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Dimensionality of somatic complaints: Factor structure and psychometric properties of the Self-Rating Anxiety Scale

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Abstract

Somatic complaints are often key features of anxiety pathology. Although most measures of anxiety symptoms capture somatic complaints to some degree, the Self-Rating Anxiety Scale (SAS) was developed primarily as a measure of somatic symptoms associated with anxiety responding. We evaluated the psychometric properties and factor structure of the SAS in two large undergraduate samples who completed the SAS and measures of anxiety and depression. Exploratory factor analysis revealed four lower-order SAS factors in both samples: (1) anxiety and panic; (2) vestibular sensations; (3) somatic control; and, (4) gastrointestinal/muscular sensations. The SAS demonstrated good reliability in both samples, and the correlations between the SAS factors and other anxiety

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variables provide supportive evidence for convergent validity, though evidence for discriminant validity was limited. The strengths and limitations of the SAS are offered as well as the implications of our findings for the nature and assessment of somatic complaints in anxiety disorders.

Keywords: Self-Rating Anxiety Scale; Factor analysis; Anxiety; Somatic complaints

Somatic symptoms are the leading cause of outpatient medical visits and also the predominant reason why patients with common mental disorders present in primary care (Kellner, 1990; Kroenke, 2003). Theoretical models suggest that somatic complaints may represent a core feature of anxiety pathology (e.g., Goldberg, 1996; Lang, 1971). Somatic complaints may manifest as cardiophobia, the repeated complaint of chest pain, heart palpitations, and other sensations related to having a heart attack (Eifert, 1992). The fear and catastrophic misinterpretations of somatic sensations may place individuals at risk for the development of anxiety-related conditions (Clark, 1986; Ehlers, 1991; Reiss & McNally, 1985), particularly panic disorder. Indeed, studies have demonstrated a strong, positive relationship between fear of bodily sensations and panic disorder (e.g., Apfledorf, Shear, Leon, & Portera, 1994; McNally & Lorenz, 1987) and patients with panic disorder also endorse more somatic anxiety symptoms than do controls (Hoehn-Saric, McLeod, Funderburk, & Kowalski, 2004).

Somatic complaints have also been implicated in other anxiety disorders (e.g., Koksal, Power, & Sharp, 1991). For instance, studies have shown a strong association between somatic symptoms and posttraumatic stress disorder (PTSD) independently of anxiety, depression, injury severity, and medical comorbidity (Van Ommeren et al., 2002; Zatzick, Russio, & Katson, 2003). Patients with generalized anxiety disorder (GAD) also score higher on somatic anxiety symptoms than controls (Hoehn-Saric et al., 2004) and studies have shown a unique relation between muscle tension and pathological worry observed in GAD (Joormann & Stober, 1999). Social phobia is also often accompanied by somatic symptoms, such as trembling, blushing, and sweating (Mersch, Hilderbrand, Lavy, Wessel, & Van Hout, 1992) as well as concerns that others will notice one's anxiety-related somatic symptoms (e.g., Taylor, Koch, & McNally, 1992). Hypochondriasis, the excessive worry about one's health, is yet another example of an anxiety problem in which somatic sensations are prominent (Abramowitz, Schwartz, & Whiteside, 2002; Taylor & Asmundson, 2004).

In recognition of the importance of somatic complaints in anxiety disorders, many self-report measures of anxiety incorporating items assessing somatic concerns have been developed. For example, many items of the Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988) inquire about numbness or tingling and wobbliness in the legs. The BAI was developed to better discriminate anxiety from depression, and as a result it consists primarily of somatic items.

However, the BAI has been criticized because its composition of somatic complaints may be specific to panic disorder rather than anxiety disorders in general (Cox, Cohen, Direnfeld, & Swinson, 1996). For example, Cox et al. (1996) found that among panickers, the BAI and Panic Attack Questionnaire (Norton, Dorward, & Cox, 1986) items loaded together onto the same factors, indicating that the panic patients completed the BAI as if it were a measure of panic symptoms. These authors argued that the BAI is too "panic-centric." Another concern is that the number of items incorporated to assess somatic complaints in other anxiety measures are often low, which may influence reliability (Koksal & Power, 1990; Maranell, 1974) and adequacy in capturing the potentially heterogeneous nature of somatic complaints.

