ORIGINAL ARTICLE

Developing a Brief Version of the Social Thoughts and Beliefs Scale (STABS) Using Item Response Theory

Itamar Stein[1] · Maya Asher[1] · Shahaf Erez[1] · Tomer Shechner[1] · Sofi Marom[2] · Haggai Hermesh[2] · Idan M. Aderka[1]

Abstract

Cognitions play a central role in the maintenance of social anxiety disorder (SAD). The aim of the present study was to develop a brief version of the social thoughts and beliefs scale (STABS) that can be used in clinical trials and experience sampling studies in which multiple repeated measures (e.g., weekly or daily measurements) are utilized. Our sample ($n = 361$) included both individuals diagnosed with SAD ($n = 108$) and non-anxious controls ($n = 253$). We used item response theory analyses to examine items of the STABS and kept only items which differentiated between 4 levels of SAD-related cognitions between the 5th and 95th percentiles of scores. This strategy resulted in a brief, seven-item scale—the mini-STABS. We then compared the mini-STABS with the full-length, 21-item STABS, as well as examined convergent and divergent validity for the brief measure. Results indicated that the mini-STABS was highly correlated with the 21-item STABS, and demonstrated similar patterns of associations with convergent and divergent measures compared to the 21-item STABS. These findings suggest that the mini-STABS is a psychometrically sound brief version of the STABS that provides similar information using fewer items. Implications for assessment of SAD are discussed.

Keywords Social anxiety disorder (SAD) · Cognitions · Social thoughts and beliefs scale (STABS) · Item response theory (IRT)

Introduction

Cognitions play a central role in the maintenance of social anxiety disorder (SAD) according to extant models of the disorder (Clark and Wells 1995; Rapee and Heimberg 1997; Hofmann 2007). For instance, negative thoughts and beliefs about the self, about social situations and about the consequences of inadequate social behavior result in perceptions of social situations as dangerous and in subsequent anxiety (Clark and Wells 1995). Moreover, anticipatory and post-event processing (typically focused on negative cognitions) significantly contribute to the maintenance of the disorder (Clark and Wells 1995; Clark 2001). Finally, individuals with SAD have negative expectancies in social situations

(e.g., expectations of social mishaps) which are followed by negatively-focused rumination (Hofmann 2007).

Empirical findings provide ample support for the prominent role of cognitions in SAD. For instance, individuals with SAD view themselves as deficient or inferior in a wide range of attributes (e.g., Moscovitch et al. 2009), and engage in upward social comparisons (i.e., comparisons in which one is lacking compared to others; e.g., Antony et al. 2005). Moreover, they view others as more threatening and dominant (e.g., Aderka et al. 2013). Individuals high in social anxiety engage in anticipatory processing to a greater extent compared to individuals low in social anxiety (Hinrichsen and Clark 2003; Vassilopoulos 2004, 2008; Wong and Moulds 2011a), and the experimental manipulation of anticipatory processing can lead to higher self-reported anxiety and poorer performance among socially anxious individuals (Hinrichsen and Clark 2003; Vassilopoulos 2005; Wong and Moulds 2011b). Post-event processing has also been found to be common, to be negatively self-focused and perseverative, and to maintain the disorder (see Brozovich and Heimberg 2008 for a review). Finally, a number of studies have shown that changes in maladaptive cognitions mediate the outcome

✉ Idan M. Aderka
iaderka@psy.haifa.ac.il

1 Department of Psychology, University of Haifa, Mount Carmel, 31905 Haifa, Israel

2 Anxiety Disorders and Behavior Therapy Unit, Outpatient Department, Geha Mental Health Center, Petach-Tikva, Israel

of cognitive behavioral therapy (CBT) for SAD (Boden et al. 2012; Hofmann 2004). A study by Wilson and Rapee (2005), for example, has shown that cognitions about the self can predict SAD symptoms 3 months after treatment.

Taken together, theoretical models and empirical findings suggest that measurement of cognitions is extremely important in both assessment and treatment of SAD. Accordingly, a number of measures for SAD-related cognitions have been developed: The Multidimensional Assessment of Social Anxiety (MASA; Gros et al. 2012), The Core Extrusion Schema measure (CES; Rodebaugh 2009), The Self-Beliefs Related to Social Anxiety (SBSA; Wong et al. 2014), and the Social Thoughts and Beliefs Scale (STABS; Turner et al. 2003). Currently, the STABS has the most extensive empirical support, with examinations in both non-clinical and clinical samples by more than one research group (Fergus et al. 2009; Koerner et al. 2013; Turner et al. 2003).

The STABS was originally developed by examining a large sample of individuals diagnosed with SAD and individuals diagnosed with other anxiety disorders (Turner et al. 2003). As part of its development, 21 items were selected from an initial pool of 45 items using exploratory factor analysis. The 21-item STABS was found to have excellent internal consistency and discriminant validity, as well as good test–retest reliability within 1–4 weeks of the first administration (Turner et al. 2003). In addition, the STABS was found to have two subscales. The first scale, 'Social Comparison' (SC), represents thoughts that others are more socially adept or competent. The second scale, 'Social Ineptness' (SI), represents beliefs that one will behave in an inept manner in social situations. The STABS scales (i.e., the total scale and the two subscales, SC and SI) showed good internal consistency, with Cronbach's alphas of .96 for the total scale and .95 and .93 for the SC and SI subscales, respectively. In addition, the STABS scales exhibited good 2-week test–retest reliability of .94 for the total scale and .94 and .93 for the SC and SI subscales, respectively (Fergus et al. 2009).

Although the STABS has excellent psychometric properties and is well supported, it has one significant limitation: its 21 items make it a relatively long questionnaire, especially when administered repeatedly in longitudinal designs. Thus, weekly repeated administration of the STABS might place a significant burden on participants.

