A dimensional approach to measuring anxiety for DSM-5

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Abstract

In preparation for DSM-5's planned inclusion of dimensional assessments of psychopathology as a complement to traditional categorical diagnoses, we developed brief self-rated scales for anxiety disorders that are consistent in content and structure. In the present paper, we discuss the creation of the scales and examine their psychometric properties and clinical sensitivity. Phase One assessed psychometric properties of the initial versions of the scales in a large non-clinical sample ($n = 702$). Phase Two assessed the psychometric properties of revised versions of the scales, including test–retest reliability, in a non-clinical sample ($n = 57$). Phase Three examined the scales' psychometric properties and relationship with clinician ratings of disorder severity in a clinical sample ($n = 48$). The scales demonstrated internal consistency ($\alpha = 0.85$–0.92), convergent validity ($r_s = 0.39$–0.69), and test–retest reliability in the non-clinical samples (ICC = 0.51–0.81). In the clinical sample, the scales demonstrated significantly higher total scores than in the non-clinical sample (Cohen's $d = 0.72$–1.50) and moderate to high correlations with clinician ratings of disorder severity ($r = 0.43$–0.82) Although further evaluation and refinement of the scales (particularly the specific phobia and agoraphobia scales) is needed, the results provide preliminary support for the use of these scales in DSM-5 and thus take an important step toward the integration of standardized dimensional measurement into the diagnosis of anxiety disorders. *Copyright © 2012 American Psychiatric Association. All rights reserved.*

Introduction

The third edition of the Diagnostic and Statistical Manual for Mental Disorders (DSM-III) dramatically changed the way mental disorders were conceptualized. The manual greatly enhanced both the reliability of diagnoses and the communication of research findings. Since DSM-III's publication, knowledge of nearly every aspect of psychopathology has grown considerably and has called into question the validity and utility of certain aspects of the DSM's approach to psychopathology. One such area is its reliance on categorical diagnoses. Currently, the DSM uses binary diagnoses (such that an individual either has a given disorder or does not). Such an approach does

not incorporate the large body of research that suggests that psychopathology can also be conceptualized dimensionally and that there are many benefits to doing so.

Dimensional assessment of psychopathology allows clinicians and researchers to assess disorder severity, subclinical presentations of disorders, and changes in symptoms over time (by repeated assessment), none of which are captured by the current categorical diagnostic system. Psychopathology can vary along multiple dimensions, such as the number, intensity, and duration of symptoms experienced and the degree of interference caused by the symptoms (e.g. Kessler, 2002; Krueger *et al.*, 2005). Researchers and clinicians alike have long recognized the benefits of dimensional assessment, which is reflected by self-report scales for psychopathology, nearly all of which are dimensional in nature. In addition to capturing more of the substantial heterogeneity that exist within diagnostic categories, dimensional ratings could be made regarding symptoms that cut across multiple diagnoses, making clearer the full presentation of symptoms within an individual and perhaps clarifying certain aspects of diagnostic comorbidity (Kraemer, 2007).

The value of dimensional assessment has been recognized by the DSM-5 Taskforce. In 2007, the Taskforce assembled a meeting in which experts in the field discussed the addition of dimensional approaches to diagnostic classification. The conclusion was that the evidence overwhelmingly supported the inclusion of dimensional assessment in DSM-5 but that dimensional classification would complement categorical classification, which is considered by many to be a highly useful (if imperfect) tool for clinical decision-making. Citing the ubiquity of dimensional self-report measures in clinical and research settings, it was emphasized that "the suggested changes [would] simply add consistency to what most clinicians already do on their own" (Helzer *et al.*, 2007, p. 126).

In few areas could the implementation of consistent dimensional measures be more useful than in the anxiety disorders, in which hundreds of validated scales are available to assess various domains of anxiety. Choosing among the existing measures is a difficult task due to the lack of consensus on a "gold standard" measure for each disorder and the substantial heterogeneity in format and content. For example, some scales are linked to diagnostic criteria (e.g. GAD-7; Spitzer *et al.*, 2006) and others are not; some emphasize beliefs (e.g. Anxiety Sensitivity Index; Peterson and Heilbronner, 1987); some emphasize behaviors (e.g. Mobility Inventory for Agoraphobia; Chambless *et al.*, 1985); and some emphasize symptoms (e.g. Beck Anxiety Inventory; Beck *et al.*, 1988). The DSM-5 Taskforce recognizes this limitation and has stressed the utility of dimensional measures that share a common template and

describe the core symptom domains shared by all of the anxiety disorders in a consistent way (Shear *et al.*, 2007). Such a measure also has to be concise, however, as brevity is paramount in its acceptability to clinicians and individuals in clinical practice settings, especially hospitals and primary care clinics. The majority of existing scales are quite lengthy, posing a further barrier to implementation. Thus, new dimensional scales that share a common template and concisely yet comprehensively assess an individual's anxiety are needed for DSM-5.

The development of such scales must take several issues into consideration. The first issue is whether to construct a scale that is rated by clinicians or self-rated by individuals. Clinician ratings have the benefit of being more objective in nature but have the potential to be perceived as an additional burden for clinicians. Self-report ratings would allow for a complement to the categorical rating made by the clinician and are less work for the clinician to administer, but also are subject to a number of rater biases and require the modification of language and structure to be easily understood by the majority of individuals. In DSM-5, one possibility under consideration is for clinicians to combine individual self-report with their own judgment to generate an overall disorder severity rating.

A second issue is the selection of scale items. Shear *et al.* (2007) distinguish between higher order and spectrum approaches to selecting items for dimensional assessment. Higher order approaches utilize factor analytic methods to elucidate the core processes that comprise psychopathology. Although they have received considerable empirical support, higher order approaches to measuring psychopathology often produce groups that are inconsistent with current DSM categorization and thus, would likely necessitate significant re-organization of the DSM-5 structure (e.g. Krueger, 1999). Furthermore, such groups have been found to vary considerably across different age groups (Wittchen *et al.*, 2009; Beesdo-Baum *et al.*, 2009). In contrast to a higher order approach, a spectrum approach examines symptoms, behavioral traits, and response orientations that are associated with existing DSM-IV categorical diagnoses and define symptoms and clinical features stemming from each category. Spectrum approaches are limited by their reliance on existing taxonomy as opposed to scientific evidence, but by nature are more likely to closely map on to DSM-5 structure and criteria. As the dimensional measures are being proposed as a complement to that structure, a spectrum approach was used to guide current scale generation.

