



Published in final edited form as:

J Clin Child Adolesc Psychol. 2014 ; 43(4): 566–578. doi:10.1080/15374416.2013.814541.

Assessing Anxiety in Youth with the Multidimensional Anxiety Scale for Children (MASC)

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Abstract

The present study examined the psychometric properties, including discriminant validity and clinical utility, of the youth self-report and parent-report forms of the Multidimensional Anxiety Scale for Children (MASC) among youth with anxiety disorders. The sample included parents and youth ($N=488$, 49.6% male) ages 7 – 17 who participated in the Child/Adolescent Anxiety Multimodal Study (CAMS). Although the typical low agreement between parent and youth self-reports was found, the MASC evidenced good internal reliability across MASC subscales and informants. The main MASC subscales (i.e., Physical Symptoms, Harm Avoidance, Social Anxiety, and Separation/Panic) were examined. The Social Anxiety and Separation/Panic subscales were found to be significantly predictive of the presence and severity of social phobia and separation anxiety disorder, respectively. Using multiple informants improved the accuracy of prediction. The MASC subscales demonstrated good psychometric properties and clinical utilities in identifying youth with anxiety disorders.

Keywords

anxiety; children; assessment; MASC; parent report

Anxiety disorders are prevalent and tend to emerge during childhood (Kessler et al., 2005). It is estimated that distressing anxiety affects as many as 20% of youth (Costello, Egger, & Angold, 2005). Children and adolescents with anxiety disorders experience psychosocial impairment (Langley, Bergman, McCracken, & Piacentini, 2004), heightened risk for mood disorders, increased substance use problems, educational underachievement (Woodward & Fergusson, 2001), and increased rates of suicidal ideation (O’Neil, Puleo, Benjamin, Podell, & Kendall, 2012). Furthermore, youth-onset anxiety disorders are likely to persist into

adulthood if left untreated (Costello et al., 2003; Pine, Cohen, Gurley, Brook, & Ma, 1998). Despite the importance of treatment to stave off potential long-term consequences, only a fraction of youth with anxiety disorders receive treatment for their anxiety; even among adolescents with severe anxiety, fewer than a third report ever receiving treatment (Merikangas et al., 2011).

Accurate assessment of anxiety disorders is a necessary first step in proper treatment. Semi-structured diagnostic interviews are sound methods of identifying anxiety disorders in youth (e.g., Kaufman et al., 1997; Silverman & Albano, 1996) but they are time consuming and require an intensive interviewer training, and thus may not be feasible in primary care or school settings where anxious youth may initially be identified. The use of screening measures (e.g., questionnaires) may foster the identification of anxious youth in these settings and be useful for ongoing assessment of symptom change during intervention. Questionnaires are easy to administer and require minimal time and training. In addition, information from both youth and parents can easily be obtained. Discrepant reports of anxiety symptoms from youth and their parents are common (Choudhury, Pimentel, & Kendall, 2003; Comer & Kendall, 2004; Safford, Kendall, Flannery-Schroeder, Webb, & Sommer, 2005). Current thinking regarding multiple informant assessment suggests that there are benefits from informants' observation of clinical relevant behaviors in different settings (De Los Reyes, Thomas, Goodman, & Kunder, 2013), and researchers suggest that youth and parents each provide unique and valuable information when reporting particular anxiety symptoms in youth (Villabø, Gere, Torgersen, March, & Kendall, 2012; Wren, Bridge, & Birmaher, 2004).

The Multidimensional Anxiety Scale for Children (MASC; March, Parker, Sullivan, Stallings, & Conners, 1997) offers both youth self-report and parent-report versions to obtain information on youth anxiety symptoms. The 39-item questionnaire assesses emotional, cognitive, physical, and behavioral symptoms. The MASC produces a total score, as well as scores from four subscales: Physical Symptoms, Harm Avoidance, Social Anxiety, and Separation/Panic. Studies using the MASC have reported high retest reliability (March et al., 1997; March, Sullivan, & Parker, 1999), favorable divergent and convergent validity (Baldwin & Dadds, 2007; March et al., 1997; Rynn et al., 2006), and good internal reliability within the four subscales (e.g., Baldwin & Dadds, 2007; Dierker et al., 2001; March et al., 1997).

Research supports the MASC as a measure that discriminates between youth with and without anxiety disorders. In a school-based sample, the youth self-report MASC predicted a diagnosis of generalized anxiety disorder (GAD) in females, but it was less successful at discriminating youth with other individual anxiety disorders (Dierker et al., 2001). In a university-based anxiety and depression clinic, the youth-reported MASC total score significantly identified youth with and without anxiety disorders (van Gastel & Ferdinand, 2008). In addition, the Social Anxiety subscale predicted a social phobia (SoP) diagnosis, the Separation/Panic subscale predicted panic disorder, agoraphobia, and separation anxiety disorder (SAD), and the Physical Symptoms subscale predicted panic disorder and agoraphobia (van Gastel & Ferdinand, 2008). In a community outpatient clinical setting, the youth self-report version of the MASC was moderately accurate at classifying youth with

and without anxiety disorders, the Social Anxiety subscale significantly predicted a SoP diagnosis, and the Harm Avoidance subscale significantly predicted a diagnosis of GAD (Grills-Taquechel, Ollendick, & Fisak, 2008). In an outpatient sample of youth ages 8 to 17, the MASC differentiated between youth with and without an anxiety disorder (Wood, Piacentini, Bergman, McCracken, & Barrios, 2002). In addition, youth with social phobia scored higher on the Social Anxiety subscale and youth with separation anxiety disorder scored higher on the Separation Anxiety and Harm Avoidance subscales, but the MASC failed to differentiate youth with a diagnosis of GAD in this study (Wood et al., 2002). Thus, research investigating the utility of the MASC in predicting specific anxiety disorders is less conclusive than research supporting its overall ability to discriminate youth who have an anxiety disorder from youth who do not.

