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An Investigation of the Psychometric Properties of the Social Thoughts and Beliefs Scale (STABS) and Structure of Cognitive Symptoms in Participants with Social Anxiety Disorder and Healthy Controls

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Abstract

Despite the recent increase of measures developed to assess the cognitive symptoms of social anxiety disorder (SOC), their validation is still largely preliminary. Thus, the present studies sought to replicate and extend the psychometric evaluation of the Social Thoughts and Beliefs Scale (STABS). Study 1 involved both participants with SOC ($n = 206$) and healthy controls ($n = 222$) that completed the STABS and other related measures of anxiety. In Study 2, participants with SOC ($n = 66$) completed exposure-based psychotherapy for SOC with the STABS used to track symptom changes. Together, the two studies provided additional support for the validity and reliability of the STABS as a measure of the cognitive symptoms of SOC. However, contrary to previous research with two subscales, a single total scale was suggested as the best interpretation of the STABS, as well as the possible general presentation of the cognitive symptoms of SOC.

Keywords

Social Thoughts and Beliefs Scale; STABS; social phobia; social anxiety disorder; cognitive; validity; reliability

Social anxiety disorder (SOC) is characterized by marked and persistent fear of one or more social or performance situations, in which exposure to said situations provokes intense anxiety and results in significant impairment and distress (American Psychiatric

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Association, 2013). Over the years, several prominent cognitive theories have been proposed to explain the development and maintenance of this disorder (Beck & Emery, 1985; Clark & Wells, 1995; Hofmann, 2007; Rapee & Heimberg, 1997). In general, these models propose that individuals with SOC possess a maladaptive cognitive schema that activates specific and enduring beliefs and related attentional biases (Turner, Johnson, Beidel, Heiser, & Lydiard, 2003). In addition, the first empirically-derived dimensional/hybrid model of social anxiety identified cognitive symptoms (i.e., thought avoidance) as one of the six core and associated symptoms of SOC among a list of over 20 candidate symptom dimensions (Gros, Simms, & Antony, 2011).

Despite substantial developments of cognitive theories and models for SOC as well as the central role of cognitive symptoms in evidence-based treatments of SOC (Hope, Burns, Hayes, Herbert, & Warner, 2010), there are several limitations in the current assessments of cognitive symptoms of SOC. The majority of rigorously evaluated self-report measures of SOC have focused primarily on situational avoidance (Gros et al., 2011; Orsillo, 2001). Although some of these measures contain items assessing limited cognitive symptoms, these items have not been supported as separate cognitive subscales and do not address the different types of cognitions hypothesized to occur in SOC. There has been a recent trend to remedy these limitations with the development of several new cognitive measures, or measures with cognitive components, for SOC (Boden et al., 2012; Gros, Simms, Antony, & McCabe, 2012; Rodebaugh, 2009; Turner et al., 2003; Wong, Moulds, & Rapee, in press). However, these measures contain several limitations as well, including most prominently their development and initial evaluation in student, rather than clinical and/or community, samples (Boden et al., 2012; Gros et al., 2012; Rodebaugh, 2009; Wong et al., in press). In addition, the evaluation of most of these measures has been limited to one or two studies, typically by the same research team. Together, these limitations suggest continued investigation of cognitive measures for the symptoms of SOC is needed.

One measure of particular promise is the *Social Thoughts and Beliefs Scale* (STABS; Turner et al., 2003). Unlike the other measures highlighted above, the STABS was not developed in a student sample, nor has its investigation been limited to a single research team (Fergus, Valentiner, Kim, & Stephenson, 2009; Koerner, Antony, Young, & McCabe, 2013). Rather, the development and subsequent evaluation of the STABS involved several steps. The initial development involved large samples of provider (psychologists and psychiatrists) and patient (diagnosed with SOC and other anxiety disorders) participants completing ratings of 45 candidate items in order to identify which items were most characteristic of SOC (Turner et al., 2003). Exploratory factor analyses (EFAs), internal consistency, and discriminant validity were investigated on the 21 retained items in a mixed sample of participants with diagnosed anxiety disorders as well as healthy control participants (Turner et al., 2003). A subsample of the mixed sample from Turner et al. (2003) completed the 21-item STABS a second time within one-to-four weeks of the first administration to investigate temporal stability. A separate study of STABS' factor structure (confirmatory factor analysis; CFA), internal consistency, convergent and discriminant validity, concurrent and incremental concurrent validity, and prediction of interpersonal functioning was completed in a large student sample by a separate research team (Fergus et al., 2009). The STABS also has

received preliminary support for its sensitivity to detect changes during the course of psychotherapy (Koerner et al., 2013). Together, these studies provided promising psychometric support of the STABS as a 21-item measure of maladaptive cognitions in SOC that contains two subscales for social comparison (i.e., belief that others are more socially adept or competent) and social ineptness (i.e., belief that one will behave in an inept manner in social situations).

