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Screening for social anxiety disorder in the clinical setting: using the Liebowitz Social Anxiety Scale☆

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Abstract

Objective: We sought to determine optimal cutoff values for the Liebowitz Social Anxiety Scale (LSAS) total and subscale scores for the diagnosis of social anxiety disorder (SAD) and designation of the generalized subtype of SAD. **Method:** Three hundred and sixty-four patients from a multi-site sample who met criteria for SAD according to structured diagnostic interview, 262 of whom met criteria for the generalized subtype, and 34 control participants free of current Axis I disorders participated in this study. All participants were given the Liebowitz Social Anxiety Scale by an independent assessor. **Results:** Receiver Operating Characteristics analysis revealed that the LSAS performed well in identifying individuals who met criteria for SAD and for the generalized subtype of SAD. Cutoffs of 30 for SAD and 60 for its generalized subtype on the LSAS total score represented the best balance of specificity and sensitivity. **Conclusions:** These findings provide support for the use of the Liebowitz Social Anxiety Scale for the identification of individuals with SAD and its generalized subtype in clinical settings. Identification of

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patients with SAD should increase the percentage of these patients who receive appropriate treatment for this impairing disorder.

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Almost two decades ago, Liebowitz, Gorman, Fyer, and Klein (1985) designated social phobia the "neglected anxiety disorder." Indeed, at that time, social phobia was considered to occur only in circumscribed performance situations such as public speaking. In addition, it was not believed to be prevalent or significantly impairing. However, recent years have witnessed a surge of interest in the study and treatment of the condition, increasingly referred to as social anxiety disorder (SAD) (Liebowitz, Heimberg, Fresco, Travers, & Stein, 2000).

The more contemporary nomenclature reflects the shift in our understanding of the impact of SAD. SAD is one of the most prevalent mental disorders, with estimates of its lifetime prevalence of over 13% in the general population (Kessler et al., 1994). It is a chronic condition (Reich, Goldenberg, Vasile, Goisman, & Keller, 1994) and a major risk factor for other psychiatric disorders (Schneier, Johnson, Hornig, Liebowitz, & Weissman, 1992). In addition, SAD is associated with significant functional impairment (Schneier et al., 1992, 1994; Wittchen, Fuetsch, Sonntag, Mueller, & Liebowitz, 1999), reduced quality of life (Bech & Angst, 1996; Safren, Heimberg, Brown, & Holle, 1997; Wittchen et al., 1999), and increased risk of attempted suicide (Weissman et al., 1996). Recognition of the importance of SAD has led to increased study of the effectiveness of its treatment (Heimberg et al., 1998; Stein et al., 1998b), which has further stimulated awareness of the condition.

The two most recent editions of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-III-R, DSM-IV; American Psychiatric Association, 1987, 1994) distinguish generalized (GSAD) and non-generalized (NSAD) subtypes of SAD. GSAD is characterized by fear of most social situations, whereas persons with NSAD typically exhibit less pervasive fears. GSAD has an earlier age at onset (Mannuzza et al., 1995) and is associated with significant familial aggregation while NSAD is not (Stein et al., 1998a). Furthermore, individuals with GSAD are more broadly impaired than their NSAD counterparts (Heimberg, Holt, Schneier, Spitzer, & Liebowitz, 1993; Kessler, Stein, & Berglund, 1998; Mannuzza et al., 1995). They are less educated, less likely to marry, and more likely to be unemployed. They also endorse greater depression, social anxiety, avoidance, and fear of negative evaluation. Heimberg, Stein, Hiripi, and Kessler (2000) documented a higher prevalence of GSAD, but not of NSAD, among the younger age cohorts in the National Comorbidity Survey — suggesting that the prevalence of GSAD is on the rise and that the development of effective treatments for this disorder is a significant public health issue.

