the MASC Social Anxiety Scale with empirically-validated measures of social phobia, given that previous research has only established convergence with subscales from broad-band anxiety measures. Second, we further evaluated the discriminant validity of the MASC Social Anxiety Scale with the Children's Depression Inventory, due to the mixed evidence in the literature. Third, we provided data on the sensitivity and specificity of this

scale, which have only been examined in one previous study (Wood et al., 2002). Fourth, we examined the predictive utility of this scale in comparison to the other MASC Scales as well as to the other well-established measures of social phobia.

The present study evaluated the MASC Social Anxiety Scale in a non-referred sample of adolescents, some of whom have diagnoses of social phobia. It was hypothesized that evidence for the convergent validity of the MASC Social Anxiety Scale would be demonstrated through positive correlations with the SAS-A and SPAI-C. It was hypothesized that adolescents diagnosed with social phobia would have higher mean MASC Total scores and scale scores (i.e., Social Anxiety, Physical Symptoms, Harm Avoidance, and Separation/Panic) compared to nonanxious adolescents. It was expected that the MASC Social Anxiety Scale would be significantly correlated with the MASC Physical Symptoms scale, and also to a lesser degree with the Harm Avoidance and Separation/Panic Scales. It was anticipated that these correlations would be smaller than those with social phobia measures. It also was hypothesized that the discriminant validity of the MASC Social Anxiety Scale would be demonstrated through smaller correlations with the CDI compared to correlations with social phobia measures. Sensitivity and specificity of the MASC Social Anxiety Scale with regard to social phobia diagnostic classification was examined using ROC analyses. It was hypothesized that a cutoff score of 13.5 (Wood et al., 2002), would adequately differentiate groups. Binary logistic regression analyses were conducted to assess the predictive utility of the MASC Social Anxiety Scale. It was hypothesized that this scale would be the only significant predictor of social phobia of the four MASC scales. Predictive utility was compared to the SAS-A and SPAI-C but no a priori hypotheses were made.

Method

Participants

Three hundred and seventy-two adolescents were recruited from local public schools in a midsized Midwestern city and participated in the present study. The sample was comprised of 170 boys and 202 girls between the ages of 13 and 17 (M age = 14.5). With respect to ethnic background, the breakdown was representative of the larger community as 92% of the sample identified themselves as Caucasian, 2% as African American, 3% as Asian American, 1% as Hispanic, and 2% as Biracial. Participants in the study reported various socioeconomic statuses (based on yearly household income), with a specific breakdown as follows: less than \$10,000 (2%), \$11,000 to \$25,000 (9%), \$26,000 to \$50,000 (24%), \$51,000 to \$75,000 (25%), \$76,000 to \$100,000 (22%), and greater than \$100,000 (17%).

Measures

Anxiety Disorders Interview Schedule for DSM-IV: Child/Parent Version (ADIS-IV:C/P; Silverman & Albano, 1996)—This semi-structured diagnostic interview is administered independently to the adolescent and parent. The ADIS-IV:C/P assesses all DSM-IV anxiety disorders, as well as Dysthymia, Major Depressive Disorder, Attention-Deficit/Hyperactivity Disorder, Conduct Disorder, and Oppositional-Defiant Disorder. Each diagnosis is accompanied by a clinician's severity rating (CSR), based on severity of symptoms and resulting impairment in functioning. The CSRs are made using a nine-point Likert-type scale ranging from 0 (*none*) to 8 (*very severely disturbing/disabling*), and a minimum rating of four is required to make a diagnosis. The ADIS-IV:C/P provides separate diagnoses and CSRs based on the adolescent and parent interviews. A composite diagnosis is ascertained by combining results from both interviews. If a diagnosis is given on one, but not both interviews, the composite diagnosis includes the diagnosis and CSR. If both interviews yield the same diagnosis, the higher of the two CSRs is given. Previous research has found the ADIS-IV:C/P to be a reliable and valid measure of anxiety disorders in youth (Silverman & Eisen, 1992;

Silverman & Rabian, 1995). ADIS-IV:C/P composite diagnoses were used to form diagnostic groups in the present study.