As in the development and evaluation of any new evidence-based assessment (Antony & Rowa, 2005; Clark & Watson, 1995), continued investigation and replication are needed to further the development of these tools. Regarding the STABS, there are several areas for replication as well as areas for new investigation. First, additional research was needed on the factor structure of the STABS, despite past EFAs in a mixed sample (Turner et al., 2003) and CFAs in a student sample (Fergus et al., 2009). The factor structure has not been investigated in a clinical sample, nor a community sample. In addition, the initial studies demonstrated very high correlations between the two hypothesized subscales ($r_s > .81$), putting the independence of these scales into question. Second, the existing evidence of convergent and discriminant validity of the STABS was limited to stronger correlations to a measure of SOC in comparison to a general measure of depression and anxiety. Additional research was needed on the STABS and its hypothesized subscales' ability to differentiate different symptoms of SOC (e.g., cognitive vs. physiological), anxiety (e.g., social anxiety vs. agoraphobia), and general symptoms (e.g., anxiety vs. depression). And third, limited research is available on the STABS and its hypothesized subscales' ability to detect changes during the course of evidence-based psychotherapy. The only existing treatment study with the STABS provided initial support for the measure, but lacked several controls for the assessment (e.g., no inter-rater reliability of the diagnostic tools) and treatment (e.g., no control group) procedures (Koerner et al., 2013).

Pending continued psychometric evaluation and support, the STABS appears to be an excellent candidate to improve the literature on the measurement of cognitive symptoms of SOC. Thus, the goal of the present studies was to further the development and evaluation of the STABS in a number of ways. The first of two present studies involved large clinical and healthy control samples that completed the STABS. The factor structure, intercorrelation among factors, internal consistency, and convergent and discriminant validity were investigated to address some of the limitations noted above. All analyses were completed in the total sample (combined SOC and healthy controls; HC) as well as each of the two subgroups separately (separated SOC and HC). In a second study, the STABS was administered at pre- and post-treatment during the completion of exposure therapy alone, a combination of social skills training and exposure therapy (Social Effectiveness Therapy [SET]: Turner, Beidel, Cooley, Woody, & Messer, 1994), or a wait list control in a sample of participants with SOC. Together, these studies should provide additional support for the reliability and validity of the STABS as an evidence-based assessment of the cognitive symptoms of SOC. Both study samples were taken from a larger study designed to investigate the impact of social skills training in the treatment of SOC through a randomized controlled trial of three treatment conditions (Beidel, Rao, Scharfstein, Wong, & Alfano, 2010).

2. Study 1

The primary goal of Study 1 was to replicate and extend the factor structure previously identified in the STABS (Fergus et al., 2009; Turner et al., 2003) in a large sample of participants with clinically diagnosed SOC as well as HC. Based on the findings from the factor analytic investigation, additional goals involved investigating the internal consistency, convergent and discriminate validity, and ability to differentiate clinical and healthy samples of the resulting factor(s). All analyses were completed in the total sample as well as the clinical and healthy control groups.

2.1. Material and Methods

2.1.1. Participants and Procedures—Two primary groups of participants were recruited for participation in the study. Recruitment involved clinic referrals (participants with SOC) and local area newspaper articles/announcements about the availability of free psychotherapy for SOC (participants with SOC). Announcements also were made regarding the availability of a research study examining “social interactions” and providing compensation (\$50.00 USD) for participation (HC participants). In total, 474 eligible participants responded to these recruitment approaches and completed a brief telephone screen to determine initial eligibility by either endorsing symptoms consistent with SOC (participants with SOC) or denying symptoms of common psychiatric disorders (HC participants). Individuals who met the initial screening criteria were invited to complete an in-person comprehensive assessment with doctoral level psychologists or doctoral students in clinical psychology. The assessment involved the Structured Clinical Interview for DSM-IV (SCID; First, Spitzer, Gibbon, & Williams, 1997), the Structured Clinical Interview for DSM-IV Axis II (First, Gibbon, Spitzer, & Williams, 1997), and a series of self-report questionnaires, including the STABS, *Social Phobia and Anxiety Inventory* (SPAI; Turner, Beidel, Dancu, & Stanley, 1989), *Brief Social Phobia Scale* (BSPS; Davidson et al., 1991), *Hamilton Anxiety Rating Scale* (HARS; Hamilton, 1959), and *Hamilton Depression Rating Scale* (HDRS; Hamilton, 1960). Twenty percent of the diagnostic interviews were videotaped and rated by a second clinician for the purposes of calculating inter-rater reliability. For the diagnosis of SOC, agreement was excellent ($\kappa = .92$). In cases with initial disagreement, the research team met to form consensus diagnosis. Forty-six participants were excluded from the study for endorsing psychiatric disorders inconsistent with the study criteria (e.g., SOC not principal diagnosis in SOC group or any diagnoses in HC group; $n = 9$) or for any missing data on the STABS ($n = 37$).