Over the last decade, researchers have invested more resources in shortening commonly used self-report measures and developing shorter measures which have adequate properties and can be used repeatedly in longitudinal designs. For instance, an ultra-brief three-item version of the social phobia inventory (SPIN) was recently developed to facilitate longitudinal assessment of SAD severity (Aderka et al. 2013). Similarly, the fear of negative evaluation scale (FNE) was shortened by Leary (1983) and the brief version

demonstrated superior psychometric properties compared to the full-length measure (Rodebaugh et al. 2004). Finally, the social phobia and anxiety inventory (SPAI) was modified based on item response theory analyses in which more than half of the items were removed (Roberson-Nay et al. 2007).

The goal of the present study was to develop a brief version of the STABS using item response theory (IRT) to reduce patient burden and facilitate the completion of the questionnaire in longitudinal designs (e.g., treatment studies conducting weekly measurements). We used a two-step approach comprised of an IRT analysis to identify items which best measure the latent factor of SAD-related cognitions, followed by an examination of the psychometric properties of the proposed brief measure. To ensure that the brief measure taps the entire continuum of SAD-related negative cognitions, we examined both clinical and non-clinical samples.

Method

Participants and Procedure

Participants in the non-anxious control (NAC) group ($n = 253$) were undergraduate students who received course credit for their participation in a number of experiments in the lab. As diagnostic assessments were not conducted for these individuals, participants with a score of 60 or more on the Liebowitz Social Anxiety Scale (LSAS) were excluded. This is because a score of 60 is highly predictive of a diagnosis of SAD (Rytwinski et al. 2009).

Participants in the SAD group ($n = 108$) were individuals who either sought treatment for SAD at a public mental health center that is affiliated with the University ($n = 60$) or attended experiments in the lab that included a structured diagnostic interview ($n = 48$).[1] Participants in both settings received a primary diagnosis of SAD according to DSM-IV-TR criteria (American Psychiatric Association 2000). Diagnoses were based on the Mini International Neuropsychiatric Interview (MINI; Sheehan et al. 1998) which was administered by experienced doctoral students trained in its administration.

Procedure

Participants in both groups signed an informed consent form, underwent the diagnostic interview and then completed self-report questionnaires measuring social anxiety

---

[1] No differences in clinical and demographic measures were found between participants with SAD from both settings.

symptoms (LSAS), depressive symptoms (BDI-II), maladaptive cognitions (STABS), and demographic data.

Measures

The Mini International Neuropsychiatric Interview version 5 (MINI; Sheehan et al. 1997; Sheehan et al. 1998). The MINI is a widely used structured interview assessing DSM-IV Axis I disorders. The interview is based on "yes" and "no" answers, and for each disorder, one or two screening questions rule out the diagnosis if answered negatively. The MINI has demonstrated good sensitivity (0.81) and specificity (0.86) for the diagnosis of SAD when compared to the Structured Clinical Interview for DSM (SCID; Sheehan et al. 1997). Inter-rater reliability for the diagnosis of SAD was 0.94 (Sheehan et al. 1997). We used the Hebrew version of the MINI (Shvartzman et al. 2005) and inter-rater agreement for this version was found to be high (Kappa = 0.92; Aderka et al. 2012).

The Social Thoughts and Beliefs Scale (STABS; Turner et al. 2003). The STABS is a 21 item self-report questionnaire, designed to assess maladaptive cognitions in individuals with SAD. Each item includes a belief which is rated using a 5-point Likert-type scale (1 = never characteristic, 2 = rarely characteristic, 3 = sometimes characteristic, 4 = often characteristic, and 5 = always characteristic). The STABS has excellent internal consistency (Cronbach's α = .96) and 2-week test–retest reliability ($r = 0.94$; Turner et al. 2003). STABS scores significantly differentiated between individuals with SAD, individuals with other anxiety disorders, and non-anxious individuals with individuals with SAD reporting significantly higher scores compared to both other groups (Turner et al. 2003). STABS scores also demonstrated high classification accuracy with 91.7% of individuals with SAD correctly classified and 83.3% of individuals without SAD correctly classified (Turner et al. 2003) versus no-SAD groups (Fergus et al. 2009). The STABS was found to be sensitive to cognitive behavior treatment for SAD and to predict its outcome (Koerner et al. 2013).

The STABS was also examined in a non-clinical sample (Fergus et al. 2009), and results supported the two-factor structure of the scale as well as indicated good convergent and divergent validity. Specifically, the STABS had high correlations with measures of SAD such as the Social Interaction Anxiety Scale (SIAS; $r = 0.78$), as well as moderate and significantly lower correlations with measures of general anxiety (DASS-Anxiety; $r = 0.40$). Finally, the STABS predicted interpersonal functioning (friendship quality and loneliness) above and beyond measures of SAD symptoms (Fergus et al. 2009).

We used a Hebrew version of the STABS in the present study and double-back-translation was performed to avoid

language bias. First, the STABS items were translated into Hebrew by the last author. The initial results were then forwarded to two independent translators for back translation. The first and last authors reviewed these back-translations and compared them with the original STABS. Any identified problems were rephrased in Hebrew and sent to another translator for a second back-translation. Finally, result of the back-translation of the affirmed Hebrew STABS was presented to an independent translator to confirm its equivalence with the original STABS.

The Liebowitz Social Anxiety Scale (LSAS; Liebowitz 1987). The LSAS assesses 24 situations (13 performance situations and 11 social interaction situations) that individuals with SAD typically fear or avoid, such as going to a party, meeting strangers, and speaking up at a meeting. For each situation, fear and avoidance are rated separately on a scale of 0–3. We used the self-report version (LSAS-SR) of the scale (Fresco et al. 2001). The LSAS-SR was found to have excellent internal consistency (Cronbach's α = .95) and test–retest reliability over a period of 12 weeks ($r = 0.83$; Baker et al. 2002). The LSAS-SR was found to be highly correlated with measures of SAD severity such as the Social Phobia Anxiety Inventory (SPAI; $r = 0.83$), moderately correlated with measures of depression such as the Beck Depression Inventory (BDI; $r = 0.48$) and sensitive to treatment change (Baker et al. 2002). The LSAS-SR was found to effectively screen for SAD and a cutoff of 60 had the best balance between sensitivity and specificity (correctly classifying 81.8% of individuals with SAD and 78.4% of individuals without the disorder). We used the validated Hebrew version of the LSAS-SR (Levin et al. 2002) in the present study.