Somatic symptoms found in anxiety disorders are manifested in many systems (e.g., Zung, 1971) including musculoskeletal (e.g., muscle tension, trembling), cardiovascular (e.g., palpitations, tachycardia), respiratory (e.g., constriction in chest, dyspnea), gastrointestinal (e.g., nausea, diarrhea), genitourinary (e.g., frequency of micturition, urgency), and skin (e.g., flushing, sweating). Thus, rather than being a one-dimensional construct, anxiety-related somatic complaints appear to consist of several factors (Liu, Clark, & Eaton, 1997; Taylor & Cox, 1998). For instance, Landy and Stern (1971) found that in a nonclinical population, somatic perceptions consist of four factors; cardiac response, sweating, vasoconstriction, and frequent urination. In a sample of patients with a clinical diagnosis of anxiety, depression, hysteria, or hypochondriasis, four factors corresponding to the head, chest, abdomen, and fatigue were identified (Mumford et al., 1991). Consideration of the dimensionality of somatic complaints may have important implications for our understanding of the etiology of anxiety disorders. Appeal to specific somatic complaints could also be useful in differentiating anxiety from depression. For example, it has been shown that the unclear boundaries between GAD and major depression may be reduced by emphasizing muscle tension and de-emphasizing concentration difficulties in the diagnosis of GAD (Joormann & Stober, 1999). Furthermore, if somatic complaints are truly multidimensional, relationships between global measures of somatic concerns and measures of specific anxiety symptoms may be misleading. For example, the relation between overall somatic concerns and response to CO_2 challenge may be less pronounced than the relation between the somatic concerns specific to the cardiovascular and respiratory systems and fearful responses to CO_2 (e.g., Schmidt, 1999).

In an attempt to provide necessary content coverage of a variety of somatic complaints associated with anxiety symptoms, Zung (1971) developed the 20-item Self-Rating Anxiety Scale (SAS). The initial psychometric evaluation of the measure revealed adequate split-half reliability ($r = .71$). A subsequent evaluation reported adequate internal consistency in normal ($\alpha = .69$) and outpatient samples ($\alpha = .81$; Jegede, 1977). Michelson and Mavissakalian (1983) also found good test–retest reliability in a clinical sample of

agoraphobics over a period ranging from 1 to 16 weeks (r's = .81 to .84). Despite some research on the psychometric properties of the SAS, to our knowledge no published study has evaluated its factor structure. The SAS may be a better instrument than existing anxiety measures for assessing the somatic symptoms of anxiety given its broader content sampling of such symptoms. The SAS may also have utility in studies specifically examining the negative impact (i.e., excessive health concerns) of somatic anxiety symptoms in anxiety disorders. However, this possibility cannot be adequately evaluated at present due to the limited research on the psychometric properties of the SAS. To address this limitation, we examined the factor structure and psychometric properties of the SAS in two large, nonclinical samples. We also provide an item-level analysis of the SAS. Consistent with the notion that somatic complaints may be multidimensional (e.g., Liu et al., 1997; Taylor & Cox, 1998), it was predicted that the SAS would yield replicable lower-order somatic factors that may load on a single higher-order factor. Finally, it was hypothesized that the SAS and its lower-order factors would demonstrate a pattern of theoretically consistent relationships with measures of anxiety and depression.

1. Study 1

1.1. Method

1.1.1. Participants

The sample consisted of 552 college students recruited from introductory psychology courses at University of North Carolina at Chapel Hill. The sample was 75.2% female with a mean age of 19.0. Four hundred and thirteen participants (74.8%) identified themselves as White/Caucasian, followed by 80 Black/African Americans (14.5%), 30 Asians or Pacific Islanders (5.4%), and 29 participants (5.3%) of other, multiple, or unreported ethnicities.

1.1.2. Measures

1.1.2.1. Self-Rating Anxiety Scale (SAS). The SAS (Zung, 1971) is a 20-item measure developed to assess the frequency of anxiety symptoms based on diagnostic conceptualizations. It consists primarily of somatic symptoms. The respondent indicates how often he or she has experienced each symptom on a 4-point Likert scale consisting of "none or a little of the time" (coded as 1), "some of the time" (coded as 2), "good part of the time" (coded as 3), and "most or all of the time" (coded as 4). Items 5, 9, 13, 17, and 19 are reversed scored and total scores on the SAS range from 0 to 80.

1.1.2.2. Agoraphobic Cognitions Questionnaire (ACQ). The ACQ (Chambless, Caputo, Bright, & Gallagher, 1984) measures frequency of 14 different fearful

cognitions associated with panic attacks and agoraphobia. The ACQ was constructed to measure the cognitive aspect of ''fear of fear.'' The ASC can generate two subscales reflecting loss of control and physical concerns. Chambless et al. (1984) reported that the ACQ has adequate test–retest reliability ($r = .86$) and internal consistency ($\alpha = .80$). The ACQ was included in the present study to assess the convergent validity of the SAS. Given its relevance to physical concerns, the ACQ was included in the present study to assess the convergent validity of the SAS.

1.1.2.3. Body Vigilance Scale (BVS). The BVS (Schmidt, Lerew, & Trakowski, 1997) measures the tendency to attend to or be vigilant to panic-related body sensations. Schmidt et al. conceptualized body vigilance as a natural consequence of learning to fear body sensations through the experience of unexpected panic attacks. The BVS has demonstrated good internal consistency ($\alpha = .82$) and adequate test–retest reliability (Schmidt et al., 1997). Given its emphases on bodily sensations, the BVS was also included in the present study to assess the convergent validity of the SAS.

1.1.2.4. Fear of Negative Evaluation Scale (FNE). The FNE (Watson & Friend, 1969) was used to measure participants' social anxiety. The FNE is a 30-item true/false scale that assesses expectation and distress related to negative evaluation from others. The scale has demonstrated good internal consistency ($\alpha = .94$ to .96) and test–retest reliability (Oei, Kenna, & Evans, 1991; Watson & Friend, 1969). The FNE was included in the present study to assess the discriminant validity of the SAS.