The resulting sample included 428 participants, with roughly equal distribution between the SOC ($n = 206$) and HC ($n = 222$) groups. Participants were predominantly women (52.1%), middle-aged ($M = 38.7$ years old; $SD = 14.6$), single (56.1%), and European American (64.5%; African American 22.7%; Asian American 4.2%; Latino/Latina 4.0%; Indian Subcontinent 1.6%; Other 2.9%). There were significant differences between the subgroups on sex, marital status, and race ($\chi^2s > 4.3$). Participants in the SOC group were more likely to be women (57.3% in SOC group; 47.3% in HC group), married (40.8% in SOC group; 28.4% in HC group), and European American (72.3% in SOC group; 57.2% in HC group). There were no differences found for participant age ($t = 1.5$, $p = .141$). Among the SOC

group, a significant minority of participants (37.4%) endorsed symptoms consistent with a comorbid diagnosis, with the most common comorbid diagnoses being generalized anxiety disorder (9.4%), dysthymic disorder (4.7%), and specific phobia (3.8%).

2.1.2. Measures

2.1.2.1. Social Thoughts and Beliefs Scale: The STABS is a 21-item scale designed to assess the cognitions associated with SOC. As described earlier, the STABS contains subscales for Social Comparison (STABS-SC) and Social Ineptness (STABS-SI). The STABS-SC contains 10 items that assess the belief that others are more socially adept or competent, such as “When I am with other people, I am not good at standing up for myself” and “I feel as if other people sound more intelligent than I do.” The STABS-SI contains 11 items that assess the belief that one will behave in an inept manner in social situations, such as “I do not know how to behave when I am in the company of others” and “When other people laugh it feels as if they are laughing at me.” The STABS has been shown to be highly related to other measures of social anxiety (Fergus et al., 2009) as well as demonstrating excellent internal consistency ($\alpha = .96$) and test-retest reliability ($r = .94$; Turner et al., 2003).

2.1.2.2. Social Phobia and Anxiety Inventory: The SPAI is a 45-item measure designed to assess severity of SOC symptoms across a range of social and performance situations (Turner et al., 1989). The SPAI contains subscales for Social Phobia and Agoraphobia. The SPAI has been shown to have excellent internal consistency, test-retest reliability, and convergent and discriminant validity (for review, see Orsillo, 2001; Turner et al., 1989).

2.1.2.3. Brief Social Phobia Scale: The BSPS is an 18-item measure designed to assess symptoms of SOC (Davidson et al., 1991). The measure includes seven social situations in which participants are instructed to rate their fear and avoidance (fear and avoidance subscales). The measure also includes four physiological symptoms in which participants are instructed to rate their severity (physiologic subscale). The BSPS has been shown to have acceptable internal consistency, test-retest reliability, and sensitivity to treatment improvements (for review, see Orsillo, 2001). Due to the nature of the larger study (Beidel et al., 2010), the BSPS scales were only administered to participants in the SOC group.

2.1.2.4. Hamilton Anxiety Rating Scale and Hamilton Depression Rating Scale: The HARS and HDRS are clinician-administered rating scales for the symptoms of anxiety and depression, respectively (Hamilton, 1959; 1960). The HARS includes 14 symptom clusters. The HDRS includes 17 symptom clusters. Although widely used in clinical research, the psychometric properties for these measures have received mixed support in the literature (Bagby, Ryder, Schuller, & Marshall, 2004; for review, see Roemer, 2001). Due to the nature of the larger study (Beidel et al., 2010), the HARS and HDRS were only administered to participants in the SOC group.

2.1.3. Data Analysis Plan—The data analytic strategies paralleled the specific goals of the present study. For the primary goal of replicating the previous psychometric study of the STABS scales (Fergus et al., 2009; Turner et al., 2003), we conducted a series of CFAs to

confirm the factor structure of the STABS. As the only previous investigation involving CFAs was limited to a student sample, the present factor analytic investigation was completed in each the total sample (combined SOC and HC), clinical sample (SOC), and healthy community sample (HC). Multiple-group CFA models also were completed to evaluate whether the factor structure underlying the STABS was invariant across the SOC and HC groups. CFAs were completed for the total and two subgroups (SOC and HC) due to the observed differences between the subgroups in demographics as well as anxiety symptomatology. Cronbach's alpha coefficients and correlation coefficients between the factors also were investigated as secondary support for the factor model. For the secondary goals of studying the convergent and discriminant validity of the STABS, Steiger's (1980) tests for comparing elements of a correlation matrix were used to determine whether the STABS scales were stronger predictors of the measures of matching (SPAI-SOC; BSPS fear and avoidance; HAM-A) or mismatching constructs (SPAI-AG; BSPS physiologic; HAM-D). Once again, these analyses were completed separately in the total sample and in each of the SOC and HC groups to investigate how the STABS performed across samples.

2.2. Results

2.2.1. Structural Analyses—CFAs were conducted in total sample as well as the SOC and HC groups separately. The CFAs were conducted using EQS 6.1 (Bentler & Wu, 1995) and the factor loadings were based on previous research on the STABS (Fergus et al., 2009; Turner et al., 2003). All models were tested using covariance matrices and maximum likelihood estimation methods. The distributions of some model variables deviated from normality; thus, we implemented robust maximum likelihood estimation methods and goodness-of-fit statistics as recommended (Brown, 2006; Satorra & Bentler, 1994). Models were identified by setting the variances of each factor to 1.0, and the factors were correlated. In the present study, CFI and IFI values of .90 and above were considered to reflect adequate fit and values of .95 and above to indicate excellent fit. RMSEA values of .08 or less were considered to reflect adequate fit; values of .06 or less were considered to reflect excellent fit (Schweizer, 2010). All goodness-of-fit statistics for each of the tested models are presented in Table 1. All factor loadings for each of the tested models of the full 21-item STABS are presented in Table 2.