The inconsistent results of previous studies in predicting specific anxiety disorder diagnoses with the MASC may be attributed to the varying prevalence of certain disorders at different ages. For example, evidence suggests that the prevalence of anxiety disorders in general increases from childhood to adolescence, but that rates of separation anxiety disorder and generalized anxiety disorder decrease while social phobia and panic disorder increase in prevalence (Costello, Copeland, & Angold, 2011). The studies to date examining the diagnostic utility of the MASC had samples with varying age ranges, some of which encompassed both childhood and adolescence, but those that examined whether the MASC was differentially efficient at different ages yielded inconsistent results. Van Gastel and Ferdinand (2008) found that the MASC better predicted panic disorder and specific phobia in an adolescent age group as opposed to younger children, but others did not find any age effects (Grills-Taquechel et al., 2008; Wood et al., 2002). Thus, further study is needed to examine the role of age in the diagnostic utility of the MASC.

Regarding the utility of the parent-report version, Villabø and colleagues (2012) found, in a Norwegian community mental health sample, that both mothers' and youth's reports on the MASC discriminated between youth (ages 7 to 13) with and without an anxiety disorder diagnosis. In addition, the Separation/Panic subscale significantly predicted a diagnosis of SAD based on the youth, mother, and father report, but only mothers' and fathers' reports on the Social Anxiety subscale were predictors of a SoP diagnosis. Overall, one study suggests that adding parent report to youth self-report significantly improved the diagnostic efficiency of the MASC (Villabø et al., 2012; Wood et al., 2002). Further study is needed to replicate and extend these findings, especially given the inconsistent results regarding the ability of the child-report version to predict specific diagnoses. The current study examines to role of the unique information provided by youth and by parents in regard to specific anxiety symptoms/diagnoses in youth.

Previous studies suggest that the youth self- and parent-report MASC can discriminate youth with and without anxiety disorders, but the ability of the MASC to predict severity of anxiety in samples of anxious youth merits study. Severity of anxiety symptoms, as determined by questionnaires (i.e., the MASC) may be useful for informing referral decisions. In addition, the utility of multiple informants warrants further investigation. The present study investigated the efficiency of the MASC at predicting severity of anxiety in a large multi-site sample of anxiety-disordered youth, the largest sample yet employed in

researching the diagnostic efficiency of the MASC. Given the inclusion of both younger children (ages 7 to 12) and adolescents (ages 13 to 17) in the sample, it was possible to investigate age differences. The study further examined the merits of the addition of parents as informants. We hypothesized that scores on the parent- and youth self-report MASC would significantly predict the presence and severity of specific anxiety disorders as determined by a semi-structured diagnostic interview. Specifically, based on previous findings, we hypothesized that scores on the Separation/Panic subscale of the MASC would predict the presence and severity of SAD, scores on the Social Anxiety subscale would predict SoP, and scores on the Harm Avoidance subscale would predict GAD. We also hypothesized that both parent and child reports would add significantly to the predictive power of the MASC.

Method

Participants

The sample consisted of 488 youth (49.6% male) ages 7 to 17 years ($M = 10.7$ years, $SD = 2.8$; 74.2% children between ages of 7 to 12) and their parents, who participated in the Child/Adolescent Anxiety Multimodal Study (CAMS; Kendall, et al., 2010; Walkup, et al., 2008). Among the 488 youth, 78.9% self-identified as white, 9.0% as black, 2.9% as Asian, 1.2% as American Indian, 0.4% as Pacific Islander, and 8.0% as Other. Socioeconomic status was classified as “low” for 25.4% of participants. Based on the Anxiety Disorder Interview Schedule for Children (ADIS-C/P; Silverman & Albano, 1996), all youth met diagnostic criteria for an anxiety disorder as the principal diagnosis: SoP only (8.2%), GAD only (6.8%), SAD only (3.3%), SAD and SoP (7.8%), SAD and GAD (9.8%), SoP and GAD (30.7%), or all three anxiety disorders (33.49%). Other comorbid disorders included other internalizing disorders (i.e., other anxiety disorders and dysthymia; 43.6%), attention-deficit/hyperactivity disorder (ADHD; 11.9%), oppositional defiant disorder or conduct disorder (9.4%), and tic disorder (2.7%). Exclusion criteria for CAMS included a diagnosis of major depressive disorder, bipolar disorder, a psychotic disorder, a pervasive developmental disorder, untreated ADHD, an eating disorder, or a substance use disorder; a diagnosis of any other Axis I disorder with a greater severity than the GAD, SAD, or SoP; recent severe school refusal behavior; suicidality or homicidality; two previous failed trials of an SSRI or a failed trial of an adequate course of CBT for GAD, SAD, or SoP; intolerance to sertraline; a confounding medical condition; pregnancy; and if the child or adolescent did not speak English.

Measures

ADIS-C/P (Silverman & Albano, 1996)—The ADIS-C/P is a semi-structured interview for assessing youth anxiety disorders based on DSM-IV criteria (American Psychiatric Association, 1994). During separate interviews, youth and parents reported on the youth’s anxiety symptoms, as well as symptoms of other Axis I disorders. Independent evaluators (IEs) provided clinician severity ratings (CSRs; Silverman & Albano, 1996) for each interview, ranging from 0 to 8; 0 = *not at all*, 4 = *some*, and 8 = *very, very much*. A CSR of 4 or above is required for a diagnosis. A composite CSR for each diagnosis was then determined based on information from both reports by the IE. The ADIS has demonstrated

favorable psychometric properties, including excellent retest reliability (Silverman, Saavedra, & Pina, 2001), good inter-rater agreement among diagnosticians (e.g., Chavira, Stein, Bailey, & Stein, 2004), and good convergent validity based on self-report measures of anxiety (March, Parker, Sullivan, Stallings, & Conners, 1997; Wood et al., 2002).

MASC, Child and Parent Versions (March et al., 1997)—The MASC C/P is a self-report questionnaire assessing youth anxiety symptoms. Both the youth and parent versions consist of 39 items and contain four main subscales: Physical Symptoms, Social Anxiety, Separation Anxiety/Panic, and Harm Avoidance. The item content and scales in each are identical, except that the items in the child version refer to “I” and those in the parent version refer to “my child.” It has demonstrated favorable psychometric properties in previous studies (Baldwin & Dadds, 2007; Dierker et al., 2001; March et al., 1997, 1999; Rynn et al., 2006), as reviewed in the introduction.