The Beck Depression Inventory-II (BDI-II; Beck et al. 1996b). The BDI-II contains 21-items assessing cognitive, affective and behavioral depressive symptoms. The BDI-II is a widely used measure and has demonstrated excellent reliability and validity (Beck et al. 1996a) in both clinical (Sprinkle et al. 2002) and non-clinical samples (Storch et al. 2004; Whisman et al. 2000). Specifically, the BDI-II has been found to be highly correlated with depressive symptoms identified using the SCID ($r = 0.83$) and to significantly differentiate between individuals with and without a current depressive episode (Sprinkle et al. 2002). Test–retest of the BDI-II was high over a number of days (1–12 days; $r = 0.96$; Sprinkle et al. 2002) and correlations with measures of depression was also high ($r = 0.76$ for the depression factor of the STAI-T scale; Storch et al. 2004).

Analytic Strategy

The STABS is comprised of items with multiple response options (i.e., polytomous items), ordered from 1 (never

characteristic) to 5 (always characteristic). The resulting data are appropriate for analysis using Samejima's graded response model (Samejima 1969, 1996). This model examines the relationship between the latent trait measured (theta) and two types of item parameters: a discrimination or slope parameter (a) and several threshold parameters (b1, b2, b3…). The discrimination parameter is an index of how the response probability changes as the latent trait increases. Thus, greater scores indicate increased sensitivity to changes in the latent trait. The threshold parameters represent the response options in the item (i.e., 1, 2, 3, 4, 5) and indicate the level of the latent trait for which 50% of individuals endorse a certain response option or higher. Because 100% of the individuals endorse one or higher, there are only four thresholds for the responses > 1 in the STABS.

For example, a parameter of -0.5 for a score of 2 on the STABS would indicate that among individuals with levels of SAD-related cognitions 0.5 standard deviations below the mean, 50% endorse the response of 2 or higher (responses 2–5). Similarly, a parameter of 1.5 for option 4 would indicate that that among individuals with levels of SAD-related cognitions 1.5 standard deviations above the mean, 50% endorse the responses of 4 or 5.

Using the program MULTILOG 7 (Thissen 1991), we fitted the graded response model to the data using marginal maximum likelihood (MML) estimates (Bock and Aitkin 1981) to obtain item parameters. We used a nonparametric kernel smoothing method (Ramsay 1991) and TestGraf software (Ramsay 2000; see http://www.psych.mcgill.ca/faculty/ramsay/ramsay.html) to choose the best items from the mini-STABS. We examined the item characteristic curves, which visually present the probability of a given item response at each value of the latent trait (in our case—SAD-related cognitions). Items were identified as having good discrimination if the likelihood of choosing higher options (e.g., "never characteristic" vs. "always characteristic") increased systematically with increasing levels of SAD-related cognitions. Poor discrimination was identified when higher item options failed to be observed with higher likelihood than lower options despite increases in levels of SAD-related cognitions.

Ramsay's nonparametric approach maintains the normal distribution of the latent trait (i.e., SAD-related cognitions) while allowing variability in the item characteristic curves. This method is particularly useful when item characteristic curves change rapidly or if the relationship between response probabilities and level of SAD-related cognitions is not symmetric across varying levels of severity. This approach has been previously used to choose the best items from the social phobia and anxiety inventory (SPAI; Roberson-Nay et al. 2007) and the social phobia inventory (SPIN; Aderka

et al. 2013), two widely used self-report measures of social anxiety.

Based on previous studies (Aderka et al. 2013; Roberson-Nay et al. 2007), we sought items that can efficiently discriminate between four levels of the latent trait (SAD-related cognitions) within the 5th–95th percentile of scores. The 5th and 95th percentiles were chosen so that there were four levels of discrimination in the bulk of the distribution of the expected score range (Roberson-Nay et al. 2007). Items meeting this criterion were retained and comprised the mini-STABS.

After choosing the items that met our criterion, we combined them to form the mini-STABS and examined the psychometric properties of the revised version compared to the original STABS. Specifically, we examined convergent validity (using the LSAS), divergent validity (using the BDI-II), and internal consistency (using Cronbach's α).

Results

Sample Characteristics

The total sample included 361 individuals. Mean age was 25.25 ($SD = 3.75$), and 63.4% of the participants were women. LSAS mean score was 46.91 ($SD = 28.79$) and BDI mean score was 10.95 ($SD = 9.57$).

Group Differences

Table 1 presents descriptive statistics for all demographic and clinical variables for both groups. As expected when comparing clinical and non-clinical groups, participants in the SAD group reported more social anxiety symptoms [$F_{(1,359)} = 855.70$, $p < 0.001$, $\eta^2 = 0.70$] and depressive symptoms [$F_{(1,359)} = 79.46$, $p < 0.001$, $\eta^2 = 0.18$] compared to the control group. Participants in the SAD group were also slightly older ($M = 26.33$, $SD = 4.66$) compared to participants in the NAC group [$M = 24.79$, $SD = 3.20$; $F_{(1,359)} = 12.94$, $p < 0.01$, $\eta^2 = 0.04$]. No group differences were found in gender, first language and years of education (all $ps > 0.05$).