2.2.1.1. Total Sample: The Satorra-Bentler chi-square goodness-of-fit tests for each of the CFA models were significant (χ^2 s > 618.3, $ps < .001$), which suggests less than ideal model fit. However, the utility of the chi-square goodness-of-fit test has been questioned in the literature due to its sensitivity to large sample sizes (Hu & Bentler, 1995; Kahn, 2006; Kline, 1998). Thus, additional fit indices were investigated here and subsequent models below to support the fit of the models. The two factor model (2F) demonstrated adequate fit across each of the fit indices. The one factor model (1F) demonstrated adequate fit in only two of the three indices. When investigating the nested models with scaled difference in χ^2 s tests (Brown, 2006; Satorra & Bentler, 1994), the 2F model demonstrated significantly better fit compared to the 1F model, $\chi^2(1) = 39.4$, $p < .001$. The factors were very strongly intercorrelated in the 2F model ($r = .95$).

2.2.1.2. SOC Group: The 2F and 1F did not reach adequate thresholds for each of the indices in the SOC group. Although both were below desired thresholds, the 2F model demonstrated significantly better fit compared to the 1F model, $\chi^2(1) = 27.2, p < .001$. Once again, although lower than in the total sample and HC group, the factors were still very strongly intercorrelated in the 2F model ($r = .88$). Of note, item 7 demonstrated particularly poor loadings in the 2F and 1F models (item 7 loadings $< .23$; all other loadings $> .43$). Modification indices (e.g., Lagrange multiplier and Wald test) did not indicate significant changes to the model χ^2 related to removing and/or adding parameters to the model associated with item 7. However, the content of item 7 (i.e., “I would never be able to make a speech in public.”) appeared to be less consistent with the two hypothesized STABS subscales, as it is the only item assessing public speech fear. Together, these findings suggest that the removal of item 7 as a possible revision to the measure/factor model.

2.2.1.3. HC Group: Similar to the fit statistics in the SOC group, the fit statistics for the 2F and 1F did not reach adequate thresholds for each of the indices in the HC group. Although both were below desired thresholds, the 2F model demonstrated significantly better fit compared to the 1F model, $\chi^2(1) = 20.5, p < .001$. Once again, the factors were very strongly intercorrelated in the 2F model ($r = .96$).

2.2.1.4. Multiple-Group: In order to evaluate whether the 2F structure underlying the STABS is invariant across the SOC and HC groups, we investigated two multiple-group CFA models: (a) a constrained model in which all factor loadings were constrained to be identical across samples, and (b) an unconstrained model in which loadings were free to vary across samples. Although both multiple-group models yielded similar fit indices (below adequate thresholds on CFI and IFI), the scaled difference in χ^2 indicated that constraining the factor loadings across samples significantly impact the model fit, $\chi^2(21) = 69.1, p < .001$. Together, these findings suggest that the STABS yielded a dissimilar 2F structure across the SOC and HC groups.

2.2.1.5. CFAs of Revised STABS (20 item): Based on the CFA findings in the SOC group, additional CFAs were investigated for a 20-item version of the STABS (removed item 7). These findings also are presented in Table 1. In general, this revision resulted in minor improvements in the fit indices across factor models and samples. Of note, the 1F and 2F models in the total sample and 2F model in the SOC group reached adequate thresholds across all fit indices. The factor intercorrelated remained very strong across the 2F models ($r_s > .88$).

2.2.2. Internal Consistency—Both total scale and subscales of the STABS demonstrated excellent internal consistency, with Cronbach’s alpha coefficients ranging from .90 and .97 in the original 21-item version. Slightly improved alpha coefficients were demonstrated in the revised 20-item version of the STABS across the three samples (α s ranging from .90 and .98).

2.2.3. Convergent and Discriminant Validity—As presented in Table 3, the convergent and discriminant validity of the STABS scales was investigated in all three samples with the 21-item and 20-item versions of the STABS scales. Both the 21-item

versions of the STABS total scale and two subscales evidenced significant positive correlations with each of the measures of anxiety and depression ($r_s > .38$). As expected, each of the STABS scales correlated more highly with the STAI-SP than with the STAI-AG ($Z_s > 6.0$; $p_s < .01$). In addition, the STABS scales also correlated more highly with the BSPS-Fear and BSPS-Avoidance scales than with the BSPS-Physiologic scale ($Z_s > 4.9$; $p_s < .01$). These differences were predicted for both BSPS-Fear and BSPS-Avoidance due to their highly overlapping content (i.e., both ratings made for the same questions) and their relatedly high intercorrelation ($r = .91$). However, in contrary to expectations, no significant differences were demonstrated between the STABS scales and the HARS and HDRS ($Z_s < 1.3$). An identical pattern of findings was observed across the 20-item versions of the STABS scales.