Procedure

Participants were recruited for CAMS (Walkup et al., 2008), a randomized clinical trial evaluating youth anxiety disorder treatment at six urban sites in the United States, via community mental health centers and clinics, community organizations, churches, schools, and advertisements in local media. All participants provided written informed parental consent and youth assent. Participants completed an initial assessment with an IE to determine eligibility for randomization to treatment. The 488 participants who met eligibility criteria completed a baseline assessment before beginning treatment. During this assessment, an IE interviewed youth and parents separately about the youth’s anxiety and other symptoms using the ADIS-C/P. The IE then assigned a composite CSR for each diagnosis based on the information obtained from both the youth and parents. Youth completed the MASC child version and parents completed the MASC parent version. Analyses for the present study were conducted using these baseline assessments (For detailed CAMS procedures, see Compton et al., 2010; Walkup et al., 2008).

Statistical Analyses

Preliminary analyses included *t* tests to examine differences between youth and parent reports on the four main MASC subscales and the MASC total score. Gender differences of these reports were also examined. Cronbach’s internal reliability coefficients (*a*) were reported for the MASC subscales and total score. Pearson correlations were conducted to examine the informant agreement between parent and youth reports.

Receiver Operating Characteristic (ROC) analyses examined whether the MASC subscales predicted the presence of a particular anxiety disorder (i.e., SAD, SoP, or GAD). ROC analysis indicates the strength of the prediction using area under the curve (AUC), which ranges from 0.50, no association in prediction, to 1, perfect association in prediction (Hanley & McNeil, 1982). Regression analyses further examined the association between the MASC subscales scores and the clinical severity of a particular anxiety disorder (as determined by the ADIS CSRs). Sequential logistic regression examined whether adding parent report to youth self-report increased the MASC’s ability to predict the presence of an anxiety diagnosis.

Results

Preliminary Analyses

Means and standard deviations for the MASC subscales and total score are presented in Table 1. No gender differences were observed on the MASC C/P subscales, except youth-reported Separation/Panic subscale, $t(478) = 2.32, p < .05$, with boys reporting higher scores than girls, and with a small effect size as determined by Cohen's d (Cohen, 1988). MASC subscales differed across age groups: compared with adolescents (ages 13 to 17), children (ages 7 to 12) scored lower on the Physical Symptoms and Social Anxiety subscales and higher on the Separation/Panic subscale based on both youth and parent report. Children scored significantly higher on the Harm Avoidance subscale based on youth self-report, but not parent report.

Cronbach's internal reliability coefficients (α) for youth and parent report of the MASC total and subscales are presented in Table 1. Internal reliability estimates for the subscales fell in the acceptable and good range except for the Harm Avoidance subscale, which demonstrated lower internal reliability. Informant agreement between youth and parent report are presented in Table 2. Similar to previous studies (Choudhury et al., 2003; Safford et al., 2005; Villabø et al., 2012), Pearson correlations revealed low youth-parent agreement overall: a small (Harm Avoidance subscale) or medium effect (Physical Symptoms and Social Anxiety subscales) was observed for youth/parent agreement on most of the subscales, with a large effect observed only on the youth/parent agreement on the Separation/Panic subscale.

Discriminant Validity of MASC

Because there were significant age differences across all MASC subscale scores, primary analyses on the discriminant validity of the MASC were conducted separately for children ($n = 362$) and adolescents ($n = 162$). Comparisons were made between youth with a diagnosis of SAD versus those without (SAD versus Non-SAD group), youth with a diagnosis of SoP versus those without (SoP versus Non-SoP group), and youth with a diagnosis of GAD versus those without (GAD versus Non-GAD group) in the entire sample, using independent t -tests and ROC analyses.

T-tests— T -tests examined disorder versus non-disorder groups, with results presented in Table 3. For the child group, both children and parents in the SAD group rated higher on the Separation/Panic and Physical Symptoms subscale compared to the Non-SAD group, with a greater difference observed on the Separation/Panic subscale. Compared to the Non-SoP group, both children and parents in the SoP group rated significantly higher on the Social Anxiety subscale. Only child-reported scores were significantly lower on the Separation/Panic subscale. Both children and parents in the GAD group rated higher on the Physical Symptoms subscale compared to the Non-GAD group. Children in the GAD group also scored significantly higher on the Harm Avoidance subscales, compared to those in the non-GAD group.

Reports from the adolescent group indicated the SAD and Non-SAD groups differed most on the Separation/Panic subscale as per adolescent and parent report. The SAD group also scored higher on parent-reported Physical Symptoms and Harm Avoidance subscales, compared to the Non-SAD group. According to both adolescent and parent reports, the SoP group scored significantly higher on the Social Anxiety subscale than the Non-SoP group. Parent-reported scores in the SoP group were significantly lower on the Harm Avoidance subscale, compared to the Non-SoP group. The GAD group scored significantly higher on the Physical Symptoms and Harm Avoidance subscales than the Non-GAD group according to parent report. The GAD group also scored higher on the Physical Symptoms subscale according to adolescent self-report.

ROC analyses—ROC analyses examined the ability of the MASC to predict diagnoses of SAD, SoP, and GAD. The AUC indicates the strength of the prediction ranging from .50 (no prediction power) to 1 (perfect prediction power), with an AUC below .50 indicating an inverse prediction. The prediction power is generally considered as .50 - .60 = failed, .60 - .70 = poor, .70 - .80 = fair, .80 - .90 = good, and .90 - 1.00 = excellent. The results of the ROC analyses are in Table 4.

For children, the Separation/Panic subscale significantly predicted SAD with fair prediction power, according to both child and parent report. Child report on the Physical Symptoms subscale also significantly predicted SAD, but with poor prediction power. The Social Anxiety subscale significantly predicted SoP with fair prediction power, according to both child and parent report. The child report on the Separation/Panic subscale inversely predicted SoP, but with poor prediction power. Child and parent report on the Physical Symptoms subscale as well as child report on the Harm Avoidance subscale demonstrated significant prediction to GAD, but all of them demonstrated poor prediction power.

For adolescents, the Separation/Panic subscale showed the strongest prediction to SAD, according to both adolescent and parent report, with fair to good prediction power. Parent report on the Physical Symptoms and the Harm Avoidance subscales also significantly predicted SAD, but both with poor prediction power. The Social Anxiety subscale significantly predicted SoP with good prediction power, according to both adolescent and parent report. Child and parent report on the Physical Symptoms subscale as well as parent report on the Harm Avoidance subscale demonstrated significant prediction to GAD, but with poor prediction power.