Evidence of differentiation between subtypes has led investigators to view GSAD as a distinct category that may require a unique approach to treatment. In fact, Brown, Heimberg, and Juster (1995) found that patients with GSAD began treatment and ended treatment more impaired than patients with NSAD. They were also less likely to meet criteria for treatment response after 12 weeks of treatment. Recognition of subtype differences has also led recent investigations of pharmacological treatment of SAD to limit themselves to the generalized subtype. In fact, many recent pharmaceutical efficacy trials (including the paroxetine registration studies for the Food and Drug Administration) have been conducted solely in patients with GSAD. These findings suggest that early identification of individuals with GSAD may be required in order to provide a more specific and intense approach to treatment.

Although SAD (especially GSAD) is prevalent and associated with significant impairment, it often goes unnoticed (Magee, Eaton, Wittchen, McGonagle, & Kessler, 1996). Patients may be hesitant to offer information about the extent of their social anxiety for fear that they may be negatively evaluated by the clinician, and many providers fail to inquire about or misdiagnose SAD symptoms as indicative of other disorders (Olfson et al., 2000). Lack of awareness of SAD is especially acute in primary care settings (Bisserbe, Weiller, Boyer, Lepine, & Lecrubier, 1996; Stein, McQuaid, Laffaye, & McCahill, 1999; Weiller, Bisserbe, Boyer, Lepine, & Lecrubier, 1996).

To increase their ability to detect SAD and GSAD, clinicians may benefit from the use of empirically validated assessment tools. While structured diagnostic interviews may be especially helpful in obtaining the information necessary to diagnose and subtype SAD, they are typically costly and time-intensive. Alternatively, rating scales for social anxiety may be easily administered in clinical settings.

The Liebowitz Social Anxiety Scale (LSAS; Liebowitz, 1987) is a commonly used clinician-administered social anxiety rating scale with impressive data in support of its validity (Heimberg et al., 1999). The LSAS assesses the degree of anxiety or avoidance in a number of typical social and performance situations. An overall total score is often used, but subscale scores for anxiety or avoidance in social interaction or performance situations are also calculated. Although the LSAS is a psychometrically sound measure of the degree of social anxiety experienced by patients, it is difficult to know whether a particular score corresponds to a diagnosis of SAD or GSAD. Thus, determination of specific cutoff scores on the LSAS or its subscales that accurately identify persons with SAD or GSAD would greatly enhance its clinical utility.

Statistical techniques such as receiver operating characteristic (ROC) analysis (Kraemer, 1992; Murphy et al., 1987; Swets, Dawes, & Monahan, 2000) allow researchers and clinicians to determine the ability of tests to discriminate individuals with a characteristic from individuals without the characteristic. ROC analysis is based on logistic regression with a continuous predictor variable and a dichotomous criterion variable. Once the logistic regression equation is estimated, the probability of each value of the predictor and its associated

sensitivity and specificity values are derived. *Sensitivity* (Sn) is defined as the likelihood of having positive test results among individuals with a positive diagnosis whereas *specificity* (Sp) is the likelihood of having negative test results in individuals without the diagnosis (Kraemer, 1992). In the present context, positive test results refer to either obtaining a diagnosis of SAD or a determination of GSAD subtype. Conversely, negative test results refer to *not* obtaining a diagnosis of SAD or being classified as NSAD instead of GSAD. Sn and Sp values can range from 0 to 1; a value of .50 represents chance. In ROC analysis, probabilities are plotted on a graph with Sn on the *Y*-axis and the reflection of the Sp values, 1-Sp (which equals the rate of false positives), on the *X*-axis. This line is called the Test ROC. Each point on the Test ROC represents a possible cutoff value for the scale's prediction of the criterion variable (i.e., the test result). A diagonal line, the Random ROC, is plotted from the origin at the bottom left of the graph to the top right. This line represents a probability of .50 or chance that an individual with a given score belongs to the criterion group.

The area between the Random ROC and the Test ROC is called the area under the curve (AUC) and provides a summary index of a test's ability to correctly classify individuals. A value of 1.0 signifies perfect classification. The Random ROC has an AUC of .50. The AUC may also be used to compare curves to each other and to chance using a Chi-square statistic (Hanley & McNeil, 1982). Thus, when several measures are available to choose from, ROC can inform the selection of the measure with greatest likelihood of correct classification.