2.2.4. Group Comparison—As presented in Table 4, an analysis of covariance (ANCOVA) was used to investigate the group difference on the STABS scales across SOC and HC groups with the significant demographic variables entered as covariates (i.e., sex, marital status, and race). Separate ANCOVAs were run for the STABS total scale, STABS-SC, and STABS-SI 20- and 21-item versions. As expected, these analyses demonstrated a significant effect of group on STABS scores with the SOC group evidencing significantly higher scores on each of the scales ($F_s > 288.7$; $p_s < .001$; $d_s > 1.66$).

3. Study 2

The primary goal of Study 2 was to investigate the sensitivity of the STABS to detect symptom changes during the course of evidence-based psychotherapy within a randomized controlled trial. A subsample of participants with SOC from Study 1 completed one of two psychotherapies for SOC (exposure alone or SET) or a waitlist control. The STABS scales were investigated for pre- to post-treatment differences across these two treatment conditions (active treatment vs. waitlist control).

3.1. Material and Methods

3.1.1. Participants and Procedures—A subset of the participants with SOC ($n = 119$) that participated in Study 1 were invited to participate in the treatment program. Participants were excluded on the basis of comorbid depression with active suicidal ideation ($n = 3$) or for declining to enter into the treatment protocol ($n = 10$). Of the 106 participants randomized to one of the three treatment conditions (i.e., exposure therapy alone, SET, or a wait list control), 66 participants completed treatment and all post-treatment measures. Participants were predominantly women (51.5%), middle-aged ($M = 36.2$ years old; $SD = 14.4$), single (59.1%), and European American (75.8%; African American 9.1%; Asian American 7.6%; Latino/Latina 4.5%; Indian Subcontinent 1.5%; Middle Eastern 1.5%). Participants were randomly assigned to one of two exposure-based psychotherapies ($n = 48$) or to a wait list control condition ($n = 18$). All participants completed the STABS at pre- and post-treatment.

3.1.2. Treatment

3.1.2.1. Exposure-based psychotherapy: The exposure-based treatments included SET (individual and group sessions) and exposure/flooding treatment (individual sessions). Although both treatments involved a primary exposure approach with both imaginal and situational exposures, SET also included a social skills training component. Participants in both treatment conditions were seen for 90 minutes per session, twice per week for 12 weeks, with both groups receiving in-clinic treatment and out of clinic homework assignments. Therapists were doctoral level psychologists or doctoral students in clinical psychology with previous experience conducting social skills training and exposure therapy, supervised by a licensed clinical psychologist. Clinicians provided treatment in both conditions, following standardized treatment manuals. For the purposes of the present study, the two treatments were collapsed into a single active treatment condition, and compared with the wait list control condition.

3.1.2.2. Wait list control: Participants were told that they would be treated after a 12-week wait period, at which point they would be able to select either of the two exposure-based psychotherapies. During the 12 week wait period, participants were telephoned weekly to assess their clinical status. No participants were removed from the wait list control condition because of worsening clinical status.

3.2. Results

STABS scale scores were analyzed via a 2 Time (pre-treatment, post-treatment) X 2 Group (exposure-based psychotherapy, waitlist control) analysis of variance (ANOVA). Separate ANOVAs were run for the STABS total scale, STABS-SC, and STABS-SI, for the full 21-item and revised 20-item versions from Study 1. Both the 21-item and 20-item versions were used to compare with existing literature (21 item) and further study the revised version (20 item). Each of the six scales demonstrated a significant pre- to post-treatment effect ($F_s > 20.9$; $p_s < .001$) as well as a significant treatment by condition interactions ($F_s > 17.3$; $p_s < .001$). More specifically, all six measures demonstrated significant decrease in symptoms from pre- to post-treatment in exposure –based psychotherapy ($t_s > 8.3$; $p_s < .001$; $d_s > 1.38$), but not in the waitlist control condition ($t_s < 1.7$; $p_s > .05$; $d_s < 0.27$) (see Table 5).

4. General Discussion

The present study investigated the psychometric properties of the STABS as a measure of the cognitive symptoms of SOC. A mixed pattern of findings was identified across the various psychometric evaluations in the present studies. Although the 2F factor structure of the STABS was supported in the combined sample of participants with SOC and HC, the more homogeneous subgroups (SOC and HC) evidenced inadequate fit indices for the 1F and 2F models. The model fit also was inconsistent across the two samples in the multi-group CFA analyses. The investigation of the convergent and discriminant validity demonstrated stronger positive correlations between the STABS and similar symptoms of social anxiety than dissimilar symptoms of social anxiety (i.e., social anxiety vs. agoraphobia; social fear/avoidance vs. physiologic). However, the STABS scales did not discriminate between general symptoms of anxiety and depression, similar to the past

literature on the STABS (Fergus et al., 2009). The STABS also demonstrated robust differences between the participants in the SOC and HC groups as well as the participants with SOC from pre- to post-treatment in the active treatment, but not the wait list condition. Together, these findings both provide continued support as well as provide direction for possible revisions of the STABS and how it is scored/interpreted.