IRT Analysis

The discrimination and threshold parameters for all 21 STABS items appear in Table 2. Approximately half of the STABS items were able to discriminate in a balanced way across the range of SAD-related cognitions in the present sample. Specifically, 9 of the 21 items had two negative thresholds (i.e., b) values indicating 2 discrimination levels below the mean of SAD-related cognitions,

Table 1 Demographic and clinical measures

	SAD group ($n=108$)	NAC group ($n=253$)	Statistic	Effect size	p
Age[a]	26.33 (4.66)	24.79 (3.20)	$F_{(1, 359)}=12.94$	$\eta^2=0.04$	<0.01
Gender[b]					
Male	45 (42.1)	86 (34.0)	$\chi^2_{(1)}=2.1$	Cramer's V$=0.01$	0.15
Female	62 (57.9)	167 (66.0)			
First language[b]					
Hebrew	92 (85.2)	211 (83.4)	$\chi^2_{(1)}=0.20$	Cramer's V<0.01	0.90
Arabic	8 (7.4)	20 (7.9)			
Other	8 (7.4)	22 (8.7)			
Education (years)[a]	13.47 (2.23)	13.56 (1.47)	$F_{(1, 359)}=0.14$	$\eta^2=0.001$	<0.01
LSAS[a]	83.84 (16.65)	31.14 (15.24)	$F_{(1, 359)}=855.70$	$\eta^2=0.70$	<0.001
BDI[a]	17.06 (10.81)	8.22 (7.49)	$F_{(1, 359)}=79.46$	$\eta^2=0.18$	<0.001

SAD social anxiety disorder, *LSAS* Liebowitz Social Anxiety Scale, *BDI* beck depression inventory

[a]Values are means with standard deviations in parentheses

[b]Values are number of subjects with percentage in parentheses

Table 2 IRT Parameters for STABS items

Item	Discrimination parameter			Threshold parameters							
	A	SE	A/SE	B1	SE	B2	SE	B3	SE	B4	SE
1. I appear clumsy to other people	1.91	0.18	10.61	− 1.02	0.11	− 0.14	0.10	0.86	0.12	2.33	0.28
2. If I have an opinion, I am likely to chicken out[a]	2.06	0.19	10.84	− 1.27	0.11	− 0.22	0.10	0.83	0.11	1.67	0.18
3. I feel as if other people sound more intelligent than I do[a]	1.50	0.17	8.82	− 1.50	0.16	− 0.37	0.11	0.92	0.16	2.13	0.27
4. I am not good at standing up for myself	2.1	0.21	10.00	− 1.07	0.11	− 0.21	0.09	0.91	0.12	1.96	0.2
5. I am a coward when it comes to interacting with other people	3.45	0.31	11.12	− 0.76	0.07	0.00	0.08	0.71	0.08	1.53	0.12
6. I feel unattractive when I am with other people	2.18	0.21	10.38	− 0.81	0.1	0.00	0.09	0.72	0.10	1.69	0.16
7. I would never be able to make a speech in public	1.48	0.17	8.70	− 0.78	0.12	0.02	0.12	0.79	0.16	1.5	0.20
8. Other people are more comfortable than I am[a]	2.95	0.23	12.82	− 1.30	0.09	− 0.65	0.07	0.08	0.08	0.77	0.09
9. Other people are more socially capable than I am	3.02	0.39	7.74	− 1.20	0.09	− 0.46	0.07	0.10	0.07	0.89	0.10
10. I will always be uncomfortable in social situations[a]	3.48	0.30	11.60	− 0.56	0.07	0.08	0.08	0.74	0.08	1.45	0.12
11. My mind is very likely to go blank when I am talking[a]	2.33	0.23	10.13	− 0.88	0.08	0.12	0.09	0.95	0.11	1.62	0.15
12. I am not good at making small talk[a]	2.33	0.23	10.13	− 0.66	0.08	0.02	0.09	0.71	0.10	1.42	0.15
13. Other people are bored when they are around me	3.05	0.29	10.51	− 0.51	0.07	0.25	0.08	1.04	0.10	1.90	0.17
14. Others will think what I am saying is stupid	2.76	0.26	10.61	− 0.48	0.08	0.55	0.09	1.29	0.12	1.96	0.19
15. I am likely to get panicky or do something to embarrass myself	2.12	0.20	10.60	− 1.10	0.10	− 0.07	0.09	0.85	0.12	1.57	0.17
16. I do not know how to behave when with others	3.56	0.36	9.88	− 0.36	0.07	0.31	0.08	0.98	0.09	1.70	0.12
17. If something went wrong, I would not be able to smooth it over	2.51	0.24	10.45	− 0.73	0.09	0.30	0.09	1.13	0.12	2.11	0.23
18. Other people don't think I am very smart	1.92	0.21	9.14	− 0.36	0.10	0.79	0.13	1.59	0.18	2.28	0.26
19. When other people laugh it feels as if they are laughing at me	1.83	0.18	10.16	− 0.45	0.10	0.68	0.12	1.36	0.16	2.37	0.27
20. People can easily see when I am nervous[a]	1.39	0.15	9.26	− 2.01	0.21	− 0.75	0.12	0.41	0.14	1.57	0.23
21. If there is a pause, I feel as if I have done something wrong	2.01	0.20	10.05	− 0.95	0.10	− 0.03	0.09	0.81	0.12	1.57	0.18

[a]Items included in the mini-STABS

Table 3 Means and standard deviations for the mini-STABS

	SAD group ($n = 108$)	Control group ($n = 253$)
Total score	25.35 (5.73)	14.78 (4.95)
Item 2	3.57 (0.96)	2.09 (1.02)
Item 3	3.36 (1.16)	2.23 (1.01)
Item 8	4.23 (1.03)	2.50 (1.21)
Item 10	3.48 (1.23)	1.72 (0.97)
Item 11	3.42 (1.11)	1.81 (0.94)
Item 12	3.54 (1.26)	1.83 (1.06)
Item 20	3.75 (1.19)	2.59 (1.09)

and 2 discrimination levels above the mean of SAD-related cognitions. For instance, item number 1 ("I appear clumsy to other people") had a b1 value of − 1.02, indicating that for individuals with latent SAD-related cognition levels of − 1.02 standard deviations below the mean, 50% endorsed 2 or more.[2] The b2 value of − 0.14 indicates that for the individuals with latent SAD-related cognition levels of − 0.14 standard deviations below the mean, 50% endorsed responses of 3 or more. Similarly, the b3 value of 0.86 indicates that for the individuals with latent SAD-related cognition levels of 0.86 standard deviations above the mean, 50% endorsed responses of 4 or more, and the b4 value of 2.33 indicates that 50% of individuals with this level of latent SAD-related cognitions endorsed the response 5.

