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Development and Initial Validation of an Abbreviated Spider Phobia Questionnaire Using Item Response Theory

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An abbreviated Spider Phobia Questionnaire (SPQ) was developed using methods based in item response theory. Fifteen of the 31 SPQ items that demonstrated good to excellent discrimination along the spider fear continuum were retained in Study 1 that consisted of 1,555 nonclinical and clinical participants. The SPQ-15 demonstrated good internal consistency and correlated highly with the full SPQ. Structural equation modeling revealed that the SPQ-15 demonstrated excellent convergent validity, with strong associations with small animal disgust and other phobic symptoms. Supportive evidence was also found for divergent validity in relation to panic-related symptoms. The SPQ-15 was uniquely predictive of avoidance behavior and fear and disgust responding towards spiders in nonclinical, analogue, and treatment-seeking samples in Studies 2, 3, and 4. Lastly, in Study 5, the SPQ-15 was sensitive to the effects of exposure-based treatment. These findings suggest that the SPQ-15 has considerable strengths, including decreased assessment and scoring time while retaining high reliability, validity, and sensitivity.

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Specific phobias are characterized by an excessive or unrealistic fear of specific objects or situations (American Psychiatric Association, 1994). Epidemiological studies have shown that an estimated 10 to 12.5% of people in the US experience a specific phobia in their lifetime (Kessler et al., 2005; Magee, Eaton, Wittchen, McGonagle, & Kessler, 1996). Factor analytic investigations have consistently identified animals as a distinct category of specific phobias (Arrindell, Pickersgill, Merckelbach, Ardon, & Cornet, 1991), with approximately 40% of all diagnosed phobias belonging to this category (Chapman, 1997). In fact, the most common specific fear in Western societies is that of spiders, with prevalence estimates upwards of 55% and 18% among females and males, respectively (Davey, 1992). Similar to other phobic disorders, individuals with spider phobia experience persistent dread, immediately respond with fear upon exposure, and generally avoid situations in which the phobic stimulus might be encountered. Despite evidence of role impairment in phobia, only a minority of individuals with phobia ever seek professional treatment (Magee et al., 1996). In contrast to many phobic disorders, disgust appears to play a prominent role in spider phobia (Olatunji & Deacon, 2008).

Investigations of spider phobia have greatly advanced our clinical and theoretical knowledge about anxiety disorders. For instance, research on spider phobia has identified disgust as a critical emotion that may be relevant for a variety of other anxiety disorders (Olatunji & McKay, 2007). Furthermore, the importance of context dependency

in fear extinction has been illuminated through the use of samples with spider phobia (Vansteenwegen et al., 2007). Studies with spider phobia have also helped identify specific neural correlates of autonomic (amygdala) and direct evaluation (insula, anterior cingulate gyrus, left dorsomedial prefrontal cortex) of threatening stimuli (Straube, Mentzel, & Miltner, 2006). Lastly, research employing spider phobic samples has begun to shed light on the effects of successful psychotherapy on brain function in persons with anxiety disorders (Straube, Glauer, Dilger, Mentzel, & Miltner, 2006).

The clinical condition of spider phobia appears to serve as a model for better understanding the phenomenology of fear and anxiety in the laboratory. Given the broad impact of research on spider phobia, brief and sensitive methods of assessment would be of considerable utility. Although multiple self-report inventories exist, the Spider Phobia Questionnaire (SPQ; Klorman, Hastings, Weerts, Melamed, & Lang, 1974) has established itself as the most widely used measure of spider fear. The SPQ has been translated into several languages (e.g., Dutch, Swedish) and has been adapted as a measure for children (SPQ-C; Kindt, Brosschot, & Muris, 1996). The SPQ was developed to assess the verbal-cognitive component of spider fear, consisting of 31 true/false items, 9 of which are reversed-scored (Antony, Orsillo, & Roemer, 2001).

Although the development of the SPQ has enabled researchers to follow a standardized procedure for the evaluation of spider phobia (Klorman et al., 1974), reports of the internal consistency of the SPQ have been inconsistent. For example, Muris and Merckelbach (1996) reported Chronbach alpha of .62 before treatment and .90 after treatment for the SPQ in a sample of spider phobic individuals. Muris and Merckelbach also found a Cronbach alpha of .43 among nonphobic controls. However, other studies using the Kuder-Richardson formula 20 have reported higher reliability estimates in nonclinical samples (α's ranging from .83 to 90; Klorman et al., 1974). Despite variable internal consistency estimates, the SPQ has demonstrated excellent test-retest reliability over periods between 3 weeks ($r = .94$; Muris & Merckelbach, 1996) and 1 year ($r = .87$; Fredrikson, 1983). Importantly, the SPQ discriminates individuals with spider phobia from those with snake phobia and nonclinical controls (Fredrikson, 1983; Muris & Merckelbach, 1996) and correlates significantly with other measures of spider fear and avoidance (Muris & Merckelbach, 1996). Lastly, the SPQ is sensitive to the effects of treatment (Hellstrom & Öst, 1995; Öst, 1978; Teachman & Woody, 2003). Despite the widespread use of the SPQ and studies examining its psychometric properties, no study has used modern statistical techniques, such as item response theory (IRT; see Embretson & Reise, 2000, or Thissen & Wainer, 2001), to examine the psychometric properties of each SPQ item.