A third issue is determining the core components of anxiety to be rated. Research has long noted the importance of assessing both anxiety, a future-oriented mood state associated with preparation for possible upcoming

negative events, and fear, an alarm response to present or imminent danger regardless of whether it is real or perceived (e.g. Barlow, 1988; Craske *et al.*, 2009). Anxiety and fear in turn are comprised of response components, characterized as subjective-verbal, physiological, and behavioral (Lang, 1971). As such, comprehensive measurement should include the subjective-verbal symptoms of fear (i.e. thoughts of imminent danger) and anxiety (i.e. thoughts of future danger), physiological symptoms of fear (i.e. racing heart) and anxiety (i.e. muscle tension), and the behavioral symptoms of fear (i.e. escape) and anxiety (i.e. avoidance and safety behaviors; see Craske *et al.*, 2009). Although there will likely be changes to the diagnostic criteria for each anxiety disorder with DSM-5, the same core domains of cognitive symptoms, physiological symptoms, and avoidance behaviors related to fear and anxiety are likely to remain. Thus, the present scales focus on these domains. The goal of the present research is to develop a brief self-rated scale for each anxiety disorder that uses a common template to asses the core constructs of fear and anxiety that are shared across the anxiety disorders despite being manifested in different ways. A three-phase study was conducted to examine the validity and reliability of such scales. In Phase One, the preliminary versions of the scales were administered to 702 undergraduates. During this phase we examined internal consistency, convergent and discriminant validity, and sensitivity, as well as the utility of a single dimensional scale that cut across all anxiety disorders. In Phase Two, the scales were revised and two week test–retest reliability was examined in 57 undergraduates. Finally, in Phase Three, the clinical utility of the scales was examined in a sample of 48 individuals.

Phase One: development and initial validation of the scales

Method

Development of the scales

The initial versions of the dimensional anxiety scales were constructed by members of and advisors to the Anxiety Disorders Subgroup of the DSM-5 Anxiety, OC Spectrum, Post-traumatic, and Dissociative Disorder Work Group. After extensive consideration of the proposed DSM-5 criteria for each disorder, the goals outlined by the Taskforce, and the strengths and limitations of previously validated scales, the Work Group constructed a common template that assessed the frequency and intensity of cognitive and physical symptoms and the frequency of escape and avoidance behaviors that are present across all anxiety disorders. Once in place, the template was adapted for five

disorders to create disorder-specific dimensional scales: social anxiety disorder (SAD-D), specific phobia (SP-D), agoraphobia (AG-D), panic disorder (PD-D), and generalized anxiety disorder (GAD-D).[1]

In line with the stated goal from the DSM-5 Taskforce of eight- to ten-item dimensional measures, the initial templates consisted of eight items. The first four items assessed cognitive and physical symptoms related to the experience of fear and anxiety (e.g. "Anxiety, worry, or nervousness about upcoming social situations," "Thoughts or images of future negative events or catastrophes involving family, health, finances, school, or work") that were assessed on two dimensions: *intensity* and *frequency*. These dimensions were selected because they are the most commonly used in previously validated self-report measures of anxiety. Each item was rated on a five-point scale, ranging from zero ("none" for intensity, "never" for frequency) to four ("extreme" for intensity, "all of the time" for frequency). The mean of the intensity and frequency rating was taken to create a single score for each item. The next set of four items assessed the frequency of escape and avoidance behaviors ("Refuse to attend social situations," "Leave situations early, or participate only minimally because of panic attacks"). Frequency of avoidance behavior was rated on a five-point scale ranging from zero (never) to four (all the time). A total score for the scale was created by summing the eight values (range of possible scores: 0–32). All items were assessed in regard to the past month, to capture stable anxiety consistent with the diagnostic minimum of one month for anxiety disorders (i.e. panic disorder, with all other anxiety disorders proposed to persist at least several months in DSM-5). Scales were adapted for each of the five disorders through different introductory statements and different reference points throughout the items. In order to examine the utility of even briefer measures, a cross-cutting dimensional scale (Cross-D) was created. The scale uses the same eight-item template as the other scales but is written generally such that it can apply to any anxiety disorder (e.g. "I have avoided, or did not approach or enter, situations that made me anxious").

Previously validated anxiety measures

Participants also completed the following six widely used self-report scales for anxiety in order to assess the

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[1] Dimensional scales assessing obsessive compulsive disorder (OCD) and post-traumatic stress disorder (PTSD) were developed by other subgroups of the DSM-5 Anxiety, OC Spectrum, Post-traumatic, and Dissociative Disorder Work Group and thus are not included in the present analyses.

convergent and discriminant validity of the dimensional measures: The Panic Disorder Severity Scale – Self Report Version (PDSS-SR; Shear *et al.*, 1997), a seven-item scale that assesses panic attacks, anxiety, and avoidance; the Social Phobia Inventory (SPIN; Connor *et al.*, 2000), a 17-item scale that assesses SAD symptoms and related avoidance behaviors; the five-item agoraphobia subscale of the Fear Questionnaire (FQ-A; Marks and Matthews, 1979), which assesses how likely an individual is to avoid agoraphobia-type situations; the GAD-7 (Spitzer *et al.*, 2006), a seven-item measure that assesses the frequency of GAD-related symptoms; the Overall Anxiety Severity and Impairment Scale (OASIS; Norman *et al.*, 2006), a five-item measure assessing panic, anxiety, avoidance, and distress and interference associated with anxiety symptoms; and the Patient Reported Outcome Measurement Information System Adult Anxiety Version 1.0 Short Form (PROMIS-ANX; see Pilkonis *et al.*, 2011), a seven-item scale that assesses the frequency of anxiety symptoms over the past week. The previously validated disorder-specific anxiety scales were selected based on their wide use, the strength of their psychometric properties, and the number of core domains of anxiety assessed (cognitive symptoms, physiological symptoms, and avoidance behaviors). Whereas PDSS-SR, SPIN, and GAD-7 assess at least two of the three core domains, FQ-A only addresses one (avoidance behaviors). We considered selecting other measures, but we were unable to find an agoraphobia measure that assessed additional domains and was not prohibitively long. No existing scale was included for specific phobia due to the fact that the existing self-report scales for specific phobia either assess a single subtype (e.g. the Spider Phobia Questionnaire; Klorman *et al.*, 1974) or are prohibitively long (e.g. the Fear Survey Schedule; Wolpe and Lang, 1964).