All diagnostic interviews were completed by trained doctoral-level clinical psychology graduate students, under the supervision of a licensed clinical psychologist with expertise in adolescent anxiety. All interviewers were trained based on the criteria outlined by the authors of the ADIS-IV:C/P (Silverman & Albano, 1996). All of the diagnostic interviews were audiotaped in order to assess for independent diagnostic agreement. A second trained interviewer randomly selected and re-evaluated 25% of the tapes to assess for interrater reliability. It was considered a diagnostic match if there was exact agreement on the composite diagnoses and CSRs were within one point. In the present sample, interrater reliability was found to be 94%.

Multidimensional Anxiety Scale for Children (MASC; March et al., 1997)—The MASC is a 39-item self-report measure of anxiety. As described earlier, the items comprise four scales and six subscales and model invariance is supported across gender (Grills-Taquechel et al., 2008). Items are rated on a four-point Likert-type scale ranging from zero (*never true about me*) to three (*often true about me*), such that higher scores on the subscales and the total scale indicate higher levels of anxiety. The MASC Social Anxiety Scale is comprised of nine items and has a potential range of scores from zero to 27. As noted, a raw score cutoff of 13.5 on the Social Anxiety Scale was recommended to differentiate socially anxious from non-socially anxious youth (Wood et al., 2002). The MASC Total Scale and scale scores have been demonstrated to have good internal consistency and reliability (March et al., 1997). In a nonclinical sample (Muris et al., 2002), the mean MASC Total and MASC Social Anxiety Scale scores were 38.00 ($SD = 18.8$) and 9.70 ($SD = 6.90$), respectively. The mean MASC Total and Social Anxiety Scale were higher in a clinical sample ($M = 61.20$, $SD = 1.60$; $M = 16.70$, $SD = .60$; Rynn et al., 2006).

Social Anxiety Scale for Adolescents (SAS-A; La Greca & Lopez, 1998; La Greca & Stone, 1993)—The SAS-A is a self-report measure that includes 18 items assessing three dimensions: fear of negative evaluation, social avoidance, and distress. Items are rated on a five-point Likert-type scale ranging from one (*not at all true*) to five (*true all of the time*). Higher total scores indicate higher levels of social anxiety. The SAS-A has been demonstrated to be reliable and valid (La Greca & Lopez, 1998; Inderbitzen-Nolan, Davies, & McKeon, 2004; Inderbitzen-Nolan & Walters, 2000). The mean SAS-A score in a nonclinical sample of adolescents was 39.09 ($SD = 12.00$), and the suggested cutoff score to reliably differentiate socially anxious and nonanxious adolescents is 50 (La Greca & Lopez, 1998). Using a larger set of data from the current project, Inderbitzen-Nolan, Davies, and McKeon (2004) found that the specificity of the SAS-A was quite high (82.7%), whereas the sensitivity was only 43.6%. The SAS-A was included in the present investigation to assess convergent validity of the MASC Social Anxiety Scale and as a comparison of predictive utility.

Social Phobia and Anxiety Scale for Children (SPAI-C; Beidel et al., 1995)—The SPAI-C is an empirically-derived 26-item self-report measure that assesses somatic, cognitive, and behavioral symptoms associated with social phobia. Each item is responded to using a three-point Likert-type scale (*never or hardly ever, sometimes, almost always or always*). Higher scores are indicative of higher anxiety. The SPAI-C has good reliability and validity estimates (Beidel, Turner, & Fink, 1996; Beidel et al., 1995) and has been found to accurately distinguish children with social phobia from children with other anxiety disorders (Morris & Masia, 1998). Several studies support the suggested cutoff score of 18 to reliably differentiate socially-anxious and non-socially anxious children (Beidel et al., 1995; Beidel et al., 1999). The mean SPAI-C score was 14.70 ($SD = 10.18$) in a nonclinical sample and 20.42 ($SD = 11.70$) in a clinical sample (Epkins, 2002). Although the SPAI-C initially was developed to be

used with children ages 8–13, recent evidence has supported its reliability and validity in adolescents (Storch, Masia-Warner, Dent, Roberti, & Fisher, 2004). Inderbitzen-Nolan and colleagues (2004) found that the specificity of the SPAI-C was quite high (82.7%), and the sensitivity was 61.5%. The SPAI-C was included in the present study as an additional measure of convergent validity with the MASC Social Anxiety Scale and as a comparison of predictive utility.