1.1.2.5. Center for Epidemiological Studies-Depression Scale (CES-D). The CES-D (Radloff, 1977) is a 20-item measure that assesses the frequency of depressive symptoms experienced during the past week. The CES-D has demonstrated good internal consistency in both general and clinical populations (α's = .85 and .90, respectively; Radloff, 1977) and correlates strongly with the Beck Depression Inventory ($r = .87$; Santor, Zuroff, Ramsay, Cervantes, & Palacios, 1995). The CES-D was also included in the present study to assess the discriminant validity of the SAS.

1.1.3. Procedure

Participants completed the psychometric assessment on a website created for the study and received course credit for their participation. Informed consent was obtained electronically via clicking a web link as proxy for signature. After completing the measures, participants' data was submitted electronically to a database that was read into a statistical software package (SPSS) for data analysis. Participants were informed that their responses would be kept confidential and that they were free to withdraw from the study at any time.

Table 1
Self-Rating Anxiety Scale: item means and standard deviations, obliquely rotated factor loadings, and communalities for the four-factor solution from Study 1

SAS item	*M*	S.D.	SAS factor				
			I	II	III	IV	h^2
1. I feel more nervous and anxious than usual	1.67	.66	**.80**	−.14	.08	−.01	.62
2. I feel afraid for no reason at all	1.25	.50	**.78**	.08	.05	−.16	.61
3. I get upset easily or feel panicky	1.61	.71	**.73**	.06	.15	−.01	.63
4. I feel like I'm falling apart and going to pieces	1.48	.68	**.51**	.25	.17	.00	.46
20. I have nightmares	1.43	.61	**.42**	.00	−.16	.25	.29
18. My face gets hot and blushes	1.68	.74	**.41**	−.07	−.10	.29	.30
10. I can feel my heart beating fast	1.44	.60	**.40**	**.34**	−.01	.03	.36
12. I have fainting spells or feel like it	1.11	.36	−.08	**.81**	−.06	.02	.62
11. I am bothered by dizzy spells	1.20	.47	−.07	**.76**	−.08	.12	.64
6. My arms and legs shake and tremble	1.15	.44	.17	**.53**	.13	−.01	.42
14. I get feelings of numbness and tingling in my fingers and toes	1.22	.50	.00	**.35**	.17	.10	.21
17. My hands are usually dry and warm	2.64	1.07	−.09	.06	**.66**	−.02	.43
19. I fall asleep easily and get a good night's rest	2.35	.92	.03	−.08	**.62**	.23	.47
9. I feel calm and can sit still easily	2.22	.92	.13	−.20	**.60**	.21	.48
5. I feel that everything is all right and nothing bad will happen	2.42	.87	.22	.00	**.57**	−.06	.41
13. I can breathe in and out easily	1.55	.91	−.02	.20	**.51**	−.09	.33
15. I am bothered by stomachaches or indigestion	1.54	.74	.01	.13	.01	**.69**	.55
16. I have to empty my bladder often	1.78	.84	−.07	−.08	.05	**.61**	.35
8. I feel weak and get tired easily	1.66	.76	.11	.20	.09	**.55**	.48
7. I am bothered by headaches neck and back pain	1.70	.84	.02	.27	.05	**.51**	.41
% Variance of rotated factors			24.63	7.80	6.83	6.07	

Note. Factor loadings ≥|.30| are listed in boldface type. The first five eigenvalues were 4.92, 1.56, 1.36, 1.21, and 1.06.

1.2. Results

1.2.1. Reliability and item-level analyses

The mean SAS total score was 33.09 (S.D. = 6.88). SAS total scores for women ($M = 33.95$, S.D. = 6.97) were higher than those for men ($M = 30.47$, S.D. = 5.89), $t(550) = 5.25$, $P < .01$. Given that the scale consisted of 20 items, these mean SAS total scores indicate that participants tended to indicate between "None or a little of the time" or "Some of the time" agreement with the scale items. Means and standard deviations for the SAS items are presented in Table 1. Mean scores on 16 out of 20 items were below 2.0 (i.e., "Some of the time" agreement with the item), suggesting that the content of most SAS items was generally outside of the experience of most participants. The SAS demonstrated adequate internal consistency ($\alpha = .81$). Based on the criterion of .30 as an acceptable corrected item-total correlation (Nunnally & Bernstein, 1994), all 20 items performed adequately (range: .34 to .65).

1.2.2. Factor structure of the SAS

To our knowledge, no published study has reported on the factor structure of the SAS. Accordingly, we elected to use exploratory factor analysis in the first study. We chose principal components analysis (PCA) as the primary method because factor scores from principal-axis factor analysis (PAF) are indeterminate (Schönemann & Wang, 1972). Factors were rotated using an oblique (Oblimin) transformation in both cases because we expected the lower-order factors to show low-to-moderate intercorrelations. The number of factors to retain was determined by parallel analysis, a statistical procedure for determining the break in the scree plot (Horn, 1965). This method is one of the most accurate techniques for determining the number of factors to retain across varying sample conditions (Zwick & Velicer, 1986). Based on the recommendations of Longman, Cota, Holden, and Fekken (1989), parallel analyses were conducted twice, once using the mean eigenvalues and once using the 95th percentile eigenvalues.