Associations between MASC and severity of disorders

Multiple regression analyses examined whether the scores of MASC subscales predicted the severity of SAD, SoP, and GAD for all participants, and child and adolescent groups were examined separately. The severity of each diagnosis was determined by the CSR given by the IE based on the ADIS C/P. Table 5 presents results from the regression analyses.

For children, both child and parent report on the Separation/Panic subscale evidenced a significant relationship with the CSR of SAD. Both child and parent report on the Social Anxiety subscale and parent report on the Harm Avoidance subscale demonstrated an inverse relationship with the CSR of SAD, yet all with relative small beta values compared

to the Separation/Panic subscale. Child and parent report on the Social Anxiety subscale significantly predicted the CSR of SoP. Child report on the Separation/Panic subscale was negatively associated with the CSR of SoP, though with a smaller beta value, compared to the Social Anxiety subscale. Both child and parent report on the Physical Symptoms subscale as well as parent report on the Harm Avoidance subscale demonstrated significant prediction to the CSR for GAD.

Results from the adolescents exhibited a similar pattern. Both adolescent and parent report indicated that the Separation/Panic subscale was a significant predictor for the CSR of SAD. With smaller beta values, both adolescent and parent report on the Social Anxiety subscale were negative predictors, whereas parent report on the Harm Avoidance subscale was a positive predictor for the CSR of SAD. Adolescent and parent report on the Social Anxiety subscale significantly predicted the CSR of SoP, whereas parent report on the Harm Avoidance subscale negatively significantly predicted the CSR of SoP, with scores on the Social Anxiety subscale demonstrating the greatest beta value. Both adolescent and parent reports on the Physical Symptoms subscale demonstrated significant prediction for the CSR for GAD, whereas parent report on the Social Anxiety subscale negatively predicted the CSR of GAD.

Gains from Multiple Informants

Sequential logistic regression analyses examined the potential gain of adding parent report to youth report for predicting the presence of SAD, SoP, and GAD using the MASC. In the first step, scores of youth-reported MASC subscales were entered as predictors to the presence or absence of an anxiety diagnosis (i.e., SAD, SoP, or GAD). Scores of parent-reported MASC subscales were entered in the second step. The same steps were repeated each for SAD, SoP, and GAD. Again, separate analyses were carried out for child and adolescent groups. The results of the sequential logistic regressions are presented in Table 6. The overall model fits in testing the prediction of the three anxiety disorders were good (all Hosmer-Lemeshow, $ps > .05$).

For the child group, initial modeling when including only child report found that increased scores on the Separation/Panic subscale and decreased scores on the Social Anxiety subscale predicted the presence of SAD. The presence of SoP was predicted by both increased scores on the Social Anxiety subscale and decreased scores on the Separation/Panic subscale based on child report. The presence of GAD was predicted by increased scores on the child-reported Physical Symptoms subscale.

When adding parent report to test the full model, additional benefits, including consistently increased percentage of correctly classified cases as well as the explained variance, were found compared to the initial model that included only child report. Compared to the initial model, the explained variance (Nagelkerke's R^2) in the full models increased (from .20 to .36 for SAD, .20 to .31 for SoP, and .06 to .10 for GAD).

The results from the full model sequential regressions suggested that parent report contributed unique information in the prediction of the presence of SAD, SoP, and GAD. In the full model, increased scores on the Separation/Panic subscale predicted SAD according

to parent report when controlling the effect of other MASC subscales as well as child report. Child-reported Separation/Panic subscale scores continued to be a significant predictor of SAD when parent report was added to the model, suggesting that child report and parent report on the Separation/Panic subscale each have unique contributions to the prediction of SAD. Child report on the Social Anxiety Subscale was no longer associated with the presence of SAD. In the full model, increased child-reported scores on the Physical Symptoms subscale also significantly predicted SAD. Based on parent report, increased scores on the Social Anxiety subscale significantly predicted the presence of SoP, controlling for child report and other MASC subscales. After adding parent report, child report on the Social Anxiety subscale remained a significant predictor of SoP, suggesting that child and parent report on the Social Anxiety subscale each made unique contributions to the prediction of SoP. In the full model, decreased child report on the Separation/Panic subscale was not associated with SoP. Increased parent-reported scores on the Physical Symptoms subscale significantly predicted a diagnosis of GAD, controlling for the effect of child report and all other MASC subscales. After adding parent report to the model, the child report on the Physical Symptoms subscale remained a significant predictor of GAD, indicating that parent and child report each contributed unique information.

For adolescents, initial modeling including only adolescent report revealed that increased scores on the Separation/Panic and decreased scores on the Social Anxiety subscales predicted SAD. SoP was predicted only by increased scores on the Social Anxiety subscale. The presence of GAD was predicted by increased scores on the Physical Symptoms subscale.

Similar to the child group, when adding parent report to test the full model with adolescents, benefits were found. Compared to the initial model, Nagelkerke's R^2 in the full models were increased from .30 to .46 for SAD, .37 to .54 for SoP, and .10 to .19 for GAD.

In the full model, increased scores on the Separation/Panic subscale predicted SAD according to parent report when controlling for the effect of other MASC subscales as well as adolescent report. After adding parent report, adolescent report on the Separation/Panic subscale was no longer associated with SAD, suggesting that parent report on the Separation/Panic subscale was a stronger predictor for SAD in adolescents. In the full model, increased adolescent-report scores on the Physical Symptoms subscale predicted SAD. According to parent report, decreased scores on the Harm Avoidance subscale were associated with SoP after controlling for adolescent report and other MASC subscales. However, adolescent report on the Social Anxiety subscale remained a significant predictor in the full model, indicating that adolescent report contributed unique diagnostic information. No MASC subscale scores predicted the presence of GAD in the full model for adolescents.

Discussion

The present results support the utility of the MASC to predict the presence and severity of particular anxiety disorders in children and in adolescents. Consistent with past research (Grills-Taquechel, et al., 2008; van Gastel & Ferdinand, 2008; Villabø et al., 2012), the

Separation/Panic subscale predicted a diagnosis of SAD, and the Social Anxiety subscale predicted SoP. Furthermore, supporting the findings of Villabo et al (2012), the addition of the parent-report to youth self-report improved the accuracy of identifying youth with an anxiety disorder. Both the parent- and youth self-report versions contributed valuable information when predicting SAD, SoP, and GAD. Accordingly, a multi-informant approach is recommended when assessing for anxiety disorders in youth.