Application of analytic techniques, such as IRT, to the SPQ may be warranted given that the validity and relative utility of the measure is not without question (Packer, Bond, & Siddle, 1987). For example, Muris and Merckelbach compared the psychometric properties of the SPQ to that of the Fear of Spiders Questionnaire (FSQ; Szymanski & O'Donohue, 1995), an alternative measure of spider fear. Both were found to be generally reliable and valid self-report measures of spider fear. However, two potential drawbacks of the SPQ, relative to the FSQ, were observed. First, the findings indicated that the SPQ may be limited in indexing more subtle differences in self-reported spider fear in samples with (extremely) low levels of spider fear. Second, the 18-item FSQ is shorter than the 31-item SPQ, and although the amount of time required to administer and score a 31-item instrument is not unreasonable, clinicians and researchers often need quick measures either to screen for spider phobia or to use as part of a larger assessment battery. By refining and reducing the number of items on the SPQ, greater compliance (i.e., fewer skipped or missing items) could be achieved while simultaneously reducing participant burden. It could also be argued that given that spider fear/phobia represents a relatively narrow construct, 31 items may not be necessary for accurate assessment. For these reasons, an abbreviated version of the SPQ that continues to validly and reliably assess spider fear would have considerable practical benefits.

Prior studies have made important contributions towards a better understanding of the psychometric properties of the SPQ (e.g., Muris & Merckelbach, 1996), but these studies are based on classic test theory methods that have important limitations. Specifically, they do not directly assess how well SPQ items discriminate individuals who differ in their level of spider fear (cf. Embretson, 1996). IRT consists of a set of generalized linear models and statistical procedures that identify responses on an underlying latent trait. IRT models have a number of potential advantages over classic test theory in facilitating valid and reliable assessment. For example, IRT models yield estimates that do not vary with the characteristics of the sample in the underlying trait and trait estimates linked to item content. Furthermore, IRT facilitates evaluation of the extent to which items are equivalent among different respondents. Accordingly, it has been argued that state-of-the-art scale development

should use IRT methods to determine the psychometric performance of scale items (see Beevers, Strong, Meyer, Pilkonis, & Miller, 2007; Embretson, 1996). IRT methods have not yet been applied to the SPQ. Given the widespread use of the SPQ and the general benefit of using brief assessments to increase compliance and reduce subject burden, we conducted a series of studies using IRT to develop a briefer version of the SPQ that (a) is comprised of items that discriminate individuals along the spider fear continuum, (b) is highly correlated with the original SPQ, (c) has adequate internal consistency, (d) has adequate convergent/divergent, concurrent and predictive validity, and (e) shows treatment sensitivity. Using IRT and structural equation modeling, we examined the responses of a large nonclinical sample to evaluate, refine, and shorten the SPQ. We then used approaches from traditional test theory to examine the reliability and validity of the abbreviated version of the SPQ in nonclinical, analogue, and treatment-seeking community samples.

Study 1 Methods: Development and Initial Validation of the Abbreviated SPQ

PARTICIPANTS

A total of 1,555 participants were included in the analysis. One thousand four hundred and five (63% female; mean age = 20.88, *SD* = 5.14, ranged in age from 18 to 56 years) of these participants were recruited from undergraduate courses and participated in exchange for course credit. A second set of 91 participants were recruited from an outpatient clinic in the Netherlands (see Study 4). Of these 91 participants, 61 (mean age = 33.82; *SD* = 11.05; 82% women) met diagnostic criteria for spider phobia and 30 (mean age = 35.18; *SD* = 13.07; 80% women) did not. A third set of 59 participants were recruited from an outpatient clinic in the United States (see Study 5). Of these 59 participants, 30 (mean age = 33.60; *SD* = 10.70; 83% women) met diagnostic criteria for spider phobia and 29 (mean age = 24.00; *SD* = 9.40; 77% women) did not. Nonclinical and clinical participants were combined for the initial analysis to ensure a more ecologically valid continuum of spider fear and phobia.

MEASURES

The *Spider Phobia Questionnaire* (SPQ; Klorman et al., 1974) is a 31-item true/false measure of fear and avoidance of spiders. Scoring is reversed for 9 fear-absent items.