Although five factors had eigenvalues greater than 1.0, parallel analysis indicated a four-factor solution for both the mean and 95th percentile eigenvalues. Accordingly, four factors were extracted. Table 1 displays the eigenvalues, pattern matrices (loadings), communalities, and percentage of variance for the four rotated factors. The four-factor solution accounted for 45.3% of the item variance. The magnitude of the communalities suggests that the factors accounted for a moderately large portion of the variance in most items. Table 1 also shows that the first factor accounted for a substantial portion of the variance in SAS item scores (24.6%), whereas the remaining three factors explained smaller portions of the item variance (between 7.8 and 5.3% each).

Factor I had seven items with salient ($\geq$.30) loadings and assessed complaints related to anxiety and panic (e.g., ''I get upset and panicky''). Accordingly, this factor was labeled ''anxiety and panic.'' Factor II had five items with salient loadings and was labeled ''vestibular sensations.'' Factor III also contained five items with salient loadings and assessed adaptive somatic functioning and the perception of calm (e.g., ''I can breathe in and out easily''). Accordingly, this factor was labeled ''somatic control.'' The fourth factor consisted of four items with salient loadings. Most items on Factor IV pertained to gastrointestinal (e.g., ''I am bothered by stomachaches or indigestion'') and muscular complaints (e.g., ''I am bothered by headaches, neck and back pains''). Accordingly, Factor IV was labeled ''gastrointestinal/muscular sensations.''

Adequacy of the four-factor solution was examined through consideration of simple structure (Thurstone, 1947), the criteria for stability suggested by Guadagnoli and Velicer (1988), and by examining the internal consistency of each factor. As shown by the pattern matrices in Table 1, the four-factor solution appears to have adequate simple structure. Each factor consisted of an adequate number of items with salient loadings (4–6) and PCA resulted in only item 10 (''I can feel my heart beating fast'') presenting as a complex item (i.e., items with salient loadings, $>$0.30, on more than one factor). However, item 10's second highest loading was not higher than .40, suggesting that no items on the SAS were

salient markers for more than one factor. Guadagnoli and Velicer (1988) recommended that to be considered stable, factors should have (a) four or more loadings above .60, (b) 10 or more items with loadings above .40 and a sample size greater than 150, or (c) a sample size of greater than 300 for factors with only a few loadings. Based on criterion C, the four factors appear to be stable.

1.2.3. The higher-order structure of the SAS

The higher-order factor structure of the SAS was examined by conducting a PCA on the four obliquely rotated factor scores obtained (e.g., Taylor & Cox, 1998). The eigenvalues were 1.69, 0.88, 0.77, and 0.64, and thus a single higher-order factor was extracted. The higher-order factor accounted for 42.3% of the variance, and each lower-order factor loaded greater than .59 on this factor. Thus, the results appear to support a hierarchical solution for the SAS in which the four lower-order factors load on a single higher-order arousal factor.

1.2.4. Correlates of the SAS and its factors

Table 2 presents correlations between the SAS, the lower-order SAS factors, and the ACQ, BVS, FNE, and CES-D. The SAS lower-order factors were strongly correlated with SAS total scores (range: .60 to .81). The SAS "anxiety and panic" factor was most strongly associated with the remaining three factors (range: .42 to .46), while other comparisons between SAS factors yielded low-to-moderate correlations. SAS total scores were moderately to highly correlated with measures of fearful cognitions, body vigilance, negative evaluation, and depression (range: .40 to .64). SAS total scores were most strongly associated with the CES-D, a measure of depression ($r = .64$, $P < .001$). Excluding depression, the SAS "anxiety and panic" factor was more strongly associated with panic and agoraphobic-related

Table 2
Pearson correlations between the Self-Rating Anxiety Scale factors and related measures from Study 1

Scale	SAS total score	SAS factor scores				Mean	S.D.
		I	II	III	IV		
SAS total score	–					33.09	6.88
SAS Factor I	.81	–				10.55	2.88
SAS Factor II	.60	.42	–			4.67	1.25
SAS Factor III	.75	.40	.29	–		11.17	2.96
SAS Factor IV	.71	.46	.39	.32	–	6.67	2.15
ACQ	.45	.47	.25	.28	.29	22.82	6.32
BVS	.40	.34	.29	.29	.28	22.14	20.44
FNE	.42	.45	.16	.31	.24	13.99	7.90
CES-D	.64	.59	.31	.49	.40	14.83	9.71

Note. All *r*'s are significant, $P < .001$. SAS factor labels assigned in the present study: Factor I: anxiety and panic; Factor II: vestibular sensations; Factor III: somatic control; Factor IV: gastrointestinal/muscular sensations. ACQ: Agoraphobic Cognitions Questionnaire; BVS: Body Vigilance Scale; FNE: Fear of Negative Evaluation Scale; and CES-D: Center for Epidemiological Studies-Depression Scale.

cognitions (ACQ) than the other factors. The SAS "vestibular sensations" factor was more related to tendency to attend to panic and agoraphobic-related cognitions and panic-related body sensations (BVS) than the fear of negative evaluation. The "somatic control" and "gastrointestinal/muscular sensations" factors appear to have low-to-moderate correlations with each criterion variable at about the same strength. Means and standard deviations (S.D.) of the SAS lower-order factors and measures of anxiety and depression are also listed in Table 2.