Each point on the Test ROC line represents a cutoff score and its ability (as determined by Sn and Sp) to predict the dichotomous criterion variable. As one maximizes Sn, Sp will decrease (and vice versa). ROC analysis allows one to evaluate the relative merits of choosing a cut score so that future screening or assessments can be informed based on the needs of the research or clinical endeavor. Often, the score that maximizes both Sn and Sp is considered the best cutoff value for the scale. However, if finding everyone who is likely to be positive on the criterion measure is critically important and having some false positives in the sample is acceptable (as might be the case when screening for a highly contagious disease), then a cut score that maximizes sensitivity is indicated. Conversely, if a more conservative approach in which a homogeneous sample is required and it is less important that all true positives are identified, then a cut score that maximizes specificity might be used. Studies requiring the investment of substantial resources in the evaluation of a single participant because assessment of false positives would prove wasteful (e.g., a functional magnetic resonance imaging study) represent an example where maximizing specificity might be beneficial.

The present study sought to determine the optimal cutoff scores for the LSAS for the diagnosis of SAD and assignment of the GSAD subtype. Utilizing ROC analysis, LSAS scores were compared to SAD diagnosis and GSAD classification made by a consensus of clinicians based on information obtained from semi-structured diagnostic interviews for DSM-III-R or DSM-IV. Cutoff scores for SAD and GSAD were generated using the LSAS total score. LSAS subscale scores

(performance and social interaction) were also examined to determine the relative strength of different types of situations in predicting diagnosis and subtype.

1. Method

1.1. Participants

Participants, aged 18–65, were obtained from a large multi-site sample of patients seeking treatment for social anxiety. One hundred and eighty-five participants sought treatment at the Center for Stress and Anxiety Disorders of the University at Albany, State University of New York (CSAD). One hundred and fourteen participants sought treatment at the Anxiety Disorders Clinic of the New York State Psychiatric Institute (NYSPI). Sixty-five participants sought treatment at the Adult Anxiety Clinic of Temple University (AACT). In addition, a group of individuals from the community, matched to the AACT patient sample on demographic characteristics, but who met criteria for no current DSM-IV Axis I disorders served as a non-anxious control group (NAC; $n = 34$). There were no significant differences among these groups on demographic characteristics.

The 364 treatment-seeking participants received a principal diagnosis of SAD according to either DSM-III-R or DSM-IV criteria. At the CSAD, diagnoses were determined by either the Anxiety Disorders Interview Schedule-Revised (ADIS-R; DiNardo & Barlow, 1988) or the Anxiety Disorders Interview Schedule IV: Lifetime Version (ADIS-IV-L; DiNardo, Brown, & Barlow, 1994), while the ADIS-IV-L was used at the AACT for both clinical and control participants. Participants at NYSPI were assessed with the Schedule for Affective Disorders and Schizophrenia, lifetime version modified for use with the anxiety disorders (SADS-LA; Mannuzza, Fyer, Klein, & Endicott, 1986) or the Structured Clinical Interview for DSM-IV (SCID-IV; First, Spitzer, Gibbon, & Williams, 1996). All interview procedures have been shown to have high rates of inter-rater agreement for the principal diagnosis of SAD (Brown, DiNardo, Lehman, & Campbell, 2001; DiNardo, Moras, Barlow, Rapee, & Brown, 1993; First et al., 1996; Mannuzza et al., 1989).

Individuals with comorbid diagnoses, with the exception of current bipolar disorder or psychotic disorder as well as drug or alcohol dependence within the past 6 months, were included. SAD patients were classified as having GSAD if they demonstrated fear in most social situations or were otherwise classified as having NSAD. GSAD and NSAD patients did not differ on demographic characteristics.