The *Disgust Emotion Scale* (DES; Kleinknecht, Kleinknecht, & Thorndike, 1997) is a 30-item scale measuring disgust sensitivity across five domains: Animals, Injections and Blood Draws, Mutilation and Death, Rotting Foods, and Smells. Ratings are given on a 5-point Likert-type scale, ranging from 0 (*no disgust or repugnance at all*) to 4 (*extreme disgust or repugnance*). The alpha coefficient for the DES was .93 in the present study. The DES has demonstrated acceptable reliability and validity (Kleinknecht et al., 1997).

The *Injection Phobia Scale–Anxiety* (IPS-Anx; Öst, Hellstrom, & Kaver, 1992) is an 18-item scale in which individuals rate their degree of anxiety if they were to experience a variety of injection and/or venipuncture procedures. The scale ranges from 0 (*no anxiety*) to 4 (*maximum anxiety*). The IPS-Anx demonstrated good internal consistency in the present study ($\alpha = .95$). Two additional items, assessing fainting and avoidance, were added to the IPS-Anx. The fainting item asked participants if they have ever fainted, almost fainted, or felt dizzy during medical procedures such as giving blood or receiving injections. The avoidance item asked participants if they have ever avoided, delayed, or put off medical procedures because they were afraid of blood, needles, injections, etc.

The *Anxiety Sensitivity Index* (ASI; Reiss, Peterson, Gursky, & McNally, 1986) is a 16-item questionnaire in which respondents indicate on a 5-point Likert-type scale (0 = *very little* to 4 = *very much*) the degree to which they expect negative consequences to arise from anxiety-related sensations across dimensions of Physical Concerns, Mental Incapacitation, and Social Concerns (Zinbarg, Barlow, & Brown, 1997). The ASI demonstrated good internal consistency in the present study ($\alpha = .86$). However, items for the Social Concerns subscale (Items 1, 5, 7, and 13) reportedly deviate from the other two lower-order components of the ASI (Blais et al., 2001; McWilliams, Stewart, & MacPherson, 2000). Consequently, only the Physical Concerns and Mental Incapacitation items were used in the present study ($\alpha = .86$).

ITEM RESPONSE ANALYSES

We used Birnbaum's (1968) unidimensional two parameter logistic (2PL) item response model to explore the measurement properties of individual SPQ items. This model specifies a discrimination parameter (*a*) and a threshold parameter (*b*) for each item. The *a* parameter conveys how strongly the item relates to the latent variable, and the *b* parameter is the location on the latent continuum where the discrimination occurs (and where the probability of endorsing the item is 0.5).

For typical IRT analysis, it is assumed that the latent variable (here, spider fear) is unidimensional and normally distributed. To check the dimension-

ality assumption, we used exploratory factor analysis (EFA). To avoid assuming the latent distribution is normal, as is implicit in popular software such as BILOG, MULTILOG and PARSCALE, we estimated the latent distribution simultaneously with the 2PL item parameters using Ramsay-curve item response theory (RC-IRT; Woods, 2006; Woods & Thissen, 2006) as implemented in RCLOG (Woods & Thissen, 2004).

In RC-IRT, the latent distribution is modeled as a "Ramsay-curve," which is a density made from Basis splines (B-splines; de Boor, 2001). Technical details appear elsewhere (Woods, 2004; Woods & Thissen, 2006), as does a more accessible explanation of RC-IRT (Woods, 2006). In brief, a spline regression line (which can curve) is estimated simultaneously with the item parameters and then operated upon (exponentiation and integration) so that the result is a proper density. Parameters of a Ramsay curve are coefficients of the spline regression line.

To carry out RC-IRT, the user specifies the maximum order and number of equally spaced knots for the B-splines. Order refers to the order of the polynomial B-splines (one more than degree), and knots are locations on the abscissa where different B-splines are joined together smoothly. For a single data set, RCLOG estimates a Ramsay curve for up to 25 combinations of order and number of knots, and the user selects one model to interpret. Model selection is based on a plot of all candidate Ramsay curves, and an information criterion like the Hannan-Quinn index (HQ; Hannan, 1987). The HQ is a function of the maximized log likelihood with a penalty for the number of parameters estimated; smaller values indicate better models. The Ramsay curve with order and number of knots equal to 2 (and mean and variance fixed to 0 and 1 respectively) is the normal distribution. Woods (2006) showed that with order 2 and 2 knots, RCLOG and MULTILOG results are identical.