The MASC predicted SAD and SoP in both children and adolescents using the Separation/Panic and Social Anxiety subscales, respectively. These subscales were useful for both identifying SAD and SoP and for predicting the severity of the disorders. Higher scores on the Separation/Panic subscale were associated with greater severity of SAD and higher scores on the Social Anxiety subscale were associated with greater severity of SoP across informants. These findings make sense given that many of the MASC subscale items are consistent with the diagnostic criteria for these anxiety disorders.

The findings for GAD were less clear-cut. In line with past research (Grills-Taquechel et al., 2008; van Gastel & Ferdinand, 2008; Villabø et al., 2012; Wood et al., 2002), the MASC subscales were less predictive of the presence and/or severity of GAD. Of the four subscales, the Physical Symptoms subscale performed best by predicting the presence and severity of GAD according to multiple and logistic regression analyses, followed by the Harm Avoidance subscale. Unlike SAD and SoP, there is not a single subscale of the MASC designed to depict the full scope of GAD symptoms. It is possible that combining items across subscales could improve the prediction of GAD. For example, the Physical Symptoms and Harm Avoidance subscales may be inconsistently associated with GAD because they each tap only some of the DSM-IV criteria (e.g. somatic symptoms *or* worry symptoms) of GAD. Selecting items from both scales (and perhaps others) may capture the complete array of symptoms, and improve prediction of GAD.

Comorbidity was high in the present sample. Most youth met criteria for more than one anxiety disorder, and there was no non-anxiety disorder group. Symptoms of different anxiety disorders overlap to some extent and may make it difficult to distinguish between specific disorders. This observation may in part explain why few subscales performed better than fair in their ability to identify the specific anxiety disorders. Moreover, the ROC analyses relied on information from only one informant while other findings in the present study and by others (Villabø et al., 2012) suggest that combining parent and youth self-report increases the MASC's ability to detect specific anxiety disorders.

The addition of parent report to youth self-report improved the accuracy in identifying youth anxiety disorders. Consistent with Villabø et al (2012), valuable information was gained when youth and parent reports were combined. Furthermore, there were instances when particular informants provided unique information, and slightly different patterns emerged for younger and older youth. For children up to the age of 12, both children and parents provided unique information on the Separation/Panic subscale that together yielded a more accurate identification of SAD than relying on information from one informant. Similarly, combining information from both children and parents resulted in improved identification of SoP than child-report alone using the Social Anxiety subscale. Although predicting the

presence of GAD proved more challenging, both children and parents provided unique information of physical symptoms that were associated with the presence of GAD. These findings emphasize the importance of using multiple informants in the assessment of anxiety disorders in youth. Though the same subscales provided the strongest associations to the specific disorders according to both parents' and youth's reports, different patterns of symptoms seemed to be reported. For adolescents, parent report of Separation/Panic symptoms was of particular importance when identifying SAD compared to adolescent self-report, whereas adolescent self-report of social anxiety symptoms was of greater importance when identifying SoP. It may be that adolescents are more reluctant to report symptoms of separation anxiety, but such symptoms may be more readily observable to parents, who also may be more willing to report them. Symptoms relating to feeling embarrassed in front of peers, on the other hand, are increasingly prevalent in adolescence and commonly tied to situations outside of the home, making self reports of these symptoms particularly important.

This study is not without limitations. First, the sample contained youth with principal anxiety diagnoses. The absence of a non-anxious comparison group did not allow for the testing of the MASC to differentiate between anxiety disordered and non-disordered youth. However, prior studies have consistently found the MASC to discriminate between anxious and non-anxious samples (Dierker et al., 2001; van Gastel & Ferdinand, 2008; Villabø et al., 2012), and this study extended these findings to investigate differentiation among anxiety disorders in a clinical sample, as well as to examine prediction of disorder severity. Second, the sample was predominately Caucasian middle-to-upper SES and thus, generalizability of the results may be limited. Third, the present study did not include the information regarding which parent(s) completed the MASC, even though past research indicates that parents are often consistent when providing information at the symptom level, and that the addition of a father to a mother's report does not significantly improve accuracy (Villabø et al. 2012). Future research should include teacher report to determine if the addition improves diagnostic accuracy. In addition to SAD, SoP, and GAD, Wood et al. (2002) found both parent- and youth-reported MASC scores to successfully discriminate panic disorder from other anxiety disorders. Future research can examine the ability of the MASC subscales to predict other anxiety disorders, such as specific phobias and agoraphobia. Finally, work is needed to improve the accuracy of the MASC in predicting GAD. Efforts to create a subscale by uniting items relating to physiological and emotional/cognitive symptoms may be useful, as has been done previously using the Child Behavior Checklist (Achenbach, 1991), to detect anxiety disorders (Kendall, et al., 2007).

For researchers and clinicians alike, the findings support the utility of the MASC to predict SAD and SoP. Given the ease of administration and minimal resources required, the MASC is a cost-effective screener for particular anxiety disorders in youth. The MASC is a useful tool when administered to both parents and youth and the reported data are integrated. Despite the predictive abilities of the MASC, it is not a substitute for structured or semi-structured interviews (Silverman & Ollendick, 2005). However, as a screener, the MASC can be useful to clinicians to determine youth who may need additional services. The MASC may reduce clinicians' assessment burden and assure that youth receive services in line with their needs.

Acknowledgments

This research was supported by NIMH grant (MH063747) awarded to Philip C. Kendall.