Children's Depression Inventory (CDI; Kovacs, 1992)—The CDI is a 27-item self-report measure assessing cognitive and somatic symptoms associated with depression. Items are rated on a three-point Likert-type scale ranging from zero to two and higher scores indicate more severe depressive symptomatology. The CDI is the most extensively used measure of depression in youth, and research supports its reliability and validity (Curry & Craighead, 1993; Saylor, Finch, Spirito, & Bennett, 1984). Previous research found a mean of 10.96 in a clinical sample and 6.29 in a nonclinical sample (Saylor et al., 1984). The CDI was included in the present study as a measure of discriminant validity with the MASC Social Anxiety Scale.

Procedure

All measures were administered as part of a larger study. Recruitment letters were mailed to parents and adolescents in grades seven through twelve in public middle and high schools in a midsized Midwestern city. The letters indicated that youth who reported being shy or feeling nervous in social interactions would be compared with those who did not feel nervous in such situations, and thus, any youth between the ages of 13 and 17 may be eligible for participation. Interested parents completed an initial phone screen to determine eligibility. For the purposes of the larger study, adolescents with learning disabilities or principal diagnoses of Bipolar Disorder, Major Depressive Disorder, Attention-Deficit/Hyperactivity Disorder, Conduct Disorder or Oppositional Defiant Disorder were excluded from participation.

Over the course of four years, approximately 9,300 letters were mailed to parents and guardians. Approximately 640 parents (6.9% of those who received flyers) called requesting additional information about the study. Appointments were scheduled with 475 adolescent/parent pairs (74% of those calling), and 372 adolescent/parent pairs (78% of those who had a scheduled appointment) actually attended the assessment appointment.

Adolescents meeting the inclusion criteria, based on parent report, were invited to participate in two, two-hour appointments. During the first appointment, the ADIS-IV:C/P was administered separately to the adolescent and to the parent by the same interviewer. The order of parent/adolescent interviews was counterbalanced across subjects. Adolescents also completed a battery of self-report measures, including the SAS-A, SPAI-C, and CDI, the order of which also was counterbalanced. Adolescents were invited to return approximately one week later to participate in a second appointment. Due to the purposes of the larger study, two adolescents were not invited to return for a second appointment because they received a principal diagnosis of Dysthymia and Conduct Disorder, respectively. All other adolescents were scheduled and returned for the second appointment. During this appointment, adolescents completed the MASC in addition to other tasks. All adolescents and parents were provided with a list of psychological treatment providers in the area.

Results

Formation of Diagnostic Groups

Two groups were formed using the ADIS-IV:C/P: a social phobic group and a nonanxious group. Adolescents who received a principal composite diagnosis¹ of social phobia on the ADIS-IV:C/P were included in the social phobic group. Principal and secondary diagnoses

were determined by CSRs (i.e., the diagnosis with the highest CSR was the principal diagnosis). The social phobic group was comprised of 78 adolescents (36 males and 42 females), based on this criterion. Of this group, 64 participants had a principal diagnosis of social phobia with no comorbid diagnoses. Thirteen of these adolescents had another comorbid anxiety disorder (e.g., 10 had a comorbid Generalized Anxiety Disorder (GAD), 2 had Specific Phobia, and 1 had Obsessive Compulsive Disorder (OCD)) and 1 had a secondary comorbid externalizing disorder (i.e., Oppositional Defiant Disorder). The nonanxious group was comprised of 273 adolescents (129 boys and 144 girls) who did not meet ADIS diagnostic criteria for any disorder. Adolescents in the social phobic group had significantly higher mean scores on the SAS-A, $F(1, 349) = 93.19, p < .001$, and the SPAI-C, $F(1, 349) = 117.52, p < .001$, compared to adolescents in the nonanxious group (see Table 1). Of the adolescents from the original sample of 372 adolescents, 19 were excluded prior to group formation due to having a principal diagnosis of GAD ($n = 14$), Specific Phobia ($n = 4$), and OCD ($n = 1$). A final N of 351 adolescents comprised the two groups.

Preliminary Analyses

Preliminary analyses were conducted to ensure that the nonanxious and social phobic groups did not differ with regard to demographic variables. The groups were not significantly different on age ($F(1, 349) = .04, p > .05$), gender ($X^2 = .03, p > .05$), ethnic identity ($X^2 = 2.22, p > .05$), or family income ($X^2 = 7.56, p > .05$). Means, standard deviations, and indices of skewness and kurtosis were calculated for the MASC, SAS-A, SPAI-C, and CDI (see Table 1 for means and standard deviations) to ensure that all variables were normally distributed. Outlier analyses were performed on each variable, and no outliers were detected. Of note, results presented in this manuscript were not altered significantly by considering boys and girls separately, or the interaction of diagnostic group and gender, and therefore all analyses are conducted without considering gender as a covariate and without separating boys and girls.