1.2. Materials and procedure

The data for the present study were obtained during patients' pre-treatment assessment or when community participants visited the AACT to take part in various studies. All participants provided written informed consent after being

given a complete description of the purpose and procedure of the specific study in which they took part. A clinician uninformed about the participants' performance on other assessment measures administered the LSAS. The LSAS contains 13 social and 11 performance situations that are rated by the clinician on separate 4-point (0–3) scales of fear/anxiety and avoidance. A number of subscale scores can be derived from the LSAS including total fear, fear of social interactions, fear of performance, total avoidance, avoidance of social interactions, avoidance of performance, total performance, and total social interaction. In addition, an overall total score is generated by summing both fear and avoidance ratings for all items and is commonly used in the evaluation of pharmacotherapies for SAD. In the present analyses, the overall total score (LSAS-T), the total performance subscale score (LSAS-PER), and total social interaction subscale score (LSAS-SI) were examined. Extensive support for the reliability and validity of the LSAS has been reported by Heimberg et al. (1999).

1.3. Data analysis

Using ROC analysis, we examined cutoff values that corresponded to a diagnosis of SAD (distinguishing patients with SAD from normal comparison subjects) and GSAD (distinguishing between subtypes of persons with SAD). We determined cutoff values that: (1) maximized both Sn and Sp; (2) maximized Sn (without reducing Sp below chance level); and (3) maximized Sp (without reducing Sn below chance level). For the LSAS-SI and LSAS-PER scale scores, only the cutoff values that maximized both Sn and Sp are presented. Data were analyzed using the STATA 6.0 software program (Stata Corporation, 1999). Significance for the following analyses was set at .01.

2. Results

2.1. Diagnosis of SAD

The total sample ($N = 398$) of SAD patients ($n = 364$) and NAC participants ($n = 34$) was submitted to ROC analysis. The AUC for this ROC analysis was .98 and was significant versus chance or the random ROC line ($P < .0001$) (Fig. 1). A LSAS-T score of 30 provided the best balance between Sn and Sp. The vast majority (93.28%) of patients with SAD were correctly identified, and only 5.88% (1-Sp) of persons without SAD were misclassified with a LSAS-T score of 30. A score of 10 (maximizing Sn) correctly classified all patients with SAD but misclassified 44.12% of persons without SAD as positive cases. Conversely, with a score of 63 (maximizing Sp), all persons without SAD were correctly identified but 47.29% of persons with SAD were overlooked.

The ROC analysis for the LSAS-SI subscale produced an AUC of .95 that was significantly different from the random ROC line ($P < .0001$). The AUC for the