1.3. Discussion

Findings from Study 1 suggest that the SAS is composed of four lower-order factors assessing: (1) anxiety and panic; (2) vestibular sensations; (3) somatic control; and (4) gastrointestinal/muscular sensations. The four lower-order SAS factors also appear to load on a single higher-order arousal factor. The four factors were generally stable and demonstrated significant correlations with theoretically related variables. The four lower-order SAS factors were also generally more strongly associated with the CES-D, a measure of depression (range: .31 to .59). However, the SAS total score demonstrated the most robust correlation with the other scales suggesting that the factors may be less potent by themselves. The SAS factor structure obtained in Study 1 has important implications for the validity and utility of the SAS in nonclinical samples. However, given that this is the first study to report on the factor structure of the SAS, replication of these findings in an independent sample would bolster confidence in their reliability. Accordingly, we elected to repeat our examination of the SAS in a second sample.

2. Study 2

2.1. Method

The study questionnaires were administered to a second sample of undergraduate students recruited from introductory psychology courses at University of North Carolina at Chapel Hill. This sample consisted of 443 participants, including 332 women (74.9%), with a mean age of 19.0. The sample was 77% White/Caucasian ($n = 341$), followed by 56 Black/African Americans (12.6), 21 Asians or Pacific Islanders (4.7%), and 25 participants (5.6%) of other, multiple, or unreported ethnicities. The measures and procedures were identical to those used in Study 1.

2.2. Results

2.2.1. Reliability and item-level analyses

The mean SAS total score was 32.66 (S.D. = 6.86). SAS total scores for women ($M = 33.23$, S.D. = 7.24) were higher than those for men ($M = 30.97$,

Table 3
Self-Rating Anxiety Scale: item means and standard deviations, obliquely rotated factor loadings, and communalities for the four-factor solution from Study 2

SAS item	*M*	S.D.	SAS factor				
			I	II	III	IV	h^2
2. I feel afraid for no reason at all	1.23	.69	**.76**	.05	.04	.06	.58
3. I get upset easily or feel panicky	1.58	.71	**.71**	.08	.04	.02	.53
1. I feel more nervous and anxious than usual	1.64	.69	**.70**	.17	.10	.09	.57
4. I feel like I'm falling apart and going to pieces	1.38	.61	**.58**	.06	.06	−.08	.42
18. My face gets hot and blushes	1.56	.71	**.54**	.15	−.07	−.11	.31
9. I feel calm and can sit still easily	2.17	.98	.14	**.69**	−.07	−.16	.57
5. I feel that everything is all right and nothing bad will happen	2.44	.88	.23	**.61**	.02	.20	.44
17. My hands are usually dry and warm	2.64	1.08	−.04	**.60**	.03	.01	.36
13. I can breathe in and out easily	1.44	.85	−.10	**.60**	.12	−.04	.40
19. I fall asleep easily and get a good night's rest	2.28	.94	−.03	**.54**	−.08	**−.34**	.42
12. I have fainting spells or feel like it	1.12	.40	−.08	.05	**.82**	.18	.62
11. I am bothered by dizzy spells	1.21	.49	−.08	.03	**.79**	−.10	.66
10. I can feel my heart beating fast	1.47	.64	.18	−.06	**.59**	−.05	.46
14. I get feelings of numbness and tingling in my fingers and toes	1.28	.54	.07	−.02	**.42**	−.14	.25
6. My arms and legs shake and tremble	1.15	.41	.18	.01	**.33**	−.23	.30
7. I am bothered by headaches neck and back pain	1.73	.83	−.13	.01	.07	**−.76**	.56
8. I feel weak and get tired easily	1.63	.81	.03	.07	.11	**−.71**	.60
15. I am bothered by stomachaches or indigestion	1.54	.74	.18	.09	.11	**−.46**	.36
20. I have nightmares	1.41	.59	.08	.15	−.01	**−.44**	.27
16. I have to empty my bladder often	1.77	.88	.27	−.11	.01	**−.30**	.21
% Variance of rotated factors		23.69	7.98	7.04	6.11		

Note. Factor loadings $\geq|.30|$ are listed in boldface type. The first five eigenvalues were 4.74, 1.59, 1.40, 1.22, and 1.11.