Internal consistency

In the present study, results supported excellent internal consistency for the MASC Total Scale ($\alpha = .92$), the MASC Social Anxiety Scale ($\alpha = .91$), and the Physical Symptoms Scale ($\alpha = .88$), as well as good internal consistency for the Harm Avoidance Scale ($\alpha = .76$), and the Separation/Panic Scale ($\alpha = .73$). In addition, excellent internal consistency was evidenced by the SAS-A ($\alpha = .91$), the SPAI-C ($\alpha = .97$), and the CDI ($\alpha = .85$).

Convergent Validity

In order to examine the convergent validity of the MASC Social Anxiety Scale, scores on this scale were correlated with scores on the SAS-A and SPAI-C. Results indicated that scores on the MASC Social Anxiety Scale were significantly and positively correlated with scores on both the SAS-A ($r = .84, p < .001$) and SPAI-C ($r = .80, p < .001$; see Table 2). Fisher's Z test revealed that the difference between the correlation of the MASC Social Anxiety Scale with the SAS-A and the correlation of the MASC Social Anxiety Scale with the SPAI-C ($Z = 1.40, p > .05$) was not significant.

Separate ANOVAs were computed for the MASC Total Scale and for each of the scales, with diagnostic group (i.e., social phobic and nonanxious) serving as the between groups factor and the MASC Total Scale and scale scores as the dependent variables. Results indicated that adolescents in the social phobic group had significantly higher mean scores on the MASC Total Scale, $F(1, 349) = 37.81, p < .001$, compared to adolescents in the nonanxious group. In

¹Of the 78 adolescents who met criteria for a composite diagnosis of social phobia, 35 composite diagnoses were based on parent-only report, 17 were based on adolescent-only, and 26 composite diagnoses were based on both parent and adolescent report.

addition, adolescents in the social phobic group exhibited higher mean scores on the MASC Social Anxiety Scale, $F(1, 349) = 85.34, p < .001$, and on the MASC Physical Symptoms Scale, $F(1, 349) = 24.26, p < .001$, compared to adolescents in the nonanxious group. There was no significant mean difference between adolescents in the two diagnostic groups in scores on the MASC Harm Avoidance Scale, $F(1, 349) = 1.16, p > .05$, or on the MASC Separation/Panic Scale, $F(1, 349) = 3.58, p > .05$, contrary to the hypothesis. Means and standard deviations for the two diagnostic groups on the MASC Total Score and scale scores are listed in Table 1.

Correlational analyses revealed significant positive correlations between scores on the MASC Social Anxiety Scale and scores on the MASC Physical Symptoms Scale ($r = .57, p < .001$), MASC Harm Avoidance Scale ($r = .27, p < .001$), and MASC Separation/Panic Scale ($r = .43, p < .001$). Fisher's Z tests were performed in order to examine the relative strength of these correlations. Corresponding to the hypothesis, scores on the MASC Social Anxiety Scale were more highly correlated with scores on the MASC Physical Symptoms Scale than with scores on the MASC Harm Avoidance Scale ($Z = 4.23, p < .05$) and the MASC Separation/Panic Scale ($Z = 2.14, p < .05$). Correlations between the MASC Social Anxiety Scale scores and the latter two scales were not significantly different from each other ($Z = 1.82, p > .05$). Scores on the MASC Social Anxiety Scale, however, were more strongly associated with the SAS-A ($Z = 6.54, p < .05$) and SPAI-C ($Z = 5.14, p < .05$) compared to scores on the MASC Physical Symptoms Scale.