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Table 1
 Mean Scores, Cronbach's Alpha, and between Groups Differences by Age and Gender for Youth Self- and Parent-Reported MASC Subscales

Informant and Subscales	Youth Report						Parent Report										
	All		Gender Subgroups		Age Subgroups (years)		All		Gender Subgroups		Age Subgroups (years)						
	Boys <i>n</i> = 238	Girls <i>n</i> = 242	<i>t</i> (478)	<i>d</i>	7-12 <i>n</i> = 354	13-17 <i>n</i> = 126	7-12 <i>n</i> = 354	13-17 <i>n</i> = 126	Boys <i>n</i> = 239	Girls <i>n</i> = 243	<i>t</i> (480)	<i>d</i>	7-12 <i>n</i> = 354	13-17 <i>n</i> = 126	<i>t</i> (478)	<i>d</i>	
Physical Symptoms																	
Cronbach's α	0.85	0.84	0.84	0.85	0.82	0.90	0.80	0.81	0.80	0.80	0.81	0.80	0.80	0.80	0.80	0.80	
<i>M</i>	13.21	13.42	13.00	0.62	12.67	14.72	-2.64*	-0.28	11.12	11.64	10.60	1.86	0.17	10.57	12.66	-3.33***	-0.35
<i>SD</i>	7.49	7.58	7.41	7.41	7.11	8.32		6.11	6.11	6.15	6.05	6.05	5.91	6.42	6.42		
Harm Avoidance																	
Cronbach's α	0.64	0.64	0.64	0.64	0.60	0.69	0.72	0.75	0.72	0.68	0.75	0.72	0.72	0.71	0.71	0.71	0.71
<i>M</i>	18.94	18.90	18.98	-0.22	-0.02	19.45	4.51***	0.47	18.98	19.28	18.67	1.57	0.14	19.19	18.39	1.81	0.19
<i>SD</i>	4.22	4.15	4.29	4.29	4.06	4.35		4.27	4.27	4.01	4.49	4.49	4.19	4.45	4.45		
Social Anxiety																	
Cronbach's α	0.86	0.87	0.86	0.86	0.84	0.89	0.88	0.87	0.88	0.87	0.87	0.87	0.87	0.86	0.86	0.86	0.86
<i>M</i>	13.83	14.37	13.30	1.68	0.15	12.90	-4.97***	-0.52	18.00	18.09	17.90	0.35	0.03	17.48	19.44	-3.17**	-0.33
<i>SD</i>	7.02	7.08	6.94	6.94	6.85	6.86		6.02	6.02	5.93	6.12	6.12	5.98	5.94	5.94		
Separation/Panic																	
Cronbach's α	0.76	0.74	0.78	0.78	0.71	0.79	0.80	0.82	0.80	0.77	0.82	0.74	0.80	0.80	0.80	0.80	0.80
<i>M</i>	11.54	12.17	10.92	2.32*	0.21	12.88	8.92***	0.93	14.23	14.62	13.84	1.32	0.12	15.80	9.79	9.92***	1.03
<i>SD</i>	5.96	5.72	6.13	6.13	5.54	5.49		6.41	6.41	6.11	6.69	6.69	5.65	6.38	6.38		
Total Score																	
Cronbach's α	0.88	0.89	0.87	0.87	0.87	0.91	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.88	0.88	0.88	0.88
<i>M</i>	57.52	58.87	56.20	1.68	0.07	57.90	0.81	0.07	62.32	63.63	61.02	1.85	0.08	63.04	60.28	1.72	0.08
<i>SD</i>	17.47	17.60	17.28	17.28	16.87	19.10		15.47	15.47	15.28	15.58	15.58	15.01	16.60	16.60		

Note. MASC = Multidimensional Anxiety Scale for Children

* $p < .05$, two-tailed.

** $p < .01$, two-tailed.

*** $p < .001$, two-tailed.

Table 2
 Concordance between Informants for Youth Self- and Parent-Reported MASC Subscales

MASC Subscales	All N = 380		Children Ages 7 – 12 n = 354		Adolescents Ages 13 – 17 n = 126	
	Youth/ Parent		Child/ Parent		Adolescent/ Parent	
	r	P	r	P	r	P
Physical Symptoms	0.31	0.001	0.26	0.001	0.38	0.001
Harm Avoidance	0.21	0.001	0.16	0.01	0.27	0.01
Social Anxiety	0.39	0.001	0.36	0.001	0.43	0.001
Separation/Panic	0.57	0.001	0.47	0.001	0.57	0.001
Total Score	0.31	0.001	0.29	0.001	0.35	0.001

Note. MASC = Multidimensional Anxiety Scale for Children

Table 3
 Mean Scores (Standard Deviations) of the MASC by Diagnostic Category for Youth and Parent Report

Children Ages 7 - 12		SAD	Non-SAD	d	SoP	Non-SoP	d	GAD	Non-GAD	d
MASC Subscale		n = 227	n = 127		n = 270	n = 84		n = 287	n = 67	
		M (SD)	M (SD)		M (SD)	M (SD)		M (SD)	M (SD)	
Physical Symptoms										
Child		13.34 (7.53)*	11.47 (6.12)	0.27	12.95 (7.01)	11.79 (7.40)	0.16	13.24 (7.06)**	10.22 (6.85)	0.43
Parent		11.04 (6.07)*	9.72 (5.55)	0.22	10.55 (5.73)	10.64 (6.50)	-0.02	11.07 (5.94)***	8.47 (5.34)	0.45
Harm Avoidance										
Child		19.42 (4.07)	19.59 (4.05)	-0.04	19.37 (4.11)	19.69 (3.89)	-0.08	19.70 (4.00)*	18.37 (4.13)	0.33
Parent		19.44 (4.11)	18.72 (4.29)	0.17	19.09 (4.15)	19.50 (4.32)	-0.10	19.38 (4.13)	18.37 (4.34)	0.24
Social Anxiety										
Child		17.18 (5.89)	18.03 (6.11)	-0.14	13.96 (6.86)***	9.51 (5.64)	0.68	13.20 (6.83)	11.64 (6.87)	0.23
Parent		17.40 (5.91)	18.71 (6.10)	-0.22	18.74 (5.35)***	13.40 (6.09)	0.95	17.68 (6.19)	16.63 (4.90)	0.18
Separation/Panic										
Child		14.22 (5.10)***	10.49 (5.50)	0.71	12.47 (5.21)*	14.19 (6.34)	-0.31	13.02 (5.47)	12.30 (5.81)	0.13
Parent		17.74 (4.65)***	12.30 (5.63)	1.05	15.53 (5.62)	16.68 (5.69)	-0.20	15.88 (5.73)	15.44 (5.33)	0.08
Adolescents Ages 13 - 17										
MASC Subscale		SAD	Non-SAD	d	SoP	Non-SoP	d	GAD	Non-GAD	d
		n = 33	n = 93		n = 113	n = 13		n = 102	n = 24	
		M (SD)	M (SD)		M (SD)	M (SD)		M (SD)	M (SD)	
Physical Symptoms										
Adolescent		16.73 (8.43)	14.01 (8.21)	0.35	14.81 (8.44)	14.00 (7.52)	0.10	15.57 (8.17)*	11.13 (8.17)	0.55
Parent		14.61 (5.66)*	11.97 (6.56)	0.42	12.53 (6.38)	13.77 (6.93)	-0.19	13.40 (6.22)**	9.50 (6.43)	0.63
Harm Avoidance										
Adolescent		18.42 (5.23)	17.19 (3.98)	0.29	17.67 (4.17)	16.15 (5.73)	0.35	17.86 (4.23)	16.04 (4.67)	0.43
Parent		20.45 (3.78)**	17.66 (4.46)	0.65	18.11 (4.40)*	20.85 (4.28)	-0.65	18.94 (4.21)**	16.04 (4.76)	0.68
Social Anxiety										