S.D. = 5.22), $t(441) = 3.03$, $P < .01$. Given that the scale consisted of 20 items, these mean SAS total scores indicate that participants in the second study also tended to indicate between "None or a little of the time" or "Some of the time" agreement with the scale items. Means and standard deviations for the SAS items are presented in Table 3. Mean scores on 16 out of 20 items were below 2.0 (i.e., "Some of the time" agreement with the item), suggesting that the content of most SAS items was generally outside of the experience of most participants. The SAS demonstrated adequate internal consistency ($\alpha = .81$). Based on the criterion of .30 as an acceptable corrected item-total correlation (Nunnally & Bernstein, 1994), all 20 items performed adequately (range: .34 to .59).

2.2.2. *Factor structure of the SAS*

Exploratory factor analysis was used to reexamine the factor structure of the SAS. Although confirmatory factor analysis (CFA) is sometimes used in similar situations, an exploratory approach appears to be a more appropriate analytic

strategy as only our Study 1 has investigated the factor structure of the SAS to date. Thus, additional exploratory research on the SAS's factor structure is needed before researchers attempt to confirm its latent structure. As in Study 1, the lower-order factor structure of the SAS was examined using PCA with Oblimin rotation. Parallel analysis indicated a four-factor solution for the mean and 95th percentile eigenvalues. However, a three-factor solution was indicated for the 95th percentile eigenvalues. This somewhat discrepant finding is likely due to the smaller *N* in the second sample. We specified a three-factor solution but the resulting structure did not yield an interpretable pattern of item-factor loadings or sufficient stability. Accordingly, for purposes of interpretability and consistency with our Study 1 we elected to extract four factors.

Table 3 displays the item means and standard deviations, factor loadings, and communalities for the four-factor SAS solution from Study 2. As can be seen, these results are highly comparable with those from Study 1 (see Table 1). The solution accounted for 44.8% of the SAS item variance. Consistent with Study 1, the pattern of loadings in Table 3 suggests the following factor labels: ''anxiety and panic'' (Factor I, five items), ''somatic control'' (Factor II, five items), ''vestibular sensations'' (Factor III, five items), and ''gastrointestinal/muscular sensations'' (Factor IV, five items).

2.2.3. *Replicability of the four-factor SAS solution*

To examine the replicability of the four-factor SAS solution, coefficients of congruence (Gorsuch, 1983) were computed between the factor loadings from PCA in the present study and those reported in Study 1. These data are presented in Table 4. The first factor from the present study, labeled ''anxiety and panic,'' was highly comparable with the ''anxiety and panic'' factor from Study 1 (coefficient of congruence = .92). The second factor from the present study, labeled ''somatic control,'' was most similar to Factor III, ''somatic control'' from Study 1 (coefficient of congruence = .93). The third factor from the present study,

Table 4
Coefficients of congruence between Self-Rated Anxiety Scale (SAS) factors from Study 1 and Study 2

Factor from Study 1	Factor from Study 2			
	I	II	III	IV
I	**.92**	.19	.19	.13
II	.04	.03	**.93**	.24
III	.18	**.93**	.03	.16
IV	.14	.07	.15	**.87**

Note. Coefficients between SAS Factor IV from Study 2 and other variables, although negative in sign, reflect positive relationships; these are reported here as positive correlations for ease of interpretability. Coefficients of congruence (Gorsuch, 1983) were derived using loadings from the factor pattern matrix. SAS factor labels assigned in Study I: Factor I: anxiety and panic; Factor II: vestibular sensations; Factor III: somatic control; and Factor IV: gastrointestinal/muscular sensations. Corresponding factors in Study 2 are listed in boldface type.

labeled ''vestibular sensations,'' was most similar to Factor II ''vestibular sensations'' from Study 1 (coefficient of congruence = .93). The fourth factor from the present study, labeled ''gastrointestinal/muscular sensations,'' was most similar to the ''gastrointestinal/muscular sensations'' factor from Study 1 (coefficient of congruence = .87). Coefficients of congruence between non-corresponding factors were uniformly weak (range: .03 to .24).

2.2.4. Reexamination of the higher-order SAS structure

To reexamine the hierarchical structure of the SAS factor scores on the four lower-order factors obtained in the initial analysis were factor analyzed using PCA. A single factor was extracted in PCA (eigenvalues = 1.76, 0.88, 0.71, and 0.64) that accounted for 43.6% of the variance. This replicates the findings of Study 1 that suggests that the four lower-order SAS factors appear to load on a single higher-order arousal factor.

2.2.5. Correlates of the SAS and its factors

Table 5 presents correlations between the SAS, the lower-order SAS factors, and the ACQ, BVS, FNE, and CES-D. The SAS lower-order factors were strongly correlated with SAS total scores (range: .67 to .76). The SAS ''anxiety and panic'' factor was most strongly associated with the vestibular sensations and the gastrointestinal/muscular sensations factor (r's = .41 and .44, respectively), while the somatic control factor was most strongly associated with the gastrointestinal/muscular sensations factor (r = .34). Though highly correlated with measures of fearful cognitions, body vigilance, and negative evaluation (range: .42 to .49), the SAS total scores were most strongly associated with depression (r = .61,

Table 5
Pearson correlations between the Self-Rating Anxiety Scale factors and related measures from Study 2