Discriminant Validity

In order to examine the discriminant validity of the MASC Social Anxiety Scale, the social phobic and nonanxious groups were compared on depressive symptomatology, as measured by the CDI. An ANOVA was computed with diagnostic group (i.e., social phobic and nonanxious) serving as the between groups factor and scores on the CDI as the dependent variable. Results indicated that adolescents in the social phobic group scored significantly higher on the CDI, $F(1, 349) = 53.74, p < .001$, compared to adolescents in the nonanxious group, as expected. Means and standard deviations for scores on self-report measures by diagnostic group are listed in Table 1. Scores on the MASC Social Anxiety Scale were significantly correlated with scores on the CDI ($r = .54, p < .001$; see Table 2). Further examination of the discriminant validity of the MASC Social Anxiety Scale revealed that scores on this scale were more strongly associated with the SAS-A ($Z = 7.04, p < .01$) and SPAI-C ($Z = 5.64, p < .01$) than with the CDI. Scores on the MASC Social Anxiety Scale were not differentially correlated with scores on the CDI and scores on the MASC Physical Symptoms Scale ($Z = .49, p > .05$).

MASC Social Anxiety Scale Sensitivity/Specificity

In order to determine the ability of the MASC Social Anxiety Scale to discriminate adolescents in the social phobic and nonanxious groups, Receiver Operating Characteristics (ROCs) of the MASC Social Anxiety Scale were conducted and analyzed to find an adequate cutoff score. Results revealed the area under the curve to be .80 ($SE = .03, p < .01$), suggesting that there is an 80% probability that an adolescent with social phobia will have a higher score on the MASC Social Anxiety Scale than a nonanxious adolescent. The 95% confidence interval of the area under the curve ranged from .74 – .85. Table 3 shows the sensitivity and specificity for different MASC Social Anxiety Scale cutoff scores. Both 12.5 and 13.5 (the recommended clinical cutoff; Wood et al., 2002) performed similarly in terms of an optimal balance between sensitivity and specificity. A cutoff score of 12.5 on the MASC Social Anxiety Scale yielded a sensitivity of 67.9% and a specificity of 78.0%, while a cutoff score of 13.5 yielded a sensitivity of 62.8% and a specificity of 81.7%. The rate of false negative and false positive diagnoses based on a cutoff score of 12.5 was 32.1% and 22.0%, respectively. Rate of false

negative and false positive diagnoses based on a cutoff score of 13.5 was 37.2% and 18.3%, respectively.

Predictive Utility

Binary logistic regression analyses were performed to assess which variables contribute most significantly to the prediction of social phobia diagnoses (see Table 4). Diagnoses on the ADIS-IV:C/P were the outcome variable (i.e., social phobic or nonanxious). The MASC Social Anxiety Scale was entered as a predictor in the first step and the SAS-A and SPAI-C were added as predictors in the second step of this social phobia model. A model with just the MASC Social Anxiety Scale accounted for 28% of the variance in social phobia diagnoses [$X^2(1) = 71.23, p < .001$], and resulted in 79% classification accuracy. The MASC Social Anxiety Scale significantly contributed. Adding the two social anxiety measures to the model increased the variance accounted for in social phobia diagnoses to 36% [$X^2(2, 3) = 22.33, p < .001$] and resulted in 82% classification accuracy. Only one variable significantly contributed to the model. The SPAI-C was related to diagnostic status, $Wald(1) = 10.84, p < .01$, such that higher SPAI-C scores are better predictors of social phobia diagnoses, controlling for the other two predictors at their means.

In a second binary logistic regression (MASC model), diagnoses on the ADIS-IV:C/P were the outcome variable (i.e., social phobic or nonanxious) and the four MASC scales were entered simultaneously as predictors. This model accounted for 30% of the variance in social phobia diagnoses [$X^2(4) = 75.57, p < .001$], and resulted in 80% classification accuracy. The MASC Social Anxiety Scale was the only variable related to diagnostic status, $Wald(1) = 42.60, p < .001$, such that higher MASC Social Anxiety Scale scores are better predictors of social phobia diagnoses, controlling for the other three predictors at their means.

Discussion

The present investigation sought to examine the utility of the MASC Social Anxiety Scale as a screening tool for assessing social phobia symptomatology in a non-referred sample of adolescents, some of whom have diagnoses of social phobia. We investigated the convergent validity of this scale with two well-established measures of social phobia, as well as its discriminant validity with a measure of depression. Given that little research has examined the sensitivity and specificity of this particular scale, we sought to provide support for a previously established cutoff score of 13.5 (Wood et al., 2002). Finally, we evaluated the predictive utility of this scale compared to the other four MASC scales and to the social phobia measures.