Participants

Participants were 702 undergraduates enrolled in psychology courses at the University of California, Los Angeles (UCLA) during the 2009–2010 academic year that completed the study in exchange for course credit. The sample was 76% female, racially diverse (37% Asian, 36% Caucasian, 2% Black, 7% multiracial, and 18% another race not specified), and had a mean age of 20.6 (standard deviation [SD] = 2.6, range = 18–45).

Procedure

The scales were completed online. After granting informed consent, participants were directed to complete a demographic form and all of the scales via a Survey Monkey program.

Statistical analyses

To examine internal consistency, Cronbach's alpha was calculated for each eight-item dimensional scale. To assess the convergent and discriminant validity, Spearman's Rank Order Correlations (r_s) were calculated between the total score of each dimensional measure and the total score of each previously validated measure and the r_s values for conceptually similar and conceptually distinct measures were statistically compared using a Fisher r_s-to-z Transformation. To evaluate the utility of the cross-cutting measure, Spearman's Rank Order Correlations were calculated between the cross-cutting measure and each of the dimensional and existing scales. Spearman's Rank Order Correlations were used in Phase One due to the non-normal distribution of scores in the sample. To evaluate clinical sensitivity, *t*-tests were conducted to determine whether participants who exceeded the established clinical cutoff on the OASIS (total score > 7; Norman *et al.*, 2011) scored significantly higher on the dimensional scales than those who scored below the cutoff. Cohen's *d* values were also calculated for each scale as a measure of the effect size of this difference. All statistical analyses were conducted using SPSS v16.0.

Results

Descriptive statistics

The response rate was 100% (all participants who gave informed consent completed the scales). Data were normally distributed for all scales with the exception of the scales assessing PD (PD-D and PDSS) and AG (AG-D and FQ-A), which were positively skewed and platykurtic. See Table 1 for descriptive statistics of the scales.

Internal consistency

For each scale, Cronbach's alpha was high: SAD-D ($\alpha = 0.83$), SP-D ($\alpha = 0.83$), AG-D ($\alpha = 0.89$), PD-D ($\alpha = 0.90$), and GAD-D ($\alpha = 0.86$). Pearson correlations between the intensity and frequency ratings for the four physiological and cognitive items were strong and significant at $p < 0.001$ (SAD-D: $r = 0.82$, SP-D: $r = 0.67$, AG-D: $r = 0.70$, PD-D: $r = 0.92$, and GAD-D: $r = 0.86$), hence they were averaged in subsequent analyses.

Convergent and discriminant validity

Validity is demonstrated if the correlation between the dimensional measure and its corresponding previously validated scale is significantly greater than the correlations between the dimensional measure and the non-corresponding

Table 1. Descriptive statistics for dimensional and previously validated scales in Phase One participants ($n = 702$)

	Mean (SD)	Median	Range of scores in Phase One sample	Possible range of scores
Dimensional scales				
SAD-D	7.2 (4.8)	6.5	0–25	0–32
SP-D	7.6 (5.7)	7.0	0–26.5	0–32
AG-D	4.7 (5.0)	3.5	0–25.5	0–32
PD-D	4.7 (5.0)	0	0–24	0–32
GAD-D	11.2 (6.2)	10.5	0–29	0–32
Cross-D	7.8 (5.3)	7.0	0–24.5	0–32
Previously validated scales				
SPIN	16.1 (12.9)	13.0	0–60	0–68
FQ-A	6.0 (6.5)	4.0	0–40	0–40
PDSS-SR	2.6 (3.8)	0	0–25	0–28
GAD-7	5.9 (4.8)	5.0	0–21	0–21
OASIS	5.3 (3.7)	5.0	0–20	0–20
PROMIS-ANX	17.5 (6.1)	17.0	7–34	7–35

Note: SAD-D, Social Anxiety Disorder Dimensional Scale; SP-D, Specific Phobia Dimensional Scale; AG-D, Agoraphobia Dimensional Scale; PD-D, Panic Disorder Dimensional Scale; GAD-D, Generalized Anxiety Disorder Dimensional Scale; Cross-D, Cross-cutting Dimensional Scale for Anxiety; SPIN, Social Phobia Inventory; FQ-A, the Agoraphobia subscale of the Fear Questionnaire; PDSS-SR, Panic Disorder Severity Scale – Self Report Version; GAD-7, Generalized Anxiety Disorder seven-item measure; OASIS, Overall Anxiety Severity and Impairment Scale; PROMIS-ANX, Patient Reported Outcome Measurement Information System Adult Anxiety Version 1.0 Short Form.

existing scales (e.g. SAD-D correlates more strongly with SPIN than PDSS, FQ-A, and GAD-7). Convergent and discriminant validity was demonstrated for SAD-D, PD-D, and GAD-D, but not AG-D (which correlated less strongly with FQ-A than the non-corresponding previously validated measures) or SP-D (which had no data available due to the fact that no existing measure of SP was included). See Table 2 for correlations between scales.