None of the STABS items were better able to discriminate in lower levels of SAD-related cognitions. Specifically, no items evinced 3 negative threshold values, that would indicate 3 discrimination levels of SAD-related cognitions below the mean. However, most items were better able to discriminate in higher levels of SAD-related cognitions. Specifically, 12 of the 21 items had three positive threshold (b) values, indicating 3 discrimination levels of SAD-related cognitions above the mean, and only 1 discrimination level below the mean.

The Mini-STABS

Inspection of the STABS items indicated that only items 2, 3, 8, 10, 11, 12 and 20 discriminated between four levels of SAD-related cognitions within the 5th–95th percentiles. Discrimination occurs when the probability function of a response cuts across the probability function of the following response. Thus, these items capture differences in latent

SAD-related cognitions to a greater extent compared to other items which demonstrate fewer levels of discrimination. Based on the guidelines of Aderka et al. (2013) and Roberson-Nay et al. (2007), we retained these items which formed the mini-STABS.

Properties of the Mini-STABS

The correlations between the mini-STABS items and the mini-STABS total score were 0.81 ($n = 361$, $p < 0.001$), 0.70 ($n = 361$, $p < 0.001$), 0.85 ($n = 361$, $p < 0.001$), 0.87 ($n = 361$, $p < 0.001$), 0.84 ($n = 361$, $p < 0.001$), 0.80 ($n = 361$, $p < 0.001$) and 0.66 ($n = 361$, $p < 0.001$) for items 2, 3, 8, 10, 11, 12 and 20 respectively. The intercorrelations among the mini-STABS items ranged from 0.38 to 0.72. Based on the total sample (both SAD and NAC groups), the mini-STABS had a mean of 17.94 ($SD = 7.10$). For items 2, 3, 8, 10, 11, 12 and 20 the means and standard deviations were 2.54 ($SD = 1.21$), 2.57 ($SD = 1.18$), 3.02 ($SD = 1.41$), 2.25 ($SD = 1.32$), 2.29 ($SD = 1.24$), 2.34 ($SD = 1.37$), 2.94 ($SD = 1.24$) respectively. Means and standard deviations for both groups separately appear in Table 3. The mini-STABS demonstrated good internal consistency (Cronbach's $\alpha = 0.90$).

Convergent Validity

To examine convergent validity, we examined correlations between the mini-STABS and the 21-item STABS as well as between the mini-STABS and the LSAS. The mini-STABS had a near-perfect correlation with the 21-item STABS ($r = 0.97$, $n = 361$, $p < 0.001$), and with each of the two STABS factors: Social Comparison ($r = 0.98$, $n = 361$, $p < 0.001$) and Social Ineptness ($r = 0.90$, $n = 361$, $p < 0.001$). This suggests that the mini-STABS and the 21-item STABS tap the same variance in SAD-related cognitions. Importantly, the mini-STABS and 21-item STABS were highly correlated even when examining both groups separately ($r = 0.95$, $n = 108$, $p < 0.001$; $r = 0.92$, $n = 253$, $p < 0.001$; for the SAD and NAC groups respectively).

The mini-STABS also had significant and very high correlations with the LSAS total score ($r = 0.81$, $n = 361$, $p < 0.001$). The correlation was almost identical to that found between the 21-item STABS and the LSAS ($r = 0.82$, $n = 361$, $p < 0.001$), and the difference between these correlations was found to be non-significant ($p > 0.05$) when applying Meng et al. (1992) criteria for comparing correlated correlation coefficients. This suggests that the mini-STABS has good convergent validity, and similar to that demonstrated by the 21-item STABS.

---

[2] Note that the parameter b1 corresponds to the response of 2. This is because 100% of participants respond 1 or more, thus obviating the need for a parameter for the response 1.

Divergent Validity

The BDI was used to establish divergent validity. The mini-STABS had a significant correlation with the BDI ($r = 0.55$, $n = 361$, $p < 0.001$), but this correlation was significantly smaller than the correlation with the LSAS ($z = 7.00$, $df = 358$, $p < 0.001$). A certain correlation with the BDI is expected as depression and anxiety overlap substantially. Importantly, the correlation of the mini-STABS and BDI in our sample was similar to that of the 21-item STABS and the BDI ($r = 0.57$, $n = 361$, $p < 0.001$), and was not significantly different from the mini-STABS-BDI correlation ($p > 0.05$). Thus, divergent validity is similar between the mini-STABS and 21-item STABS.

Discussion

The goal of the present study was to develop a brief version of the STABS in order to reduce participant load while maintaining psychometric properties. The procedure comprised two-steps. First, we used IRT to identify items which best measure the latent construct of SAD-related cognitions. Once these items were identified, we examined the psychometric properties of the brief measure and compared it to the 21-item version. We identified seven items (2, 3, 8, 10, 11, 12 and 20) which differentiated between four levels of SAD-related cognitions within the 5th and 95th percentiles of scores. These items were retained and comprised the mini-STABS. The mini-STABS had a near-perfect correlation with the 21-item STABS and its subscales, suggesting that the mini-STABS and the 21-item STABS tap the same variance in SAD-related cognitions. In addition, the mini-STABS had a very high correlation with symptoms of SAD as measured by the LSAS and a significantly lower correlation with symptoms of depression as measured by the BDI.