Results support the convergent validity of the MASC Social Anxiety Scale through positive correlations with the SAS-A and SPAI-C, as hypothesized. The MASC Social Anxiety Scale appears to measure the same construct as the other two well-established social phobia measures. Adolescents in the social phobic group, furthermore, scored higher on the MASC Social Anxiety Scale compared to adolescents in the nonanxious group. Thus, given high comorbidity among the anxiety disorders, the broad-band MASC may be a good initial screening tool to identify significant social phobia symptomatology. Elevated scores on the MASC Social Anxiety Scale may signal a need for further assessment of social phobia symptoms.

The hypothesis that adolescents in the social phobic group would have higher mean MASC Total scores and scale scores than nonanxious adolescents was partially supported. Adolescents in the social phobic group scored significantly higher than adolescents in the nonanxious group on the MASC Physical Symptoms Scale and on the MASC Total Scale. Higher scores on the MASC Total Scale were influenced by elevations on the Physical Symptoms and Social Anxiety scales. Contrary to our hypothesis, however, adolescents in the social phobic group did not differ significantly from nonanxious adolescents on the other two MASC scales (i.e.,

Harm Avoidance and Separation/Panic). These results suggest that the MASC scales tap into unique aspects of anxiety. Adolescents with social phobia may experience associated physical symptoms but not necessarily symptoms of separation/panic or harm avoidance. Adolescents in the social phobic group may not score higher on the latter two scales compared to nonanxious adolescents unless the former group also experienced other significant anxiety symptoms. In the present study, only 13 of 78 adolescents in the social phobic group had comorbid anxiety diagnoses (10 had GAD, 2 had Specific Phobia, and 1 had OCD). None of the adolescents had comorbid Separation Anxiety Disorder or Panic Disorder which may account for the lack of differences between the groups on the Separation/Panic Scale. Concerning the Harm Avoidance Scale, which consists of the Perfectionism and Anxious Coping subscales, adolescents with comorbid GAD and OCD may have endorsed some of the items on the Harm Avoidance Scale, yet this endorsement did not result in great enough elevations to account for the remaining adolescents who only reported social phobia symptoms.

The MASC Social Anxiety Scale was significantly correlated with the Physical Symptoms Scale and more so than with the other MASC scales, consistent with past research (i.e., March et al., 1997; Muris et al., 2002). The MASC Social Anxiety Scale also was significantly positively correlated with the MASC Separation/Panic and Harm Avoidance Scales. The correlation of the MASC Social Anxiety Scale with the latter scale was significantly lower than correlations with social phobia measures, the MASC Physical Symptoms Scale, and the CDI. The correlation of the MASC Social Anxiety Scale with the MASC Separation/Panic Scale, however, was not significantly lower than the correlations of the MASC Social Anxiety Scale with the Physical Symptoms Scale and the CDI. One explanation for this finding is symptom overlap among the anxiety disorders. Although scores on the MASC Social Anxiety Scale were significantly correlated with all of the measures used in the current investigation, scores on this scale were most strongly associated with scores on the SAS-A and SPAI-C, which supports the convergent validity of the MASC Social Anxiety Scale and further supports the utility of this scale as a screening measure of social phobia.

Discriminant validity of the MASC Social Anxiety Scale was supported though smaller correlations between this scale and the CDI compared to correlations of this scale with the two social phobia measures. Although the correlation between the MASC Social Anxiety Scale and the CDI was significant, it was significantly less than correlations with the SAS-A and SPAI-C. The relationship between the MASC Social Anxiety Scale and the CDI is not surprising, given the high intercorrelations of anxiety and depression. The discriminant validity of the MASC Social Anxiety Scale would be questionable, however, if the correlation of this scale with the CDI was as high as or higher than the correlations between the MASC Social Anxiety Scale and the other two social phobia measures, which was not the case. The correlation of the MASC Social Anxiety Scale with the CDI was not different from its correlation with the Physical Symptoms Scale. It is possible that the CDI taps into the physical or somatic symptoms of depression, which can appear similar to those symptoms associated with anxiety.