The area of particular interest was the findings from the CFAs in Study 1. In contrast to previous CFA findings demonstrating excellent fit indices for the 2F model (Fergus et al., 2009), the present findings evidenced poor fit in the separate subgroups. There are several possible explanations for these findings. First, the sample sizes of the two separate samples ($n_s = 222$ and 206) are much smaller than the total sample of the present study ($N = 428$) and past study of the STABS involving CFAs ($N = 469$) and may have resulted in less adequate fit indices. Although slight effects on the indices are possible, research on sample sizes in factor analyses suggest that the size of the two samples should have been more than adequate to detect model fitness (Brown, 2006; MacCallum, Widaman, Zhang, & Hong, 1999). A second interpretation is that the homogeneity of the subsamples (SOC and HC) may have reduced the available variability, resulting in a poorer fit of some items. For example, item 7 (i.e., never able to make a public speech) was identified as a particularly poor fitting item in the SOC group, possibly due to the commonality of severe public speaking fears in SOC. A third interpretation is that the hypothesized two factors are indeed not independent. In support of this hypotheses, the only EFA of the STABS demonstrated 9 of the 21 items that could be defined as problematic for their crossloading (Turner et al. 2003), as defined elsewhere (Gros et al., 2011). The two factors also have been repeatedly shown to have very strong intercorrelations across each of the studies/samples ($r_s > .81$).

Related to the problematic factor analytic findings for the 2F models, the two subscales (STABS-SC and STABS-SI) provided little additional information and/or differentiation across any of the analyses/studies. More specifically, the total scale, STABS-SC, and STABS-SI demonstrated nearly identical findings for convergent and discriminant validity, group differences, and treatment outcome in the present studies. Similar (lack of) findings were demonstrated in the two previous studies of the STABS, with the one exception being that the total STABS and STABS-SI, but not STABS-SC, were the strongest predictors of interpersonal functioning (Fergus et al., 2009). Interestingly, the investigated revision of the STABS (e.g., removal of item 7) demonstrated adequate fit indices for both the 1F and 2F models in the total sample in Study 1. Together, these findings suggest the possibility that the STABS could be interpreted as a total scale representing a single construct for cognitive symptoms of SOC. The removal of item 7 in a revision of the STABS also should be considered further due to its problematic loading of the item in participants with SOC as well as the improved fit indices for the revised STABS.

Despite past literature on various types of negative cognitions to target in the treatment of SOC (Hope et al., 2010; Hope, Heimberg, & Turk, 2006), the notion of a single cognitive symptom dimension for SOC has received some attention in the recent literature. Gros et al. (2011) completed a thorough investigation of the symptom dimensions hypothesized to be associated with SOC, in their efforts to develop a hybrid model for the disorder. Through a series of studies involving literature review and expert panel review, Gros et al. identified

more than 20 potential symptom dimensions of SOC, generated sample items for each proposed dimension, and completed a series of EFAs of the resulting item pool. Although several candidate cognitive symptom dimensions were included in the analyses (e.g., anxious thoughts, post-event processing, self-focused attention, thought avoidance, anxiety sensitivity), the model resulting from the EFAs only included a single cognitive factor (i.e., thought avoidance). This model was replicated in additional research on the development and validation of a related self-report measure based on the hybrid model (*Multidimensional Assessment of Social Anxiety*; Gros et al., 2012). Additional research on the cognitive symptoms of SOC is needed to better understand its unidimensional versus multi-dimensional nature, and may thereby inform how best to assess these symptoms.

The present studies were limited in a couple respects that should be addressed in future investigations of the STABS and related cognitive symptoms of SOC. First, although also a strength of the studies in some regards, the recruitment of the present study focused on two separate homogeneous samples (SOC and HC) that were largely divergent from one another (e.g., sex, age, marital status), potentially limiting the symptom diversity that likely was prevalent in the previous studies of the STABS (Fergus et al., 2009; Turner et al., 2003). Second, the inclusion of the HARS and HDRS, rather than more psychometrically sound measures of anxiety and depression, may have limited the findings for convergent and discriminant validity of the STABS. However contrary to this hypothesis, Fergus et al (2009)'s investigation of convergent and discriminant validity of the STABS included the *Depression Anxiety and Stress Scales* (Lovibond & Lovibond, 1995), a measure shown to demonstrate the expected pattern of correlations with alternative measures of cognitive anxiety (Gros, Antony, Simms, & McCabe, 2007), and did not evidence the expected pattern for the STABS. Thus, the findings for convergent and discriminant validity for anxiety and depression may be a limitations of the STABS itself and/or of the highly overlapping constructs of anxiety and depression as they relate to SOC (Gros, McCabe, & Antony, 2013), rather than a limitation of the study. The investigation of the convergent and discriminant validity also lacked a comparison between the STABS and another cognitive-based measure of anxiety (e.g., State Trait Inventory for Cognitive and Somatic Anxiety; Gros et al., 2007).