IRT Parameters of the STABS

All items of the STABS demonstrated differentiation between levels of SAD-related cognitions both above and below the mean. This is reflected by the b parameters which include both positive and negative values for each item. Twelve STABS items were able to differentiate between three levels of SAD-related cognitions above the mean and 1 below the mean (e.g., item 10: "I will always be uncomfortable in social situations"; item 11: "My mind is very likely to go blank when I am talking"). Thus, these items are more sensitive to changes in SAD-related cognitions at higher levels compared to lower levels. Nine STABS items were able to differentiate between two levels above the mean and two levels below the mean indicating comparable sensitivity

in higher and lower levels of SAD-related cognitions (e.g., item 20: "People can easily see when I am nervous"; item 8: "Other people are more comfortable than I am"). Finally, none of the STABS items were able to differentiate between three levels of SAD-related cognitions below the mean and one above the mean indicating that none of the items are more sensitive to changes in SAD-related cognitions at lower levels compared to higher levels. When taken together, these findings suggest that the STABS may be a better instrument to assess SAD-related cognitions at higher levels, or among clinical populations compared to lower levels or non-clinical populations.

Development of the Mini-STABS

Based on previous studies (e.g., Aderka et al. 2013; Roberson-Nay et al. 2007), we sought items that could efficiently discriminate between four levels of SAD-related cognitions within the 5th–95th percentile of scores. The items that met this criterion and comprised the mini-STABS were items 2 (If I have an opinion, I am likely to chicken out), 3 (I feel as if other people sound more intelligent than I do), 8 (Other people are more comfortable than I am), 10 (I will always be uncomfortable in social situations), 11 (My mind is very likely to go blank when I am talking), 12 (I am not good at making small talk), and 20 (People can easily see when I am nervous).

Although we identified the best items in terms of discrimination using IRT—a data-driven, bottom-up method—the resulting items are highly consistent with theoretical models of SAD and tap cognitions regarding both anxiety (items 11 and 20) and avoidance (item 2) as well as cognitions regarding the self (items 10 and 12), and others (items 3 and 8) which play a part in extant maintenance models of SAD (Clark and Wells 1995; Rapee and Heimberg 1997; Hofmann 2007).

Specifically, the mini-STABS includes items tapping negative cognitions about the self and its inferiority (I am not good at making small talk, I will always be uncomfortable in social situations) which are mirrored by items tapping cognitions about others and their superiority (I feel as if other people sound more intelligent than I do, Other people are more comfortable than I am). The remaining three items tap predictions about social situations. Specifically, item 2 describes the tendency individuals with SAD have to avoid expressing their opinions and thoughts in social contexts. Item 11 reflects a prediction that "my mind will go blank" when talking and this prediction is coupled by a prediction that others would "easily see I'm nervous". Tapping cognitions on the self, others and social situations addresses the main components of cognitive models (Clark and Wells 1995; Rapee and Heimberg 1997; Hofmann 2007).

Psychometric Properties of the Mini-STABS

The mini-STABS evidenced good psychometric properties, with the correlations among mini-STABS items ranging from 0.38 to 0.72. On the one hand, this range of correlations indicates that the items are related and do not represent completely independent constructs. On the other hand, the correlations are not too high (e.g., 0.8–0.9) which would indicate redundancy. Thus, these correlations may represent a case of multiple items tapping several facets of SAD-related cognitions.

The mini-STABS had a near-perfect correlation with the 21-item STABS and with its subscales. This suggests that the mini-STABS and the 21-item STABS tap the same variance in SAD-related cognitions. The ability to tap the same variance using only a third of the items has many advantages in terms of reducing participant burden and allowing repeated measurements of cognitions easily. This makes the mini-STABS ideal for use in treatment studies in which cognitions are monitored on a weekly basis (e.g., Stangier et al. 2011) or in experience sampling studies in which cognitions are measured daily (Hurlburt 1997; Myin-Germeys et al. 2009).

The significant and very high correlation between the mini-STABS and LSAS total score reflects the pivotal role of cognitions in SAD and provides support for the convergent validity of the measure. We expected some correlation between the mini-STABS and the BDI, as SAD and depression typically cooccur and are associated conditions. In addition, empirical findings have indicated that the 21-item STABS has shown moderate correlations with measures of depression (Fergus et al. 2009; Gros and Sarver 2014). Similarly, we found that the mini-STABS had a significant correlation with the BDI, but this correlation was significantly smaller than the correlation of the mini-STABS with the LSAS. Thus, the mini-STABS is related to depression severity but has significantly greater correlations with SAD measures.

Importantly, the mini-STABS and the 21-item STABS had similar correlations with both convergent and divergent measures suggesting that using the brief version does not detract from the psychometric properties of the full version.

Limitations and Conclusions

The present study had a number of limitations. First, we used a single measure to examine convergent validity and a single measure to examine divergent validity. Use of additional measures may provide further support for the mini-STABS and increase our understanding of patterns of association with variables of interest. Second, diagnostic criteria used in the present study were DSM-IV criteria rather than DSM-5 criteria. Thus, it is unclear whether results would generalize to individuals diagnosed using DSM-5 criteria. However, it is important to note that differences in SAD criteria between these versions of the DSM are relatively minor.

Despite these limitations, the present study included both a clinical group and a control group and used advanced statistical procedures to determine which STABS items may be superior in assessing SAD-related cognitions. While the results for the mini-STABS should be taken as preliminary, they are promising as they suggest the brief measure may tap the same variance as the 21-item version, while being significantly briefer and easier to administrate. This has implications for assessment of SAD-related cognitions in longitudinal designs, for example, in treatment trials and experience sampling studies.

Compliance with Ethical Standards

Appendix

Social Thoughts and Beliefs Scale

This is a list of common thoughts and beliefs. Using the scale below, rate how characteristic each of these statements is of your thinking when you are in a social situation or when you are anticipating a social situation.