Cross-cutting dimensional scale

Pearson correlations revealed moderate to strong relationships between Cross-D and the dimensional scales: SAD-D ($r_s = 0.62$), SP-D ($r_s = 0.44$), AG-D ($r_s = 0.50$), PD-D ($r_s = 0.49$), and GAD-D ($r_s = 0.70$). Pearson correlations revealed moderate to strong relationships between Cross-D and OASIS ($r_s = 0.65$) and between Cross-D and PROMIS ($r_s = 0.62$). All results were significant at $p < 0.001$.

Clinical sensitivity

Results confirmed significantly higher scores among individuals who exceeded the established clinical cutoff on the OASIS versus those that did not for all scales. The effect size for each scale was large (Cohen's $d > 0.80$), except SP-D, which had a medium effect size (Cohen's $d = 0.72$). See Table 3 for results.

Discussion

Despite a non-clinical sample, there was a wide range of scores. Each of the five-dimensional scales demonstrated very high internal consistency, providing preliminary support for the scale items reflecting the same underlying construct.[2] Correlations suggested that separate ratings of intensity and frequency for the cognitive and physiological symptom items do not provide unique information and thus can be collapsed into a single rating.

The SAD-D, PD-D, and GAD-D scales were more strongly related to validated measures that assess theoretically similar constructs and less strongly related to validated measures that assess theoretically distinct constructs, which suggests both convergent and discriminant validity. Since we did not include any scales assessing a domain theoretically distinct from anxiety (e.g. depression), formal tests of discriminant validity could not be performed.

AG-D failed to demonstrate convergent and discriminant validity. Rather than reflecting a failure to tap into the core

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[2] It should be noted that the use of Cronbach's alpha to assess internal consistency is limited and that a more rigorous statistical approach to assessing the unidimensionality of the scales is confirmatory factor analyses (CFAs). A separate manuscript (Beesdo-Baum *et al.*, 2012) utilizing these methods confirmed the findings of the present study.

Table 2. Spearman's Rank Order Correlations (r_s) between dimensional scales and previously validated anxiety scales in Phase One participants ($n = 702$)

	SPIN	FQ-A	PDSS-SR	GAD-7
SAD-D	0.69 (ref)	0.24*	0.40*	0.47*
AG-D	0.47	0.39 (ref)	0.36	0.37
PD-D	0.29*	0.15*	0.68 (ref)	0.42*
GAD-D	0.48*	0.18*	0.43*	0.68 (ref)

Note: SAD-D, Social Anxiety Disorder Dimensional Scale; AG-D, Agoraphobia Dimensional Scale; PD-D, Panic Disorder Dimensional Scale; GAD-D, Generalized Anxiety Disorder Dimensional Scale; SPIN, Social Phobia Inventory; FQ-A, the Agoraphobia subscale of the Fear Questionnaire; PDSS-SR, Panic Disorder Severity Scale – Self Report Version; GAD-7, Generalized Anxiety Disorder seven-item measure. Ref = Reference correlation for tests of convergent and discriminant validity. The reference correlation is the correlation between the dimensional scale and the corresponding previously validated scale. SP is not included in the table because no corresponding previously validated anxiety measure was included in Phase One.
*Indicates that the correlation coefficient is significantly smaller than the reference correlation in each row ($p < 0.01$).

features of agoraphobia, it is possible that the weak relationship between AG-D and FQ-A is due to the limitations of the measure we selected for validation purposes as the FQ-A measures avoidance behaviors only. As previously mentioned, validity analyses could not be conducted for SP-D. Further evaluation of AG-D and SP-D should be a priority of follow-up studies.

Cross-D significantly correlated with the disorder-specific dimensional scales but the correlations were inconsistent, such that Cross-D was strongly correlated with some disorder-specific scales (GAD-D, SAD-D) but only moderately correlated with the other disorder-specific scales (SP-D, AG-D, PD-D.) In its current form, Cross-D appears to be more highly related to some disorders than others, which poses a problem for a scale that is meant to capture the severity of anxiety across disorders. Thus, Cross-D should undergo further revision.

As expected, those who exceeded the clinical cutoff score on the OASIS had significantly higher total scores on each dimensional scale than individuals who were below the cutoff score, thus providing preliminary support for the clinical sensitivity of the measures.

Phase Two aimed to further simplify the scales' question content in preparation for use in a non-collegiate community sample, to replicate the findings of Phase One with the revised scales, and assess test–retest reliability of the scales.

Phase Two: revision and test–retest reliability of the scales

Method

Aim 1: revising the scales

Based on the results of Phase One and further feedback from advisors to the Work Group, several minor changes were made to the dimensional scales by the Work Group members. First, item wording was simplified to increase clarity. Second, the intensity rating was dropped from the first four items because it correlated highly with frequency and frequency is the metric preferred by the National Institute of Mental Health (NIMH) in their most recent scale construction (e.g. PROMIS). Third, two additional items were added to the template (and thus applied

Table 3. Comparison of dimensional scale totals between individuals in Phase One who did and did not exceed clinical cutoff score on the OASIS

Dimensional measure	OASIS > 7	OASIS < 7	t(df), p	Cohen's d
SAD-D	10.76 (4.96)	5.98 (4.03)	$t(668) = 12.70$, $p < 0.001$	1.06
SP-D	10.59 (5.98)	6.52 (5.23)	$t(672) = 8.55$, $p < 0.001$	0.72
AG-D	7.56 (6.02)	3.37 (4.15)	$t(665) = 9.30$, $p < 0.001$	0.81
PD-D	6.34 (6.06)	1.83 (3.36)	$t(666) = 12.09$, $p < 0.001$	0.92
GAD-D	16.92 (5.24)	9.14 (5.12)	$t(668) = 17.14$, $p < 0.001$	1.50
Cross-D	12.77 (5.17)	5.99 (4.10)	$t(669) = 17.50$, $p < 0.001$	1.45

Note: Degrees of freedom vary slightly due to missing data for some scales. OASIS, Overall Anxiety Severity and Impairment Scale; SAD-D, Social Anxiety Disorder Dimensional Scale; SP-D, Specific Phobia Dimensional Scale; AG-D, Agoraphobia Dimensional Scale; PD-D, Panic Disorder Dimensional Scale; GAD-D, Generalized Anxiety Disorder Dimensional Scale; Cross-D, Cross-cutting Dimensional Scale

to all disorder specific scales). One item separated the subjective emotional component of panic ("fear, terror, or fright") from the physiological symptoms of panic ("felt a racing heart, sweaty, trouble breathing, faint, or shaky") due to evidence that the emotional and physiological components of panic may be distinct responses (see Kircanski *et al.*, 2009). The second item assessed the frequency with which individuals distract themselves from thinking about anxiety-producing situations and was added to assess cognitive (as opposed to behavioral) avoidance strategies. The addition of these items resulted in an increase in the maximum score on the scales from 32 to 40. The first aim of Phase Two was to confirm that the revisions did not adversely affect the consistency and validity of the scales. The full text of the 10-item versions of each scale can be found in Appendices A–F.