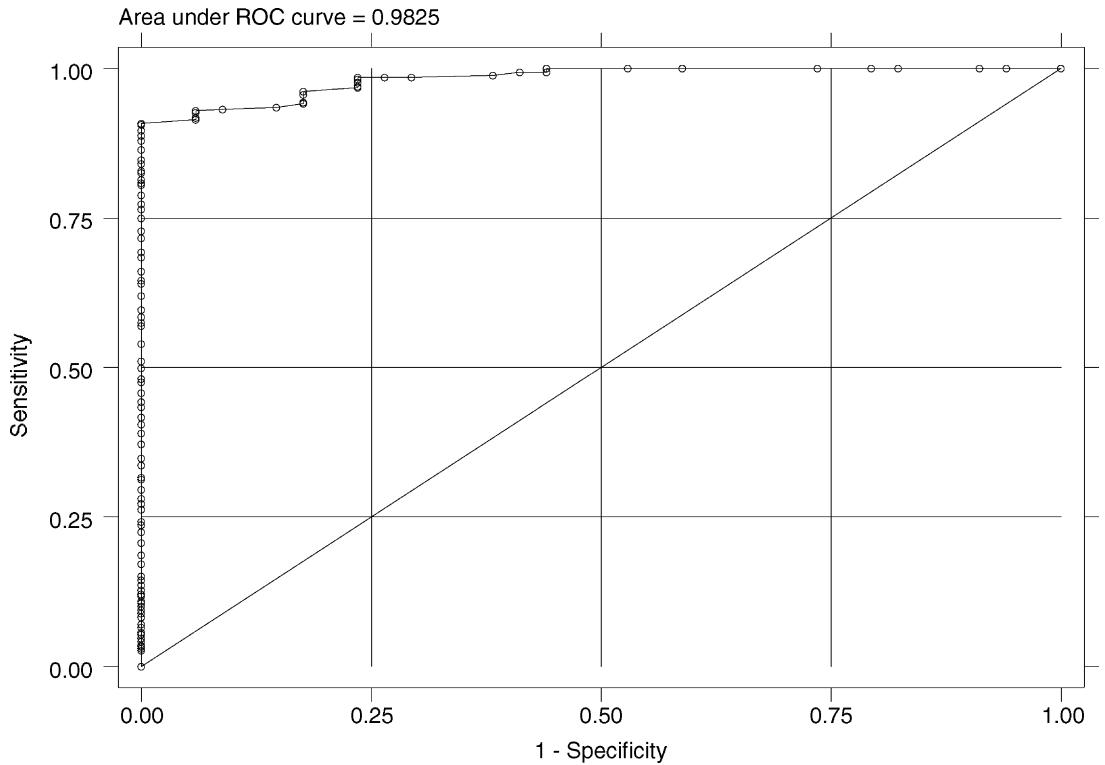

Fig. 1. Receiver operating characteristic (ROC) curve for determining social anxiety disorder (SAD) diagnosis according to LSAS total score (LSAS-T).

LSAS-SI was significantly smaller than the AUC for the LSAS-T ($\chi^2[1] = 20.75$, $P < .0001$). A cutoff value of 15 on the LSAS-SI maximized both Sn (correct classification of SAD, 87.89%) and Sp (correct classification as not having SAD, 88.24%), somewhat less accurate than the parallel score of 30 for LSAS-T.

ROC analysis of the LSAS-PER subscale revealed an AUC of .99 ($P < .0001$) which was not significantly different from the AUC for LSAS-T. However, the AUC (.99) of the LSAS-PER subscale score was significantly greater than the AUC for LSAS-SI ($\chi^2[1] = 14.61, P < .0001$). For the LSAS-PER, a cutoff score of 15 maximized both Sn (94.59%) and Sp (94.12%).[1]

2.2. *Subtype of SAD*

For determination of subtype, NAC participants were excluded — leaving a sample of the 364 participants with SAD (262 participants with the generalized subtype of SAD, 102 with the non-generalized subtype). ROC analysis of LSAS-T for determination of GSAD produced an AUC of .82 which was significantly different than the random ROC line ($P < .001$) (Fig. 2). A score of 60 was found to provide the best balance of Sn (correct classification as GSAD, 72.52%) and Sp (correct classification as NSAD, 73.53%). A score of 47 maximized Sn, correctly classifying 92.37% of persons with GSAD but misclassifying 44.12% of persons with NSAD. Conversely, a cutoff of 73 maximized Sp, correctly classifying 88.24% of persons with NSAD while misclassifying 50.38% of persons with GSAD.

Examination of ROC curves for GSAD determination revealed significant AUC values (vs. the random ROC line) for the LSAS-SI (AUC = .84; $P < .001$) and LSAS-PER subscales (AUC = .75; $P < .001$). The AUC for LSAS-SI was significantly larger than the AUC for LSAS-PER ($\chi^2[1] = 14.0, P < .001$) but did not differ significantly from the AUC for LSAS-T ($\chi^2[1] = .93$, ns). The AUC of the LSAS-PER was also significantly smaller than that of the LSAS-T ($\chi^2[1] = 24.26$, $P < .0001$). A cutoff value of 30 on the LSAS-SI was found to have the strongest balance of Sn (73.66%) and Sp (76.70%) for GSAD. For the LSAS-PER, a cutoff value of 30 was optimal for determining GSAD (Sn = 66.41%, Sp = 69.90%).[2]

3. Discussion

The present study sought to determine optimal cutoff values for the LSAS in making the diagnosis of SAD and determining GSAD subtype. In fact, the LSAS performed very well for these purposes. Using the LSAS total score, scores of 30

[1] Tables of selected values of LSAS-SI and LSAS-PER scores and their associated Sp and Sn values for the identification of social anxiety disorder are available on request from Richard G. Heimberg.