Never Characteristic 1	Rarely Characteristic 2	Sometimes Characteristic 3	Often Characteristic 4	Always Characteristic 5

If I am with a group of people and I have an opinion, I am likely to chicken out and not say what I think 1 2 3 4 5

I feel as if other people sound more intelligent than I do 1 2 3 4 5

Other people are more comfortable in social situations than I am...................... 1 2 3 4 5

No matter what I do, I will always be uncomfortable in social situations……. 1 2 3 4 5

My mind is very likely to go blank when I am talking in a social situation...... 1 2 3 4 5

I am not good at making small talk 1 2 3 4 5

People can easily see when I am nervous 1 2 3 4 5

Note. Measure taken from Turner et al. (2003). Reprinted with permission.

References

Aderka, I. M., Haker, A., Marom, S., Hermesh, H., & Gilboa-Schechtman, E. (2013). Information-seeking bias in social anxiety disorder. *Journal of Abnormal Psychology, 122*(1), 7–12.

Aderka, I. M., Hofmann, S. G., Nickerson, A., Hermesh, H., Gilboa-Schechtman, E., & Marom, S. (2012). Functional impairment in social anxiety disorder. *Journal of Anxiety Disorders, 26*(3), 393–400.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders DSM-IV-TR* (4th ed.). Washington, DC: American Psychiatric Publication.

Antony, M. M., Rowa, K., Liss, A., Swallow, S. R., & Swinson, R. P. (2005). Social comparison processes in social phobia. *Behavior Therapy, 36*(1), 65–75.

Baker, S. L., Heinrichs, N., Kim, H. J., & Hofmann, S. G. (2002). The Liebowitz social anxiety scale as a self-report instrument: A preliminary psychometric analysis. *Behaviour Research and Therapy, 40*(6), 701–715.

Beck, A. T., Steer, R. A., Ball, R., & Ranieri, W. F. (1996a). Comparison of Beck depression inventories-I and-II in psychiatric outpatients. *Journal of Personality Assessment, 67*(3), 588–597.

Beck, A. T., Steer, R. A., & Brown, G. K. (1996b). *Beck depression inventory II manual*. San Antonio: The Psychological Corporation.

Bock, R. D., & Aitkin, M. (1981). Marginal maximum likelihood estimation of item parameters: Application of an EM algorithm. *Psychometrika, 46*(4), 443–459.

Boden, M. T., John, O. P., Goldin, P. R., Werner, K., Heimberg, R. G., & Gross, J. J. (2012). The role of maladaptive beliefs in cognitive-behavioral therapy: Evidence from social anxiety disorder. *Behaviour Research and Therapy, 50*(5), 287–291.

Brozovich, F., & Heimberg, R. G. (2008). An analysis of post-event processing in social anxiety disorder. *Clinical Psychology Review, 28*(6), 891–903.

Clark, D. M. (2001). A cognitive perspective on social phobia. In W. R. Crozier & L. E. Alden (Eds.), *The essential handbook of social anxiety for clinicians* (pp. 193–218). New York: John Wiley & Sons.

Clark, D. M., & Wells, A. (1995). A cognitive model of social phobia. In R. G. Heimberg, M. Liebowitz, D. A. Hope & F. R. Schneier (Eds.), *Social phobia: Diagnosis, assessment, and treatment* (pp. 69–93). New York: Guilford Press.

Fergus, T. A., Valentiner, D. P., Kim, H. S., & Stephenson, K. (2009). The social thoughts and beliefs scale: Psychometric properties and its relation with interpersonal functioning in a non-clinical sample. *Cognitive Therapy and Research, 33*(4), 425–431.

Fresco, D. M., Coles, M. E., Heimberg, R. G., Liebowitz, M. R., Hami, S., Stein, M. B., & Goetz, D. (2001). The Liebowitz social anxiety scale: A comparison of the psychometric properties of self-report and clinician-administered formats. *Psychological Medicine, 31*(06), 1025–1035.

Gros, D. F., & Sarver, N. W. (2014). 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. *Journal of Anxiety Disorders, 28*(3), 283–290.

Gros, D. F., Simms, L. J., Antony, M. M., & McCabe, R. E. (2012). Development and psychometric evaluation of the multidimensional assessment of social anxiety (MASA). *Journal of Clinical Psychology, 68*(4), 432–447.

Hinrichsen, H., & Clark, D. M. (2003). Anticipatory processing in social anxiety: Two pilot studies. *Journal of Behavior Therapy and Experimental Psychiatry, 34*(3), 205–218.

Hofmann, S. G. (2004). Cognitive mediation of treatment change in social phobia. *Journal of Consulting and Clinical Psychology, 72*(3), 392–399.

Hofmann, S. G. (2007). Cognitive factors that maintain social anxiety disorder: A comprehensive model and its treatment implications. *Cognitive Behavior Therapy, 36*(4), 193–209.

Hurlburt, R. T. (1997). Randomly sampling thinking in the natural environment. *Journal of Consulting and Clinical Psychology, 65*(6), 941–949.

Koerner, N., Antony, M. M., Young, L., & McCabe, R. E. (2013). Changes in beliefs about the social competence of self and others following group cognitive-behavioral treatment. *Cognitive Therapy and Research, 37*(2), 256–265.

Leary, M. (1983). A brief version of the fear of negative evaluation scale. *Personality and Social Psychology Bulletin, 9*(3), 371–375.

Levin, J. B., Marom, S., Gur, S., Wechter, D., & Hermesh, H. (2002). Psychometric properties and three proposed subscales of a self-report version of the Liebowitz Social Anxiety Scale translated into Hebrew. *Depression and Anxiety, 16*(4), 143–151.

Liebowitz, M. R. (1987). Social phobia. *Modern Problems of Pharmacopsychiatry, 22*, 141–173.

Meng, X., Rosenthal, R., & Rubin, D. B. (1992). Comparing correlated correlation coefficients. *Psychological Bulletin, 111*(1), 172–175.