Aim 2: test–retest reliability

The second aim of Phase Two was to establish the test–retest reliability of the scales. Participants in Phase Two were administered the revised dimensional scales on their first day of participation (Time 1) and completed the same scales 9 to 21 days later (Time 2). Participants only completed the demographic form and previously validated measures at Time 1.

Participants

Participants were 57 undergraduates enrolled in psychology courses at UCLA in 2010 who participated in exchange for course credit. The sample was 86% female, racially diverse (48% Asian, 33% Caucasian, 2% Black, 5% multiracial, and 12% another race not specified), and had a mean age of 20.8 (SD = 2.0, range = 18–28).

Procedure

All recruitment and study procedures were identical to Phase One, except that participants did not complete the FQ-A and were emailed eight days after completing the initial scales and given 13 days to complete the second set of scales in order to receive credit.

Statistical analyses

Analyses of internal consistency and convergent validity were the same as in Phase One. Test–retest reliability was determined by calculating the Intraclass Correlational Coefficients (ICCs) between the total score on each scale at Time 1 and Time 2. Consistent with standards in the field, test–retest reliability was considered adequate if it exceeded 0.70 (e.g. Murphy and Davidshofer, 1996).

Results

Descriptive statistics

The response rate was 100% (all participants who gave informed consent completed the scales). The revised scales tended to be positively skewed and leptokurtic. The mean (M) and standard deviation (SD) for each dimensional scale at Time 1 was generally consistent with, albeit somewhat lower than, Phase One scale totals: SAD-D ($M = 6.2$, SD = 4.6), SP-D ($M = 6.7$, SD = 7.9), AG-D ($M = 3.0$, SD = 4.1), PD-D ($M = 1.8$, SD = 3.5), and GAD-D ($M = 9.0$, SD = 6.9). The same pattern was true for the previously validated measures: SPIN ($M = 11.5$, SD = 10.7), PDSS ($M = 1.6$, SD = 2.9), GAD-7 ($M = 5.6$, SD = 4.1), OASIS ($M = 4.5$, SD = 3.3), and PROMIS-ANX ($M = 15.4$, SD = 5.3).

Internal consistency and validity

Cronbach's alpha was calculated for the revised scales and results were consistent with Phase One: SAD-D: $\alpha = 0.85$, SP-D: $\alpha = 0.93$, AG-D: $\alpha = 0.88$, PD-D: $\alpha = 0.91$, and GAD-D: $\alpha = 0.92$. Correlations with existing scales were also calculated for the revised version of the scales, with the exception of AG-D (due to the weak relationship found between AG-D and FQ-Agora in Phase One) and SP-D (due to the previously discussed lack of adequate existing measure). As in Phase One, the revised versions of the scales significantly correlated with their corresponding previously validated measure (SAD-D and SPIN: $r_s = 0.64$; PD-D and PDSS-SR: $r_s = 0.40$; GAD-D and GAD-7: $r_s = 0.67$; all values of $p < 0.01$).

Test–retest reliability

All participants completed Time 2 in the allotted time frame ($M = 11.8$ days, Mdn = 11 days, Range = 8–21 days). ICCs were calculated between the dimensional scales completed at Time 1 and Time 2: SAD-D: ICC = 0.81, SP-D: ICC = 0.51, AG-D: ICC = 0.71, PD-D: ICC = 0.84, and GAD-D: ICC = 0.74. Interestingly, test–retest reliability remained low for SP-D after removing individuals who selected a different phobic situation or object at the two time points ($n = 12$). All correlations were significant at $p < 0.001$.

Discussion

The revised 10-item scales demonstrated similar levels of internal consistency as the initial eight-item scales. Similar levels of convergent validity were established for the revised SAD-D, PD-D, and GAD-D scales. Each scale demonstrated strong test–retest reliability, with the exception of

SP-D. These high reliability rates were somewhat surprising given the fact that anxiety symptoms (especially subthreshold symptoms) are presumed to wax and wane over time, but were consistent with recent evidence that anxiety is quite stable over time (e.g. Prenoveau *et al.*, 2011). Limitations of the test–retest analyses include the use of a non-clinical sample, the relatively low sample size, and the somewhat arbitrary retest time frame. Further research should utilize larger samples and evaluate different retest time frames.

One possible explanation for the low test–retest reliability for SP-D is that many participants inconsistently came into contact with the phobic situation or object (e.g. they had not seen a spider in the month prior to Time 1 but did in the time between Time 1 and Time 2), leading to substantially different ratings. These findings combined with the lack of an existing measure for SP to be validated against mark SP-D as the scale most in need of further evaluation.

Although the psychometric properties of the scales proved promising in Phases One and Two, the use of non-clinical samples is a notable limitation, especially when one considers that these scales will be primarily used in clinical settings. In Phase Three, we address this issue by examining the scales in a clinical sample.

Phase Three: validation of the scales in a clinical sample

Method

Aims

The aim of Phase Three was to replicate the Phase One and Phase Two findings in a sample of 48 individuals with a clinically significant anxiety disorder as their principal diagnosis. The scales' internal consistency and their relationship with clinician ratings of disorder severity were examined.