The present study examined the sensitivity and specificity of the MASC Social Anxiety Scale using ROC analyses. As noted, the purpose of the MASC Social Anxiety Scale is not for diagnostic classification, but rather to serve as a screening measure of social phobia, such that scores above an empirically-established cutoff indicate that further assessment is warranted. A cutoff score of 13.5 led to a low percentage of adolescents incorrectly identified with social phobia, but a higher proportion of adolescents being overlooked in terms of heightened social phobia symptomatology. In the only previous investigation of the sensitivity/specificity of the MASC Social Anxiety Scale, Wood and colleagues (2002) found a sensitivity of .63 and specificity of .64 using a cutoff score of 13.5. The present study demonstrated similar sensitivity but better specificity (.82) using the same cutoff score. Thus, using the cutoff of 13.5 on this

scale to identify social phobia may underestimate symptomatology, and adolescents with social phobia may go undetected. Current results suggest that a cutoff score of 12.5 performs similarly in differentiating social phobic and nonanxious adolescents. Depending upon the intended purpose of the MASC, a lower cutoff score may be more appropriate. A cutoff of 12.5 may be advantageous for screening adolescents in clinical settings in order to avoid overlooking adolescents who need further assessment. A more conservative cutoff score of 13.5 may be warranted when using this scale for research purposes in order to avoid false positives. Of note, sensitivity/specificity results are similar to findings with the SPAI-C, using data from the larger study (Inderbitzen-Nolan et al., 2004), and the sensitivity of the MASC Social Anxiety Scale was better than that of the SAS-A from the larger investigation. Thus, a cutoff score of 13.5 on the MASC Social Anxiety Scale performed as well as the SPAI-C and slightly better than the SAS-A.

With regard to predictive utility of the MASC Social Anxiety Scale, results of binary logistic regression analyses indicated that this scale was the only significant predictor (of the four MASC scales) of social phobia diagnoses. These results are consistent with previous work (i.e., Grills-Taquechel et al., 2008). A model with only the MASC Social Anxiety Scale accounted for similar variance in social phobia diagnoses compared to the model with all four MASC scales. Adding the SAS-A and SPAI-C to the model with the MASC Social Anxiety Scale increased the variance accounted for, but the MASC Social Anxiety Scale no longer was a significant predictor. These results suggest that although the MASC Social Anxiety Scale accounts for a significant amount of variance, its contribution to the model is no longer significant after addition of the social phobia measures.

There are several notable limitations to the findings of the current study. First, the generalizability of the present study is limited because the vast majority of adolescents were Caucasian with very little representation of ethnic minorities. Additionally, the vast majority of adolescents were middle class, despite attempts to recruit a diverse sample. It will be important for future research to assess the MASC Social Anxiety Scale with ethnically and economically diverse adolescents. Moreover, the response rate to our recruitment efforts was quite low (6.9%). Parents who responded to the flyer may represent a different population, given that they were more open to research participation than those who did not respond to the flyer, potentially limiting the generalizability of our results to other non-referred adolescents. Also, because the constructs in the current study were measured only by self-report, it is possible that shared method variance may have inflated the results.

Another limitation is that adolescents in the current sample were not clinically referred, and therefore, may not be comparable to adolescents in a clinical sample. It is important to note, however, that adolescents in the social phobic group scored above the clinical cutoffs on both the SAS-A and the SPAI-C. Social phobic adolescents scored significantly higher on the SAS-A compared to adolescents in a nonclinical sample (La Greca & Lopez, 1998). With regard to the SPAI-C, social phobic adolescents scored higher than nonclinical youth and almost as high as clinically-referred youth (Epkins, 2002). Adolescents in the social phobic group evidenced similar scores on the MASC Social Anxiety Scale to scores in a clinical sample (Rynn et al., 2006). Thus, although this was not a treatment-seeking or clinical sample, social phobic adolescents experienced clinically severe symptomatology.

Another constraint of the current study is the relative “purity” of the sample. Most of the adolescents diagnosed with social phobia (64 of 78) did not meet criteria for comorbid diagnoses. This is not consistent with evidence that youth with social phobia often meet criteria for comorbid anxiety disorders (Beidel et al., 1999). One potential reason for the lack of comorbidity in the current study is because we specifically advertised and recruited for social phobia concerns, and therefore, adolescents with other significant anxiety problems may not

have participated in the study. Additionally, adolescents were ascertained from the community and were not currently in treatment, which suggests that any present comorbid symptoms may have been less severe compared to treatment-seeking adolescents. It is possible that the “purity” of the sample may have impacted some of our results, such as a lack of group differences on MASC scales, which potentially limits the generalizability of our findings.