[2] Tables of selected values of LSAS-SI and LSAS-PER scores and their associated Sp and Sn values for the identification of the generalized subtype of social anxiety disorder are available on request from Richard G. Heimberg.

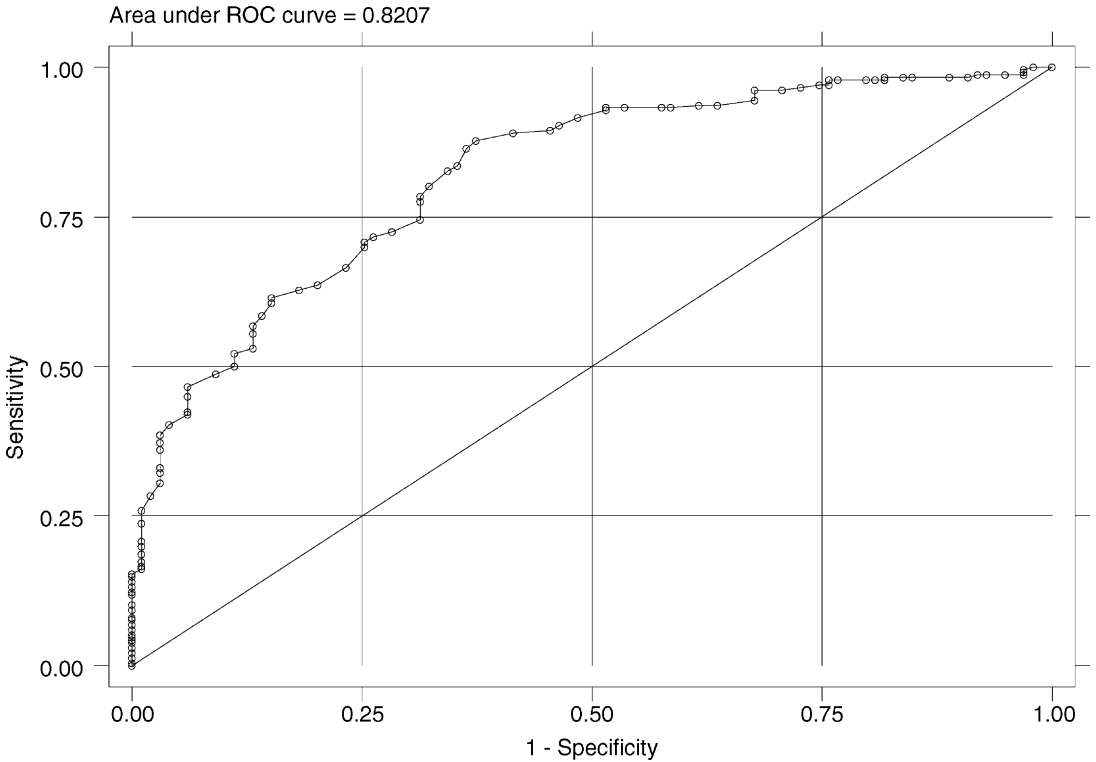

Fig. 2. Receiver operating characteristic (ROC) curve for determining generalized subtype of social anxiety disorder (GSAD) according to LSAS total score (LSAS-T).

for SAD and 60 for GSAD provided the best balance between sensitivity and specificity.

Cutoff values were also presented that maximized either sensitivity or specificity for SAD and GSAD. These values were provided to demonstrate that the appropriate cutoff score depends on one's particular purpose. Sensitivity is to be emphasized when correct identification of positive cases is more important than the misclassification of a greater percentage of negative cases as positive (i.e., false positives), as might be the case in some public health initiatives. Specificity is to be emphasized when a truly homogeneous population for study is desired. In the absence of particular objectives, however, we suggest that the cutoff points that maximize both sensitivity and specificity be used, as they provide the best balance between correct identification of individuals who do have SAD or GSAD and misclassification of those who do not.