Participants

Phase Three participants were 48 individuals seeking behavior therapy for anxiety. The sample was 52% male and had a mean age of 34.0 (SD = 10.8, range = 18–60). The racial breakdown of the sample was as follows: 69% Caucasian, 20% unspecified race, 4% Asian, 2% multiracial, and 5% missing data. See Table 4 for the diagnostic profile of Phase Three participants.

Procedure

Participants were individuals taking part in one of two research studies at the UCLA Anxiety Disorders Research

Table 4. Axis I diagnoses for Phase Three participants (*n* = 48)

	Principal diagnosis: CSR ≥ 4	Secondary diagnosis: CSR > 0	Total in sample: CSR > 0
SAD	32 (70%)	7 (15%)	39 (85%)
SP[a]	1 (2%)	11 (24%)	12 (26%)
AG	0 (0%)	14 (30%)	14 (30%)
PD	5 (10%)	9 (20%)	14 (30%)
GAD	8 (17%)	9 (20%)	17 (37%)
OCD	2 (4%)	1 (2%)	3 (6%)
PTSD	0 (0%)	3 (6%)	3 (6%)
MDD	0 (0%)	14 (30%)	14 (30%)
DD	0 (0%)	7 (15%)	7 (15%)

Note: Principal and secondary diagnoses determined by Anxiety Disorders Interview Schedule for DSM-IV (ADIS-IV). Clinical Severity Ratings (CSRs) ranged from 0–8. SAD, Social Anxiety Disorder; SP, Specific Phobia; AG, Agoraphobia; PD, Panic Disorder; GAD, Generalized Anxiety Disorder; OCD, Obsessive Compulsive Disorder; PTSD, Posttraumatic Stress Disorder; MDD, Major Depressive Disorder; DD, Dysthymic Disorder.
[a]Specifiers for individuals diagnosed with Specific Phobia: Situational = 8 (17%), Animal = 2 (4%), Blood Injection Injury = 2 (4%), Natural Environment = 1 (2%), Other = 3 (6%). There are a total of 16 specifiers for 12 individuals due to the fact that four of the individuals diagnosed with specific phobia met criteria for two specifiers.

Center comparing moderators and mediators of treatment outcome in cognitive behavioral therapy (CBT) and acceptance commitment therapy (ACT) for anxiety disorders. One study required all participants to have a principal diagnosis of SAD, whereas the second study enrolled participants with a principal diagnosis of any anxiety disorder (SAD, SP, PD, AG, GAD, obsessive compulsive disorder [OCD], and post-traumatic stress disorder [PTSD]). Participants were recruited via advertisements and referrals. Eligible participants had a clinically significant anxiety disorder as their principal diagnosis as determined by the Anxiety Disorders Interview Schedule for DSM-IV (ADIS-IV; Brown *et al.*, 1994). Diagnostic interviews were conducted by graduate students and highly trained research assistants, each of whom successfully completed a standardized training protocol and demonstrated interrater reliability on three consecutive interviews. In addition to recording whether the individual met the DSM-IV criteria for each anxiety disorder, interviewers rated the severity of each current diagnosis (including NOS) in the past month using the DiNardo and Barlow

(1988) 0–8 clinician severity rating (CSR) scale, in which scores of four and above indicate clinically significant severity, impairment, or distress in the past month, scores of three indicate possible caseness, and scores of 2 or lower indicate no case. CSRs were confirmed by licensed psychologists who supervised the interviewers. ADIS-IV-R assessments were audiotaped and 22 were selected at random for blind ratings by a second rater. Kappa coefficients for diagnostic status (clinically significant distress and disability [CSR of 4+] versus subclinical [CSR of 1–3] vs. none [CSR of 0]) ranged from 0.77 (SP) to 1.0 (OCD, SAD, PTSD). Pearson r coefficients for dimensional (0–8) CSR ratings ranged from $r = 0.75$ (SP) to $r = 1.0$ (OCD).

Participants were between ages 16 and 80, English speaking, medication-free or stabilized on psychotropic medication, and therapy-free or stabilized on psychotherapy (other than CBT or ACT). Participants were excluded if they had a psychiatric hospitalization in the past five years, substance abuse or dependence within the last six months, active suicidal ideation, severe depression, a history of bipolar disorder, psychosis, mental retardation or brain damage, or a serious medical condition. The study staff was instructed to administer the dimensional scales that corresponded to each anxiety disorder for which the participant received a CSR > 0 (excluding PTSD and OCD). All participants completed the revised 10-item scales prior to initiating treatment.

Statistical analyses

Analyses of internal consistency were conducted using Cronbach's alpha. Convergent validity was assessed by conducting Pearson correlations between each dimensional scale total and the participants' CSR for the corresponding anxiety disorder.

Results

Descriptive statistics

The response rate was 100% (all participants screened during data collection for the present study were administered the dimensional scales). The dimensional scale totals were normally distributed with the exception of PD-D, which was negatively skewed and leptokurtic. See Table 5 for descriptive statistics.

Internal consistency and validity

Cronbach's alpha was calculated for the completed 10-item dimensional scales: SAD-D: $\alpha = 0.93$ ($n = 42$), SP-D: $\alpha = 0.96$ ($n = 15$), AG-D: $\alpha = 0.98$ ($n = 13$), PD-D: $\alpha = 0.94$ ($n = 16$), and GAD-D: $\alpha = 0.93$ ($n = 21$).

Pearson correlations were conducted between the dimensional scales and the corresponding ADIS-IV CSRs assigned by the interviewer: SAD-D and SAD CSR: $r = 0.64$, $p < 0.001$ ($n = 42$); SP-D and SP CSR: $r = 0.70$, $p = 0.003$ ($n = 15$); AG-D and AG CSR: $r = 0.82$, $p < 0.001$ ($n = 13$); PD-D and PD CSR: $r = 0.58$, $p = 0.02$ ($n = 16$); and GAD-D and GAD CSR: $r = 0.43$, $p = 0.051$ ($n = 21$).