Children Ages 7 - 12		SAD		Non-SAD		SoP		Non-SoP		GAD		Non-GAD		<i>d</i>	
MASC Subscale		<i>n</i> = 227	<i>M</i> (<i>SD</i>)	<i>n</i> = 127	<i>M</i> (<i>SD</i>)	<i>n</i> = 270	<i>M</i> (<i>SD</i>)	<i>n</i> = 84	<i>M</i> (<i>SD</i>)	<i>n</i> = 287	<i>M</i> (<i>SD</i>)	<i>n</i> = 67	<i>M</i> (<i>SD</i>)		
Adolescent		15.15 (8.39)	16.89 (6.22)	-0.26	17.34 (6.49)***	8.62 (4.81)	1.30	16.61 (7.01)	15.71 (6.29)	0.13					
Parent		18.91 (5.88)	19.63 (5.99)	-0.12	20.13 (5.68)***	13.46 (4.93)	1.20	19.45 (6.19)	19.42 (4.91)	0.01					
Separation/Panic															
Adolescent		11.24 (7.00)***	6.54 (4.25)	0.93	7.73 (5.53)	8.15 (5.34)	-0.08	8.07 (5.48)	6.50 (5.45)	0.29					
Parent		15.06 (6.44)***	7.91 (5.23)	1.29	9.78 (6.48)	9.85 (5.70)	-0.01	10.20 (6.56)	8.04 (5.34)	0.34					

Note: MASC = Multidimensional Anxiety Scale for Children; SAD = separation anxiety disorder; SoP = social phobia; GAD = generalized anxiety disorder.

* $p < .05$.

**

$p < .01$.

$p < .001$.

Table 4
 Results of Receiver Operating Characteristic Analyses Testing Diagnostic Discriminant Validity of the Youth and Parent MASC

	Physical Symptoms			Harm Avoidance			Social Anxiety			Separation/Panic		
	AUC	95% CI	p	AUC	95% CI	p	AUC	95% CI	p	AUC	95% CI	p
Children Ages 7 - 12												
SAD												
Child	0.57	[0.51, 0.63]	0.025	0.49	[0.43, 0.55]	0.759	0.48	[0.42, 0.54]	0.520	0.69	[0.63, 0.75]	0.001
Parent	0.56	[0.50, 0.62]	0.057	0.55	[0.49, 0.62]	0.102	0.45	[0.39, 0.52]	0.136	0.78	[0.71, 0.82]	0.001
SoP												
Child	0.55	[0.48, 0.63]	0.150	0.48	[0.41, 0.55]	0.526	0.69	[0.63, 0.75]	0.001	0.42	[0.34, 0.49]	0.022
Parent	0.51	[0.44, 0.59]	0.704	0.47	[0.40, 0.54]	0.437	0.74	[0.68, 0.80]	0.001	0.43	[0.36, 0.50]	0.058
GAD												
Child	0.62	[0.55, 0.70]	0.002	0.60	[0.52, 0.68]	0.011	0.56	[0.49, 0.64]	0.107	0.55	[0.48, 0.63]	0.173
Parent	0.63	[0.56, 0.70]	0.001	0.56	[0.49, 0.64]	0.105	0.57	[0.51, 0.64]	0.060	0.53	[0.46, 0.61]	0.421
Adolescents Ages 13 - 17												
SAD												
Adolescent	0.59	[0.48, 0.71]	0.108	0.60	[0.48, 0.73]	0.086	0.44	[0.31, 0.57]	0.319	0.70	[0.57, 0.82]	0.001
Parent	0.62	[0.52, 0.73]	0.038	0.69	[0.58, 0.79]	0.001	0.46	[0.34, 0.58]	0.488	0.80	[0.71, 0.89]	0.001
SoP												
Adolescent	0.53	[0.38, 0.68]	0.739	0.59	[0.40, 0.79]	0.284	0.86	[0.78, 0.93]	0.001	0.46	[0.29, 0.64]	0.662
Parent	0.47	[0.31, 0.64]	0.757	0.34	[0.17, 0.50]	0.052	0.82	[0.72, 0.91]	0.001	0.49	[0.35, 0.64]	0.920
GAD												
Adolescent	0.65	[0.53, 0.78]	0.022	0.63	[0.51, 0.75]	0.054	0.54	[0.42, 0.66]	0.559	0.60	[0.48, 0.73]	0.117
Parent	0.67	[0.54, 0.79]	0.012	0.68	[0.57, 0.80]	0.006	0.53	[0.41, 0.64]	0.698	0.59	[0.48, 0.71]	0.159

Note: MASC = Multidimensional Anxiety Scale for Children; AUC = area under the curve; CI = confidence interval; SAD = separation anxiety disorder; SoP = social phobia; GAD = generalized anxiety disorder.