Scale	SAS total score	SAS factor scores				Mean	S.D.
		I	II	III	IV		
SAS total score	–					32.66	6.86
SAS Factor I	.72	–				7.39	2.24
SAS Factor II	.74	.30	–			10.97	3.05
SAS Factor III	.67	.41	.31	–		6.21	1.64
SAS Factor IV	.76	.44	.34	.45	–	8.07	2.44
ACQ	.49	.48	.28	.33	.34	22.46	6.03
BVS	.40	.30	.25	.33	.31	21.38	19.22
FNE	.42	.43	.33	.19	.23	13.96	7.90
CES-D	.61	.57	.42	.35	.43	14.54	9.82

Note. All r's are significant, $P < .001$. SAS factor labels assigned in the present study: Factor I: anxiety and panic; Factor II: somatic control; Factor III: vestibular sensations; Factor IV: gastrointestinal/muscular sensations. ACQ: Agoraphobic Cognitions Questionnaire; BVS: Body Vigilance Scale; FNE: Fear of Negative Evaluation Scale; CES-D: Center for Epidemiological Studies-Depression Scale.

$P < .001$) when calculating the difference between independent correlation coefficients. Of the measures of anxiety, the SAS ''anxiety and panic'' factor was more strongly associated with panic and agoraphobic-related cognitions (ACQ) than the other factors. The SAS ''vestibular sensations'' and ''gastrointestinal/muscular sensations'' factors was more related to tendency to attend to panic and agoraphobic-related cognitions and panic-related body sensations (BVS) than the fear of negative evaluation. The ''somatic control'' factor appears to be low-to-moderately correlated with each criterion variable at about the same strength. Means and standard deviations (S.D.) of the SAS lower-order factors and measures of anxiety and depression are also listed in Table 5.

2.3. Discussion

The findings from Study 2 suggest that the SAS is composed of four lower-order factors assessing: (1) anxiety and panic; (2) somatic control; (3) vestibular sensations; and (4) gastrointestinal/muscular sensations. These factors were generally stable, and demonstrated significant correlations with theoretically related variables. Consistent with Study 1, the four lower-order SAS factors appear to load on a single higher-order arousal factor. The four lower-order SAS factors were also generally more strongly associated with the CES-D, a measure of depression (range: .35 to .57).

3. General discussion

The present study represents the first factor analytic study of the SAS. We evaluated the factor structure and psychometric properties of this self-report instrument in two large, independent nonclinical samples. Studies 1 and 2 converged to indicate that the SAS is internally consistent, with all items correlating moderately to highly with the total score. In accord with previous findings (e.g., Silverstein, 2002), significant gender differences were detected in both studies on SAS total scores such that females reported more somatic complaints than males (females also reported more somatic complaints than males on each of the four factors in Study 1 and Study 2, P's $< .05$). Item analysis revealed that participants tended to endorse either ''None or a little of the time'' or ''Some of the time'' agreement with the vast majority of SAS items. These findings suggest that the somatic complaints as assessed by the SAS items are relatively far removed from the experience of most nonclinical participants. Thus, it is possible that the SAS is not an optimal measure of somatic complaints in nonclinical populations. Item analysis revealed that items assessing somatic sensations related to musculoskeletal (i.e., ''My arms and legs shake and tremble'') and respiratory (i.e., ''I have fainting spells or feel like it'') systems were endorsed less highly than were other items. Limited variability in these items would call into question the generalizability of the results to clinical populations.

However, future research may help determine if musculoskeletal and respiratory complaints are less normative and are more evident in specific anxiety disorders (i.e., GAD, panic disorder).

Prior research on the fear and experience of somatic complaints suggests that somatic concerns are multidimensional in nature. For instance, factor analytic studies have found fear of somatic sensations consisting of three factors; fear of arousal-related symptoms, fear of gastrointestinal symptoms, and fear of cardiac symptoms (e.g., Olatunji et al., 2005). Furthermore, Liu et al. (1997) found a strong primary factor of somatic experiences consisting of gastrointestinal complaints, pain, and throat problems and a second factor consisted of cardiopulmonary symptoms and pain in the extremities. The four symptom categories (gastrointestinal and cardiopulmonary complaints, throat problems, and pain) also loaded strongly on the unrotated first factor. Similarly, results from a series of exploratory factor analyses in the present study revealed that the SAS consists of four lower-order factors, all of which load on a single higher-order factor. These lower-order factors were assigned the following labels: (1) ''anxiety and panic''; (2) ''vestibular sensations''; (3) ''somatic control''; and (4) ''gastrointestinal/muscular sensations.'' These results converge with prior findings suggesting that somatic complaints are multidimensional and that they may be hierarchically organized.

Although, each of the four lower-order factors were generally stable, factor analysis did yield one complex item (i.e., an item with salient loadings on more than one factor) in Study 1 (item 10) and one complex item in Study 2 (item 19). In addition, we found two instances in which items had primary loadings on different factors in Study 1 and Study 2. For example, in Study 1, item 10 (''I can feel my heart beating fast'') loaded primarily on the anxiety and panic factor (Factor 1), whereas it loaded primarily on the vestibular sensations factor (Factor III) in Study 2. In Study 1, item 20 (''I have nightmares'') loaded primarily on the anxiety and panic factor (Factor 1), whereas it loaded primarily on the gastrointestinal/muscular sensations factor (Factor IV) in Study 2. Although item 10 does appear to have a face valid rationale for loading on either the anxiety and panic factor or the vestibular sensations factor, future research appears warranted to examine the somatic distinctiveness of complaints of nightmares.