Discussion

As expected, the means, standard deviations, and ranges of total scores on the scales were markedly higher in the clinical sample than the non-clinical sample. High internal consistency was demonstrated for each dimensional scale, with Cronbach's alphas higher than in the non-clinical samples. Each disorder-specific scale positively and significantly correlated with the independent interviewer ratings of clinical severity.

Table 5. Descriptive statistics for dimensional scales in Phase Three participants ($n = 48$)

	n	Mean (SD)	Median	Range of scores in Phase Three sample
Dimensional scales				
SAD-D	42	22.7 (9.1)	24	2–37
SP-D	15	21.3 (12.3)	20	1–39
AG-D	13	15.7 (11.9)	14	0–30
PD-D	16	23.6 (9.2)	26	3–38
GAD-D	21	23.1 (9.9)	24	3–40

Note: Range of possible total scores on the dimensional scales was 0–40. SAD-D, Social Anxiety Disorder Dimensional Scale; SP-D, Specific Phobia Dimensional Scale; AG-D, Agoraphobia Dimensional Scale; PD-D, Panic Disorder Dimensional Scale; GAD-D, Generalized Anxiety Disorder Dimensional Scale.

Results from Phase Three should be considered in the context of two key limitations. First, the sample sizes for all dimensional scales except for SAD-D were low ($n = 13$–21). Second, the majority of participants had a principal diagnosis of SAD. It is important for future studies to examine the scales in larger samples with more heterogeneous principal diagnoses.

General discussion

The significant heterogeneity within the DSM's diagnostic categories has long been noted by researchers and clinicians alike. The DSM-5 Taskforce has acknowledged the limitations of a singularly categorical diagnostic system and plans to supplement traditional categorical diagnoses with dimensional measures of psychopathology in the next edition. Although hundreds of validated dimensional scales exist for anxiety disorders, there is no set of scales that is adequately brief for use in primary care and hospital settings and that is consistent in form and content across the different anxiety disorders. The Anxiety Disorders Subgroup of the DSM-5 Anxiety, OC Spectrum, Post-traumatic, and Dissociative Disorder Work Group has been working for several years to construct such scales, which were evaluated in the present research. In general, evidence of strong psychometric properties was found for the scales in both non-clinical and clinical samples.

Despite the many strengths of the present research (including large and diverse samples, the use of widely used measures for validation purposes, and the clinician ratings of disorder severity in the clinical sample), these results should be considered preliminary and in the context of several limitations. Among these limitations are the use of non-clinical samples for much of the psychometric evaluation, the relatively small size of the Phase Two and Phase Three samples, the substantial differences in demographics (particularly race) of the non-clinical and clinical samples, and the lack of variability in principal diagnoses in Phase Three. Future research should address these limitations by administering the revised scales to large clinical samples that are demographically and diagnostically diverse. Establishing cutoff scores that effectively distinguish

clinical from non-clinical samples is also important, as is determining the measures' ability to accurately capture differences in subthreshold and clinically significant symptom severity. Furthermore, the validity and utility of the scales should be examined across different age groups, in different languages, and in different clinical settings.

The present study found stronger support for the dimensional measures assessing SAD, PD, and GAD than those assessing SP and AG. Follow-up studies should examine these scales in larger samples (particularly samples in which more individuals have SP and AG as principal diagnoses) and determine whether substantial revision of SP-D and AG-D is warranted.

The dimensional scales of anxiety examined in the present research have the potential to significantly benefit clinical assessment and intervention as well as research efforts. The present scales are consistent with the proposed revisions for DSM-5, brief and feasible, and are able to capture aspects of disorder presentation that are missed by categorical methods. By using a common template that is adapted for the specific anxiety disorder, the present scales are not only consistent but also strongly theoretically sound and can possibly allow for comparison of disorder presentations across the anxiety disorders, which was not possible under the previous system. Furthermore, by including a dimensional component to the measurement of anxiety disorders, the DSM-5 is taking a large step toward representing psychopathology as it truly occurs in nature.

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Declaration of interest statement

The authors have no competing interests.

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Appendix A. Social Anxiety Disorder Dimensional Scale (SAD-D)

The following questions ask about thoughts, feelings, and behaviors that you may have had about *social situations*. Usual social situations include: public speaking, speaking in meetings, attending social events or parties, introducing yourself to others, having conversations, giving and receiving compliments, making requests of others, and eating and writing in public. Please rate how often the following statements are true for you:

During *the past month*, I have . . .

	Never	Occasionally	Half of the time	Most of the time	All of the time
. . .felt moments of sudden terror, fear or fright in social situations	0	1	2	3	4
. . . felt anxious, worried, or nervous about social situations	0	1	2	3	4
. . . had thoughts of being rejected, humiliated, embarrassed, ridiculed or offending others	0	1	2	3	4
. . . felt a racing heart, sweaty, trouble breathing, faint, or shaky in social situations	0	1	2	3	4
. . . felt tense muscles, on edge or restless, or trouble relaxing in social situations	0	1	2	3	4
. . . avoided, or did not approach or enter, social situations	0	1	2	3	4
. . . left social situations early or participated only minimally (e.g. said little, avoided eye contact)	0	1	2	3	4
. . . spent a lot of time preparing what to say or how to act in social situations	0	1	2	3	4
. . . distracted myself to avoid thinking about social situations	0	1	2	3	4
. . . needed help to cope with social situations (e.g. alcohol or medications, superstitious objects)	0	1	2	3	4

Appendix B. Specific Phobia Dimensional Scale (SP-D)

The following questions ask about thoughts, feelings, and behaviors that you may have had in a variety of situations. Please circle the item below that makes you most anxious. *Choose only one item and make your ratings based on the situations included in that item.*

   a. Driving, flying, tunnels, bridges, or enclosed spaces
   b. Animals or insects
   c. Heights, storms, or water
   d. Blood, needles, or injections
   e. Choking or vomiting

During *the past month*, I have . . .