5. Conclusions

The present studies provided additional support for the validity and reliability of the STABS as a measure of cognitive symptoms of SOC. The findings may support a different factor model than the previous CFA study involving an unselected student sample, suggesting that the total scale (1F) could be interpreted on its own, rather than or in addition to the separate subscales for Social Comparison and Social Ineptness. This suggestion was further supported by replication of very strong intercorrelations between the scales as well as a general lack of differences between the scales on any of the analyses across studies. The studies also provided preliminary support for a 20-item version of the STABS, although replication is merited. Together, these findings may provide additional support for a shift in assessment practices to a single, unidimensional construct of cognitive symptoms of SOC (Gros et al., 2011; Gros et al., 2013).

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Highlights

Investigation of psychometric properties of Social Thoughts and Beliefs Scale

Study 1 evaluated factor structure, convergent validity, and internal consistency

Study 2 evaluated sensitivity to detect changes during treatment

Findings were supportive of single factor/scale interpretation of STABS

Findings may support single unidimensional cognitive construct for social anxiety

Table 1

Goodness of Fit Statistics for all Confirmatory Factor Analysis Models

Model	χ^2	df	CFI	IFI	RMSEA	CI-90
Total Sample ($N = 428$)						
1F – Total sample (21 items)	714.8	189	.94	.94	.081	(.074, .087)
2F – Total sample (21 items)	618.3	188	.95	.95	.073	(.067, .080)
1F – Total sample (20 items)	633.2	170	.94	.94	.080	(.073, .086)
2F – Total sample (20 items)	543.8	169	.96	.96	.072	(.065, .079)
Social Phobia Group ($n = 206$)						
1F – SOC only (21 items)	499.3	189	.85	.85	.089	(.080, .099)
2F – SOC only (21 items)	431.2	188	.88	.89	.079	(.069, .089)
1F – SOC only (20 items)	445.4	170	.86	.87	.089	(.079, .099)
2F – SOC only (20 items)	377.8	169	.90	.90	.078	(.067, .088)
Healthy Control Group ($n = 222$)						
1F – Control only (21 items)	398.1	189	.80	.81	.071	(.061, .080)
2F – Control only (21 items)	380.0	188	.82	.82	.068	(.058, .078)
1F – Control only (20 items)	374.7	170	.80	.80	.074	(.064, .084)
2F – Control only (20 items)	346.6	168	.82	.83	.069	(.059, .079)
Multiple Group						
2F – MG – Constrained (21 items)	871.7	397	.83	.83	.053	(.048, .058)
2F – MG – Unconstrained (21 items)	804.5	376	.84	.84	.052	(.047, .057)
2F – MG – Constrained (20 items)	792.7	358	.83	.83	.053	(.048, .058)
2F – MG – Unconstrained (20 items)	732.5	338	.85	.85	.052	(.047, .057)

Note. Bolded text represents models demonstrated adequate fit across all indices. df = degrees of freedom; CFI = comparative fit index; IFI = Bollen fit index; RMSEA = root mean-square error of approximation; CI-90 = 90% Confidence Interval of RMSEA; 1F = one factor model; 2F = two factor model; MG = Multiple group.

Table 2
Standardized Factor Loadings for the Two-Factor Model of the STABS based on the CFA

Abridged Items	F1 (Total, SOC, HC)	F2 (Total, SOC, HC)	Error (Total, SOC, HC)
1. I appear clumsy to other people.		.78, .64, .69	.63, .77, .73
2. If I have an opinion, I am likely to chicken out.	.80, .61, .74		.60, .79, .68
3. I feel as if other people sound more intelligent than I do.	.76, .58, .68		.65, .82, .74
4. I am not good at standing up for myself.	.81, .68, .73		.58, .73, .69
5. I am a coward when it comes to interacting with other people.	.90, .85, .84		.44, .53, .54
6. I feel unattractive when I am with other people.		.79, .66, .75	.61, .75, .66
7. I would never be able to make a speech in public.	.67, .23, .53		.74, .97, .85
8. Other people are more comfortable than I am.	.90, .80, .81		.43, .60, .58
9. Other people are more socially capable than I am.	.92, .88, .82		.39, .48, .58
10. I will always be uncomfortable in social situations.	.89, .79, .80		.47, .61, .61
11. My mind is very likely to go blank when I am talking.	.88, .76, .79		.48, .65, .62
12. I am not good at making small talk.	.81, .72, .65		.59, .70, .76
13. Other people are bored when they are around me.		.84, .74, .81	.54, .68, .59
14. Others will think what I am saying is stupid.		.85, .67, .87	.52, .74, .50
15. I am likely to get panicky or do something to embarrass myself.		.84, .72, .79	.55, .69, .62
16. I do not know how to behave when with others.		.81, .74, .78	.59, .68, .63
17. If something went wrong, I would not be able to smooth it over.		.84, .81, .73	.55, .59, .69
18. Other people don't think I am very smart.		.75, .63, .73	.67, .77, .69
19. When other people laugh it feels as if they are laughing at me.		.75, .68, .76	.65, .74, .65
20. People can easily see when I am nervous.		.75, .45, .70	.67, .89, .71
21. If there is a pause, I feel as if I have done something wrong.		.80, .69, .77	.60, .72, .64

Note. Some of the item descriptors were summarized from the original item content as a function of the allocated space. Total = total sample ($n = 428$). SOC = social anxiety disorder group ($n = 206$). HC = healthy control group ($n = 222$). All factor loadings were significant, $p < .05$.