One last notable limitation is lack of inclusion of the other two broad-band measures of anxiety (i.e., SCAS, SCARED). Given that these measures were not included, it cannot be definitively concluded that the MASC is a superior screening device to these measures. Although past research has examined relationships among these three broad-band measures of anxiety, it would be useful for future studies to rigorously examine the sensitivity/specificity and predictive utility of the scales of these measures in comparison to one another. This research would provide support for the utility of one broad-band measure over the other.

In conclusion, investigation of the MASC Social Anxiety Scale as a screening tool for social phobia in adolescents yields promising results. Results of the present study supported the convergent validity of this scale with well-established measures of social phobia. Discriminant validity of the scale also was supported. We provided additional support for the sensitivity and specificity of the MASC Social Anxiety Scale and determined that different cutoff scores may be warranted depending upon the setting. Predictive utility of this scale was supported. Future research with ethnically and economically diverse adolescents is warranted, in order to determine the generalizability of these findings. Results from the current study support utility of the MASC Social Anxiety Scale as a screening measure in a non-referred sample of adolescents.

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Table 1

Mean Scores and Standard Deviations for the Self-Report Measures by Diagnostic Group

MASC Scores	ADIS Diagnosis		<i>F</i>
	Social Phobic <i>M (SD)</i>	Nonanxious <i>M (SD)</i>	
MASC Total Scale	44.77 (14.45)	32.66 (15.58)	37.81*
Social Anxiety Scale	15.23 (5.87)	8.32 (5.81)	85.34*
Physical Symptoms Scale	10.18 (6.61)	6.52 (5.52)	24.26*
Harm Avoidance Scale	14.60 (4.11)	13.93 (5.02)	1.16
Separation/Panic Scale	4.76 (3.56)	3.88 (3.63)	3.56*
SAS-A	67.36 (13.43)	51.96 (12.13)	93.19*
SPAI-C	22.21 (9.46)	10.57 (8.03)	117.52*
CDI	9.53 (6.00)	5.04 (4.36)	53.74*

Note: MASC = Multidimensional Anxiety Scale for Children; SAS-A = Social Anxiety Scale for Adolescents; SPAI-C = Social Phobia and Anxiety Inventory for Children; CDI = Children's Depression Inventory

* Note: $p \leq .001$

Table 2

Correlations between MASC Social Anxiety Scale and Other Self-Report Measures

Self-Report Measures	Correlation with MASC Social Anxiety Scale
Social Anxiety Scale for Adolescents	.84 ^a
Social Phobia and Anxiety Inventory for Children	.80 ^a
Children's Depression Inventory	.54 ^b
MASC Physical Symptoms Scale	.57 ^b
MASC Separation/Panic Scale	.43 ^c
MASC Harm Avoidance Scale	.27 ^c

Note: All correlations were significant at $p \leq .001$

Note: Correlations with different subscripts are significantly different from each other

Table 3

Sensitivity and Specificity of the MASC Social Anxiety Scale

MASC Social Anxiety Scale	Sensitivity (%)	Specificity (%)
8.5	84.6	55.7
9.5	82.1	60.8
10.5	76.9	67.0
11.5	74.4	72.5
12.5	67.9	78.0
13.5	62.8	81.7
14.5	56.4	85.3
15.5	52.6	87.9
16.5	39.7	90.8
17.5	37.2	92.7
18.5	28.2	93.4

Table 4

Summary of Binary Logistic Regression Predicting Social Phobia Diagnoses

Predictors	B	SE	Wald statistic	Nagelkerke R ²	χ ²
Social Phobia Model 1				.28	71.23**
MASC Social Anxiety scale	.18	.03	54.35**		
Social Phobia Model 2				.36	22.33**
MASC Social Anxiety scale	.04	.04	1.11		
SAS-A	.03	.02	1.48		
SPAI-C	.09	.03	10.84**		
MASC Model				.30	75.57**
MASC Social Anxiety	.20	.03	42.60**		
MASC Separation	-.07	.05	2.03		
MASC Physical Symptoms	.02	.03	.39		
MASC Harm Avoidance	-.04	.04	.94		

Note: MASC = Multidimensional Anxiety Scale for Children; SAS-A = Social Anxiety Scale for Adolescents; SPAI-C = Social Phobia and Anxiety Inventory for Children

* p < .05

** p < .01