An interesting factor that emerged consistently in the present study was ''somatic control'' (''I can breathe in and out easily''). Prior studies have shown that control is associated with lower levels of physical and psychological symptoms of stress (e.g., Spector, 1986) and more recent findings have shown that limited control is significantly associated with somatic complaints (e.g., Gebhardt & Brosschot, 2002). The present findings appear to converge with prior research emphasizing the importance of control or perceived control in the phenomenology of somatic complaints (as indicated in the methods section, the items for the ''somatic control'' factor is reversed scored. Thus, the scores on this factor are actually negatively correlated with the other scales in Tables 2 and 5).

An important goal of the present study was to attempt to replicate the SAS factor structure. Coefficients of congruence (Gorsuch, 1983) indicated that the SAS factors were highly replicable across both studies. Specifically, the ''anxiety and panic'' factor reported in Study 1 was most congruent with the ''anxiety and panic'' factor reported in Study 2. The ''vestibular sensations'' factor reported in Study 1 was also most congruent with the ''vestibular sensations'' factor reported in Study 2. A similar pattern of congruence between Study 1 and Study 2 was found for the ''somatic control'' and ''gastrointestinal/muscular sensations'' factors (see Table 4). Importantly, the factors displayed very little congruence with other factors. Results from these analyses support the replicability and distinctiveness of SAS factors and suggest that researchers using the SAS in nonclinical samples are likely to obtain similar results.

In the present study, the SAS demonstrated adequate convergent validity. Specifically, the SAS and its factors were significantly correlated with measures of anxiety. However, there was evidence of limited divergent validity as the SAS and its factors appear to be low-to-moderately correlated with measures of panic and agoraphobic cognitions, body vigilance, and the fear of negative evaluation at about the same strength. The SAS and its factors also displayed statistically significant correlations with depression, thus further questioning its divergent validity.[1] The relation between the SAS and its factors and depression may be expected given that prior research suggests that somatic symptoms (i.e., back pain, feelings of heaviness/lightness in parts of the body, periods of bodily weakness, fatigue, and tension) are significantly correlated with depression (e.g., Goldberg, 1996). Prior research has also shown that somatic complaints significantly contribute to the onset (e.g., Barkow et al., 2004) and course (e.g., Wilson, Widmer, Cadoret, & Judiesch, 1983) of depression. However, examination of individual SAS items, e.g. (''I feel afraid for no reason at all''; ''I fall asleep easily and get a good night's rest'') and CES-D items (e.g., ''I felt fearful''; ''My sleep was restless'') suggests that the heightened relation between these measures may be partially attributable to item-content overlap. The item-content overlap between the SAS factors and the CES-D may also reflect the conceptual overlap between anxiety and depression (e.g., Clark & Watson, 1991; Joiner, 1996). The heightened relation between the SAS and the CES-D may also be attributable to content overlap in measurement properties as the two scales primarily assess frequency of depressive (CES-D: ''rarely or none of the time'' to most or all of the time'') and somatic (SAS: ''none or a little of the time'' to ''most or all of the time'') complaints.

The SAS appears to be a useful measure of somatic anxiety. These findings may have some value for retrospective analyses of somatic symptoms in archival data sets pertaining to anxiety-related pathology when the SAS has been used as a

[1] The items that composed each SAS factor were also included in the computation of the SAS total score. Without this potential inflation factor, the CES-D might correlate more highly with the SAS total score than the individual SAS factors.

unitary construct. The SAS may also be more ideal than alternative measures given its broader content sampling of somatic symptoms. However, future studies confirming our psychometric examination of the SAS will be necessary. For instance, future research is needed to examine whether the factor structure of the SAS varies across and within different samples. Indeed, prior research suggests that the factor structure and factor stability of somatic complaints may differ for males and females (e.g., Liu et al., 1997). Examination of the factor structure of the SAS in different cultures is also warranted as prior research suggests that the structure of somatic symptoms may differ across cultures (e.g., Mumford et al., 1991). A limitation of the present research was our use of an undergraduate sample. Extensive research examining the factor structure of the SAS in diverse community and clinical samples may provide useful information on the generalizability of the present findings. For instance, clinical samples may be more likely to reveal different somatic factors (i.e., anxiety and panic and vestibular sensations may form one factor in panic patients). Similarly, the SAS may have utility as an outcome indicator in the treatment of specific anxiety-related disorders. With the hierarchical scaling of the measure, perhaps different factors will be more sensitive to treatment (e.g., anxiety and panic in panic disorder; gastrointestinal/muscular sensations in irritable bowel syndrome). However, future studies will need to reexamine the factor structure and construct validity across diverse samples before confident inferences can be drawn regarding the utility of a hierarchical scaling of the SAS.

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