Table 3
Correlations of the STABS-21 Scales with Other Measures of Anxiety and Depression

Sample – Measure	SPAI			BSPS			Hamilton	
	SP	AG	Fear	Avoid	Phys	Anxiety	Depression	
Total – STABS-Total Scale-21	<u>.92</u> [*]	.58	–	–	–	–	–	–
Total – STABS-Social Comparison-21	<u>.93</u> [*]	.56	–	–	–	–	–	–
Total – STABS-Social Ineptness-21	<u>.87</u> [*]	.58	–	–	–	–	–	–
SOC – STABS-Total Scale-21	<u>.82</u> [*]	.40	<u>.65</u> [*]	<u>.63</u> [*]	.18	<u>.44</u>	.49	.49
SOC – STABS-Social Comparison-21	<u>.82</u> [*]	.38	<u>.66</u> [*]	<u>.64</u> [*]	.18	<u>.45</u>	.49	.49
SOC – STABS- Social Ineptness-21	<u>.74</u> [*]	.38	<u>.58</u> [*]	<u>.55</u> [*]	.17	<u>.40</u>	.44	.44
HC – STABS-Total Scale-21	<u>.85</u> [*]	.57	–	–	–	–	–	–
HC – STABS-Social Comparison-21	<u>.85</u> [*]	.52	–	–	–	–	–	–
HC – STABS-Social Ineptness-21	<u>.80</u> [*]	.58	–	–	–	–	–	–

Note. Predicted convergent correlations are underlined. An identical pattern of findings were demonstrated across the STABS 21-item and 20-item scales, and so only the 21-item version is presented above. All correlations are significant, $p < .01$. STABS = Social Thoughts and Beliefs Scale; SPAI = Social Phobia and Anxiety Inventory Social Phobia subscale; SP = Social Phobia and Anxiety Inventory Social Phobia subscale; BSPS = Brief Social Phobia Scale; Fear = Brief Social Phobia Scale Fear subscale; Avoid = Brief Social Phobia Scale Avoidance subscale; Phys = Brief Social Phobia Scale Physiologic subscale; AG = Social Phobia and Anxiety Inventory Agoraphobia subscale; SOC = social phobia group; HC = healthy control group.

* higher correlation within scale, $p < .01$.

Table 4

Changes in STABS Scales from Pre- to Post-Treatment

Scale	SOC	HC	<i>F</i>	<i>d</i>
STABS-Total-21	66.9 (15.6)	37.1 (14.0)	411.0*	2.01
STABS-Social Comparison-21	35.2 (7.9)	18.6 (7.3)	484.7*	2.18
STABS-Social Ineptness-21	31.7 (8.5)	18.6 (7.2)	288.7*	1.66
STABS-Total-20	63.1 (15.2)	35.4 (13.5)	380.2*	1.93
STABS-Social Comparison-20	31.5 (7.6)	16.8 (6.7)	429.3*	2.05
STABS-Social Ineptness-20	31.7 (8.5)	18.6 (7.2)	288.7*	1.66

Note. Social anxiety disorder group (SOC) and health control group (HC) columns presented as mean (standard deviation). STABS = Social Thoughts and Beliefs Scale.

* $p < .001$.

Table 5

Changes in STABS Scales from Pre- to Post-Treatment

Scale	Treatment	Pre-Treatment	Post-Treatment	<i>t</i>	<i>d</i>
STABS-Total-21	Exposure	74.1 (13.5)	53.8 (13.7)	9.4*	1.49
	Waitlist	67.4 (15.4)	65.9 (18.2)	0.6	0.09
STABS-Social Comparison-21	Exposure	38.6 (6.4)	28.6 (7.1)	9.8*	1.48
	Waitlist	36.1 (6.8)	34.4 (8.1)	1.3	0.23
STABS-Social Ineptness-21	Exposure	35.5 (7.8)	25.2 (7.0)	8.4*	1.39
	Waitlist	31.3 (9.6)	31.5 (10.4)	-0.1	-0.02
STABS-Total-20	Exposure	70.4 (12.9)	51.3 (13.1)	9.2*	1.47
	Waitlist	63.9 (14.8)	62.3 (17.6)	0.7	0.10
STABS-Social Comparison-20	Exposure	35.0 (5.6)	26.1 (6.5)	9.4*	1.47
	Waitlist	32.6 (6.1)	30.8 (7.4)	1.7	0.26
STABS-Social Ineptness-20	Exposure	35.5 (7.8)	25.2 (7.0)	8.4*	1.39
	Waitlist	31.3 (9.6)	31.5 (10.4)	-0.1	-0.02

Note. *N* = 66. Pre-Treatment and Post-Treatment columns presented as mean (standard deviation). Exposure treatment condition was comprised of participants receiving either Social Effectiveness Therapy or exposure/flooding treatment. STABS = Social Thoughts and Beliefs Scale.

* *p* < .001.