	Never	Occasionally	Half of the time	Most of the time	All of the time
. . . felt moments of sudden terror, fear or fright in these situations	0	1	2	3	4
. . . felt anxious, worried, or nervous about these situations	0	1	2	3	4
. . . had thoughts of being injured, overcome with fear, or other bad things happening in these situations	0	1	2	3	4
. . . felt a racing heart, sweaty, trouble breathing, faint, or shaky in these situations	0	1	2	3	4
. . . felt tense muscles, on edge or restless, or trouble relaxing in these situations	0	1	2	3	4
. . . avoided, or did not approach or enter, these situations	0	1	2	3	4
. . . moved away from these situations or left them early	0	1	2	3	4
. . . spent a lot of time preparing for, or procrastinating about (putting off) these situations	0	1	2	3	4
. . . distracted myself to avoid thinking about these situations	0	1	2	3	4
. . . needed help to cope with these situations (e.g. alcohol or medications, superstitious objects, other people)	0	1	2	3	4

Appendix C. Agoraphobia Dimensional Scale (AG-D)

The following questions ask about thoughts, feelings, and behaviors that you may have had in the following situations: crowds, public places, using transportation (e.g. buses, planes, trains), traveling alone or away from home.

During *the past month*, I have . . .

	Never	Occasionally	Half of the time	Most of the time	All of the time
. . . felt moments of sudden terror, fear or fright in these situations	0	1	2	3	4
. . . felt anxious, worried, or nervous about these situations	0	1	2	3	4
. . . had thoughts about panic attacks, uncomfortable physical sensations, getting lost, or being overcome with fear in these situations	0	1	2	3	4
. . . felt a racing heart, sweaty, trouble breathing, faint, or shaky in these situations	0	1	2	3	4
. . . felt tense muscles, on edge or restless, or trouble relaxing in these situations	0	1	2	3	4
. . . avoided, or did not approach or enter, these situations	0	1	2	3	4
. . . moved away from these situations, left them early, or remained close to the exits	0	1	2	3	4
. . . spent a lot of time preparing for, or procrastinating about (putting off), these situations	0	1	2	3	4
. . . distracted myself to avoid thinking about these situations	0	1	2	3	4
. . . needed help to cope with these situations (e.g. alcohol or medications, superstitious objects, other people)	0	1	2	3	4

Appendix D. Panic Disorder Dimensional Scale (PD-D)

The following questions ask about thoughts, feelings, and behaviors about panic attacks. A panic attack is an episode of intense fear that sometimes comes out of the blue (for no apparent reason). The symptoms of a panic attack include: a racing heart, shortness of breath, dizziness, sweating, and fear of losing control or dying.

During *the past month*, I have . . .

	Never	Occasionally	Half of the time	Most of the time	All of the time
. . . felt moments of sudden terror, fear or fright, sometimes out of the blue	0	1	2	3	4
. . . felt anxious, worried, or nervous about having more panic attacks	0	1	2	3	4
. . . had thoughts of losing control, dying, going, crazy or other bad things happening because of panic attacks	0	1	2	3	4
. . . felt a racing heart, sweaty, trouble breathing, faint, or shaky	0	1	2	3	4
. . . felt tense muscles, on edge or restless, or trouble relaxing or trouble sleeping	0	1	2	3	4
. . . avoided, or did not approach or enter, situations in which panic attacks might occur	0	1	2	3	4
. . . left situations early, or participated only minimally because of panic attacks	0	1	2	3	4
. . . spent a lot of time preparing for, or procrastinating about (putting off), situations in which panic attacks might occur	0	1	2	3	4
. . . distracted myself to avoid thinking about panic attacks	0	1	2	3	4
. . . needed help to cope with panic attacks (e.g. alcohol or medications, superstitious objects, other people)	0	1	2	3	4

Appendix E. Generalized Anxiety Disorder Dimensional Scale (GAD-D)

The following questions ask about thoughts, feelings, and behaviors, often tied to concerns about family, health, finances, school, and work.

During *the past month*, I have . . .

	Never	Occasionally	Half of the time	Most of the time	All of the time
. . . felt moments of sudden terror, fear or fright	0	1	2	3	4
. . . felt anxious, worried, or nervous	0	1	2	3	4
. . . had thoughts of bad things happening, such as family tragedy, ill-health, loss of a job or accidents	0	1	2	3	4
. . . felt a racing heart, sweaty, trouble breathing, faint, or shaky	0	1	2	3	4
. . . felt tense muscles, on edge or restless, or had trouble relaxing or trouble sleeping	0	1	2	3	4
. . . avoided, or did not approach or enter, situations about which I worry	0	1	2	3	4
. . . left situations early or participated only minimally due to worries	0	1	2	3	4
. . . spent a lot of time making decisions or putting off making decisions, or preparing for situations, due to worries	0	1	2	3	4
. . . sought reassurance from others due to worries	0	1	2	3	4
. . . needed help to cope with worries (e.g. alcohol or medications, superstitious objects, other people)	0	1	2	3	4

Appendix F. Cross-cutting Dimensional Scale (Cross-D)

The following questions ask about thoughts, feelings, and behaviors you may have had *during the past month*.

During *the past month*, I have . . .

	Never	Occasionally	Half of the time	Most of the time	All of the time
. . . felt moments of sudden terror, fear or fright	0	1	2	3	4
. . . felt anxious, worried, or nervous	0	1	2	3	4
. . . had thoughts of bad things happening	0	1	2	3	4
. . . felt a racing heart, sweaty, trouble breathing, faint, or shaky	0	1	2	3	4
. . . felt tense muscles, on edge or restless, or trouble relaxing or sleeping	0	1	2	3	4
. . . avoided, or did not approach or enter, situations that made me anxious	0	1	2	3	4
. . . moved away from or left situations early, remained near exits, or participated only minimally because of anxiety	0	1	2	3	4
. . . spent a lot of time preparing for, or procrastinating about (putting off), things because of anxiety	0	1	2	3	4
. . . distracted myself to avoid thinking about things that made me anxious	0	1	2	3	4
. . . needed help to cope with anxiety (e.g. alcohol or medications, superstitious objects, other people)	0	1	2	3	4