Table 5
Multiple Regressions to Test the Prediction of the Clinical Severity of Anxiety Diagnoses Using MASC subscales

Dx	MASC Subscales	Child/Adolescent Report				Parent Report			
		R ²	B	SE B	β	R ²	B	SE B	β
Children Ages 7 - 12									
SAD		0.15				0.28			
	Physical Symptoms		0.023	0.019	0.072		0.001	0.020	0.002
	Harm Avoidance		-0.025	0.029	-0.044		-0.057	0.028	-0.106*
	Social Anxiety		-0.063	0.019	-0.191***		-0.042	0.019	-0.109*
	Separation/Panic		0.160	0.023	0.391***		0.222	0.021	0.554***
SoP		0.14				0.25			
	Physical Symptoms		-0.004	0.016	-0.016		-0.033	0.017	-0.101
	Harm Avoidance		-0.005	0.025	-0.011		-0.045	0.024	-0.096
	Social Anxiety		0.113	0.017	0.398***		0.173	0.016	0.532***
	Separation/Panic		-0.061	0.019	-0.172**		-0.024	0.018	-0.069
GAD		0.06				0.06			
	Physical Symptoms		0.055	0.016	0.209***		0.064	0.019	0.199***
	Harm Avoidance		0.038	0.026	0.081		0.054	0.027	0.120*
	Social Anxiety		0.009	0.017	0.031		0.006	0.018	0.020
	Separation/Panic		-0.006	0.020	-0.017		-0.027	0.020	-0.081
Adolescents Ages 13 - 17									
SAD		0.30				0.40			
	Physical Symptoms		0.019	0.024	0.071		-0.014	0.030	-0.041
	Harm Avoidance		-0.003	0.052	-0.005		0.086	0.040	0.168*
	Social Anxiety		-0.116	0.031	-0.353***		-0.099	0.029	-0.259***
	Separation/Panic		0.227	0.039	0.550***		0.208	0.030	0.587***
SoP		0.28				0.26			
	Physical Symptoms		-0.017	0.019	-0.084		-0.022	0.025	-0.082
	Harm Avoidance		-0.046	0.041	-0.116		-0.101	0.034	-0.260**

Dx	MASC Subscales	Child/Adolescent Report				Parent Report			
		R ²	B	SE B	β	R ²	B	SE B	β
GAD	Social Anxiety		0.158	0.024	0.624***		0.146	0.024	0.502***
	Separation/Panic		-0.048	0.030	-0.153		-0.001	0.025	-0.004
		0.13			0.13				
	Physical Symptoms		0.075	0.022	0.333***		0.066	0.030	0.224*
	Harm Avoidance		0.013	0.049	0.031		0.068	0.040	0.160
	Social Anxiety		-0.053	0.029	-0.194		-0.071	0.029	-0.225*
	Separation/Panic		0.040	0.036	0.118		0.024	0.030	-0.081

Note: Dx = diagnosis; MASC = Multidimensional Anxiety Scale for Children; SAD = separation anxiety disorder; SoP = social phobia; GAD = generalized anxiety disorder.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 6

Sequential Logistic Regression to Test the Prediction of Anxiety Disorders Using Youth and Parent Report of the MASC

Dx	MASC Scale	Child/Adolescent			Parent			Full Model χ^2	R ²
		OR	95% CI	Wald χ^2	OR	95% CI	Wald χ^2		
Children Ages 7 - 12									
SAD	Physical Symptoms	1.04	[0.99, 1.08]	2.69	0.96	[0.91, 1.01]	2.53		
	Harm Avoidance	0.95	[0.89, 1.01]	2.88	0.94	[0.87, 1.01]	3.32		
	Social Anxiety	0.93	[0.89, 0.97]	10.75****	0.98	[0.93, 1.03]	0.73		
	Separation/Panic	1.18	[1.12, 1.25]	36.47****	1.25	[1.17, 1.33]	40.79****	106.34****	0.36
SoP	Physical Symptoms	0.99	[0.95, 1.04]	0.18	0.97	[0.92, 1.02]	1.37		
	Harm Avoidance	0.96	[0.90, 1.03]	1.25	0.93	[0.86, 1.01]	3.02		
	Social Anxiety	1.16	[1.10, 1.22]	32.22****	1.17	[1.10, 1.24]	26.42****		
	Separation/Panic	0.90	[0.85, 0.95]	14.68****	1.00	[0.94, 1.06]	0.01	81.99****	0.31
GAD	Physical Symptoms	1.07	[1.02, 1.12]	6.60*	1.08	[1.01, 1.15]	5.80*		
	Harm Avoidance	1.07	[0.99, 1.14]	3.21	1.03	[0.95, 1.11]	0.44		
	Social Anxiety	1.00	[0.95, 1.04]	0.03	0.99	[0.94, 1.05]	0.06		
	Separation/Panic	0.99	[0.93, 1.04]	0.29	0.98	[0.92, 1.05]	0.29	21.87**	0.10
Adolescents Ages 13 - 17									
SAD	Physical Symptoms	1.04	[0.77, 1.04]	1.10	0.92	[0.82, 1.03]	2.29		
	Harm Avoidance	0.99	[0.86, 1.14]	0.03	1.13	[0.97, 1.30]	2.53		
	Social Anxiety	0.88	[0.81, 0.96]	8.87**	0.92	[0.81, 1.04]	1.84		
	Separation/Panic	1.24	[1.11, 1.39]	13.62****	1.28	[1.11, 1.47]	11.54****	47.97****	0.46
SoP	Physical Symptoms	0.95	[0.87, 1.09]	1.17	0.94	[0.79, 1.12]	1.37		
	Harm Avoidance	0.95	[0.79, 1.15]	0.26	0.78	[0.63, 0.98]	3.02*		
	Social Anxiety	1.33	[1.15, 1.54]	14.64****	1.15	[0.98, 1.35]	26.42		
	Separation/Panic	0.92	[0.80, 1.05]	1.53	1.16	[0.94, 1.43]	0.01	37.99****	0.54
GAD	Physical Symptoms	1.07	[1.00, 1.15]	4.03*	1.08	[0.97, 1.13]	1.82		
	Harm Avoidance	1.09	[0.96, 1.25]	1.69	1.12	[0.91, 1.24]	3.20		
	Social Anxiety	0.95	[0.87, 1.04]	1.18	0.96	[0.86, 1.07]	0.64		

Dx	MASC Scale	Child/Adolescent		Parent		Full Model χ^2	R ²
		OR 95% CI	Wald χ^2	OR 95% CI	Wald χ^2		
	Separation/Panic	0.99 [0.89, 1.12]	0.00	1.01 [0.90, 1.13]	0.01	15.81*	0.19

Note: Dx = diagnosis; MASC = Multidimensional Anxiety Scale for Children; CI = confidence interval; SAD = separation anxiety disorder; SoP = social phobia; GAD = generalized anxiety disorder.

* $p < .05$.

** $p < .01$.

*** $p < .001$.