We also examined the performance of the LSAS-PER and LSAS-SI subscales. LSAS-PER was superior to LSAS-SI in correct classification of SAD. However, when subtype was examined, LSAS-SI was superior to LSAS-PER. LSAS-SI performed as well as LSAS-T in detecting GSAD. Since the total score was as good or better than the subscale scores, it will be most straightforward to utilize it for both diagnosis and subtyping. However, the pattern of findings for the subscales is intriguing and warrants further study. This pattern suggests that anxiety and avoidance of performance situations may be most important in distinguishing between individuals with and without SAD, but it is the addition of fear and avoidance of social interaction situations that distinguishes patients with generalized SAD from nongeneralized SAD patients.

Although promising, the present findings should be interpreted with some caution. First, we did not provide a comparative benchmark for the LSAS. We were able to show how subscales differed in their ability to predict diagnosis and subtype. However, it remains for future research to determine whether the LSAS is superior to other measures for this purpose. For instance, there are a number of self-report measures that have been developed to index the severity of social anxiety (e.g., the Social Interaction Anxiety Scale and the Social Phobia Scale by Mattick & Clarke, 1998; the Social Phobia and Anxiety Inventory by Turner, Beidel, Dancu, & Stanley, 1989). At this point, no studies have examined the relative efficacy of the LSAS and these instruments in detecting social anxiety disorder or GSAD. Future investigations will need to utilize these comparison scales to determine if the LSAS is the optimal measure for the diagnosis of social anxiety.

Second, the LSAS was quite a bit more accurate when attempting to classify cases of SAD versus subtype of SAD. Indeed, the SAD cutoff score of 30 on the LSAS-T correctly classified 93.3% of individuals with SAD. In contrast, the GSAD cutoff score of 60 on the LSAS-T correctly classified only 72.5% of individuals with GSAD. It is, however, a more difficult task to tell the difference between different subtypes of disorder than between a disorder and its absence.

A third limitation of the present study concerns the composition of the study sample. The study was conducted at a consortium of specialty anxiety clinics, and

the sample was composed of individuals with social anxiety disorder and a smaller group of normal comparison subjects. This situation created an artificially high base rate of social anxiety disorder (91%). Although sensitivity and specificity are independent of base rate, the predictive value of test scores varies as a function of base rate as well as sensitivity and specificity (Glaros & Kline, 1988). Positive predictive value is the percentage of true positives among those identified by the scale as positive. Negative predictive value is the percentage of true negatives among those identified by the scale as negative. If the base rate is high, positive predictive value for given values of sensitivity and specificity will be higher and negative predictive value lower. Similarly, if the base rate is low, negative predictive value would be inflated relative to positive predictive value. Thus, when the rate of true positives is disproportionately high, the likelihood of a test classifying a patient as positive may be artificially inflated. In fact, with the high base rate of SAD (vs. NAC) in the present study, positive predictive value was considerably higher (99.4%) than negative predictive value (57.1%) in determining SAD. If the base rate of social anxiety disorder in the sample were 20% rather than 91%, positive predictive value would be only 79.8%, while negative predictive value would increase to 98.4%.

There was less disparity in the rates of GSAD (72% of the sample) and NSAD (28%) in our sample, and this proportion appears similar to that reported in many clinical settings. Thus, the positive and negative predictive values in the ROC analyses of SAD subtype were 87.6 and 51.0%, respectively, for a LSAS-T score of 60, suggesting that we should put more faith in a diagnosis of GSAD than of NSAD. However, one must be cautious in applying cutoff values for either diagnosis or subtype in settings where the base rate of social anxiety disorder would be considerably lower. Future research is needed to examine the ability of the LSAS to identify cases of SAD and GSAD in a mixed psychiatric sample (which is comprised of individuals diagnosed with other conditions such as panic disorder or depression) or an epidemiological sample.

These limitations notwithstanding, our findings suggest that the LSAS can be used to identify cases of SAD in clinical settings. This is a vital task given the history of poor detection of SAD in clinical settings. Socially anxious persons' hesitancy to bring their distress to the attention of clinicians for fear of negative evaluation (Olfson et al., 2000) places the responsibility for the identification of individuals with social anxiety disorder, especially the generalized subtype, directly on the clinician's shoulders.

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