Moscovitch, D. A., Orr, E., Rowa, K., Reimer, S. G., & Antony, M. M. (2009). In the absence of rose-colored glasses: Ratings of self-attributes and their differential certainty and importance across multiple dimensions in social phobia. *Behaviour Research and Therapy, 47*(1), 66–70.

Myin-Germeys, I., Oorschot, M., Collip, D., Lataster, J., Delespaul, P., & Van Os, J. (2009). Experience sampling research in psychopathology: Opening the black box of daily life. *Psychological Medicine, 39*(9), 1533–1547.

Ramsay, J. O. (1991). Kernel smoothing approaches to nonparametric item characteristic curve estimation. *Psychometrika, 56*(4), 611–630.

Ramsay, J. O. (2000). TestGraf: A program for the graphical analysis of multiple choice test and questionnaire data.

Rapee, R. M., & Heimberg, R. G. (1997). A cognitive-behavioral model of anxiety in social phobia. *Behaviour Research and Therapy, 35*(8), 741–756.

Roberson-Nay, R., Strong, D. R., Nay, W. T., Beidel, D. C., & Turner, S. M. (2007). Development of an abbreviated social phobia and anxiety inventory (SPAI) using item response theory: The SPAI-23. *Psychological Assessment, 19*(1), 133–145.

Rodebaugh, T. L. (2009). Hiding the self and social anxiety: The core extrusion schema measure. *Cognitive Therapy and Research, 33*(1), 90–109.

Rodebaugh, T. L., Woods, C. M., Thissen, D. M., Heimberg, R. G., Chambless, D. L., & Rapee, R. M. (2004). More information from fewer questions: The factor structure and item properties of the original and brief fear of negative evaluation scale. *Psychological Assessment, 16*(2), 169–181.

Rytwinski, N. K., Fresco, D. M., Heimberg, R. G., Coles, M. E., Liebowitz, M. R., Cissell, S., … Hofmann, S. G. (2009). Screening for social anxiety disorder with the self-report version of the Liebowitz Social Anxiety Scale. *Depression and Anxiety, 26*(1), 34–38.

Samejima, F. (1969). Estimation of latent ability using a response pattern of graded scores. Psychometrika monograph supplement.

Samejima, F. (1996). Evaluation of mathematical models for ordered polychotomous responses. *Behaviormetrika, 23*(1), 17–35.

Sheehan, D. V., Lecrubier, Y., Sheehan, K. H., Janavs, J., Weiller, E., Keskiner, A., … & Dunbar, G. C. (1997). The validity of the Mini International Neuropsychiatric Interview (MINI) according to the SCID-P and its reliability. *European Psychiatry, 12*(5), 232–241.

Sheehan, D., Lecrubier, Y., Sheehan, K. H., Sheehan, K., Amorim, P., Janavs, J., … Dunbar, G. (1998). Diagnostic psychiatric interview for DSM-IV and ICD-10. *Journal of Clinical Psychiatry, 59*, 22–33.

Shvartzman, P., Weiner, Z., Vardy, D., Friger, M., Sherf, M., & Biderman, A. (2005). Health services utilization by depressive patients identified by the MINI questionnaire in a primary care setting. *Scandinavian Journal of Primary Health Care, 23*(1), 18–25.

Sprinkle, S. D., Lurie, D., Insko, S. L., Atkinson, G., Jones, G. L., Logan, A. R., & Bissada, N. N. (2002). Criterion validity, severity cut scores, and test-retest reliability of the Beck depression inventory-II in a university counseling center sample. *Journal of Counseling Psychology, 49*(3), 381–385.

Stangier, U., Schramm, E., Heidenreich, T., Berger, M., & Clark, D. M. (2011). Cognitive therapy vs interpersonal psychotherapy in social anxiety disorder: A randomized controlled trial. *Archives of General Psychiatry, 68*(7), 692–700.

Storch, E. A., Roberti, J. W., & Roth, D. A. (2004). Factor structure, concurrent validity, and internal consistency of the Beck Depression Inventory—second edition in a sample of college students. *Depression and Anxiety, 19*(3), 187–189.

Thissen, D. (1991). *MULTILOG user's guide: Multiple, categorical item analysis and test scoring using item response theory*. Chicago: Scientific Software International.

Turner, S. M., Johnson, M. R., Beidel, D. C., Heiser, N. A., & Lydiard, R. B. (2003). The social thoughts and beliefs scale: A new inventory for assessing cognitions in social phobia. *Psychological Assessment, 15*(3), 384–391.

Vassilopoulos, S. P. (2004). Anticipatory processing in social anxiety. *Behavioral and Cognitive Psychotherapy, 32*(03), 303–311.

Vassilopoulos, S. P. (2005). Anticipatory processing plays a role in maintaining social anxiety. *Anxiety, Stress, and Coping, 18*(4), 321–332.

Vassilopoulos, S. P. (2008). Social anxiety and ruminative self-focus. *Journal of Anxiety Disorders, 22*(5), 860–867.

Whisman, M. A., Perez, J. E., & Ramel, W. (2000). Factor structure of the Beck depression inventory—second edition (BDI-II) in a student sample. *Journal of Clinical Psychology, 56*(4), 545–551.

Wilson, J. K., & Rapee, R. M. (2005). The interpretation of negative social events in social phobia: Changes during treatment and relationship to outcome. *Behaviour Research and Therapy, 43*(3), 373–389.

Wong, Q. J., & Moulds, M. L. (2011a). Impact of anticipatory processing versus distraction on multiple indices of anxiety in socially anxious individuals. *Behaviour Research and Therapy, 49*(10), 700–706.

Wong, Q. J., & Moulds, M. L. (2011b). A new measure of maladaptive self-beliefs in social anxiety: Psychometric properties in a non-clinical sample. *Journal of Psychopathology and Behavioral Assessent, 33*(2), 228–273.

Wong, Q. J., Moulds, M. L., & Rapee, R. M. (2014). Validation of the self-beliefs related to social anxiety scale: A replication and extension. *Assessment, 21*(3), 300–311.