Table 1
Exploratory factor analysis of the Spider Phobia Questionnaire (SPQ)

SPQ item	Factor 1	Factor 2	h^2
1. I avoid going to parks or on camping trips because there may be spiders about.	**.65**	.05	.53
2. I would feel some anxiety holding a toy spider in my hand.	**.69**	.08	.45
3. If a picture of a spider crawling on a person appears on the screen during a motion picture, I turn my head away.	**.68**	.18	.33
4. I dislike looking at pictures of spiders in a magazine.	**.61**	.32	.30
5. If there is a spider on the ceiling over my bed, I cannot go to sleep unless someone kills it for me.	**.85**	−.02	.29
6. I enjoy watching spiders build their webs.*	**.04**	**.81**	.29
7. I am terrified by the thought of touching a harmless spider.	**.86**	.01	.22
8. If someone says that there are spiders anywhere about, I become alert and edgy.	**.94**	−.05	.15
9. I would not go down to the basement to get something if I thought there might be spiders down there.	**.80**	.04	.30
10. I would feel uncomfortable if a spider crawled out of my shoe as I took it out of the closet to put it on.	**.74**	−.00	.44
11. When I see a spider, I feel tense and restless.	**.98**	−.08	.11
12. I enjoy reading articles about spiders.*	**.12**	**.84**	.38
13. I feel sick when I see a spider.	**.83**	.00	.29
14. Spiders are sometimes useful.*	**.00**	**.68**	.53
15. I shudder when I think of spiders.	**.81**	.13	.20
16. I don't mind being near a harmless spider if there is someone there in whom I have confidence.*	.10	.31	.85
17. Some spiders are very attractive to look at.*	.11	**.78**	.27
18. I don't believe anyone could hold a spider without some fear.	.39	.07	.80
19. The way spiders move is repulsive.	**.62**	.25	.38
20. It wouldn't bother me to touch a dead spider with a long stick.*	.34	.24	.73
21. If I came upon a spider while cleaning the attic I would probably run.	**.82**	.06	.26
22. I'm probably more afraid of spiders than of any other animal.	**.79**	−.03	.39
23. I would not want to travel to Mexico or Central America because of the greater prevalence of tarantulas.	**.66**	−.00	.56
24. I am cautious when buying fruit because bananas may attract spiders.	**.62**	−.17	.69
25. I have no fear of non-poisonous spiders.*	**.49**	.03	.74
26. I wouldn't take a course in biology if I thought I might have to handle live spiders.	**.57**	−.07	.71
27. Spider webs are very artistic.*	−.10	.38	.88
28. I think that I'm no more afraid of spiders than the average person.*	.39	.02	.83
29. I would prefer not to finish a story if something about spiders was introduced into the plot.	**.66**	.16	.40
30. Not only am I afraid of spiders but millipedes and caterpillars make me feel anxious.	**.58**	.07	.60
31. Even if I was late for a very important appointment, the thought of spiders would stop me from taking a shortcut through an underpass.	**.67**	.01	.53

Note. Factor loadings ≥|.40| are listed in boldface type; * = reversed scored item; h^2 = communality.

Table 2
Psychometric Properties of the Spider Phobia Questionnaire (SPQ) Items

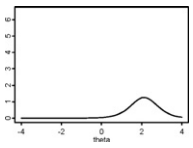
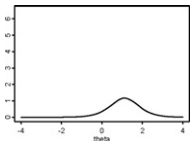
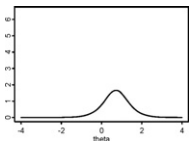
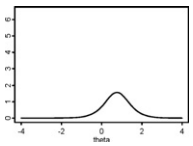
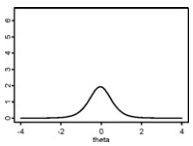
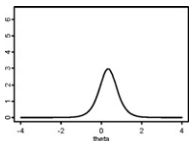
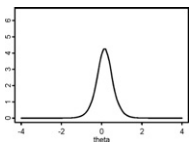
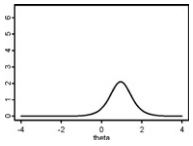
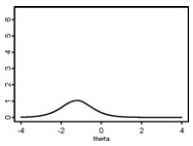
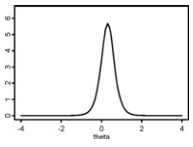
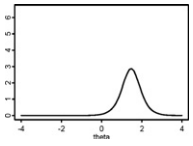
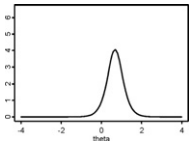
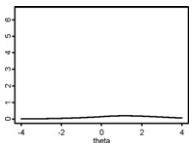
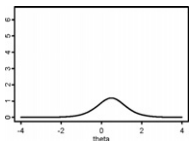
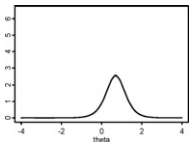
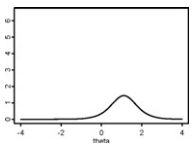
Item	Factor loading	h^2	a	b	Psychometric information
1	**.68**	**.53**	**2.26**	**2.12**	
2	**.74**	**.44**	**2.16**	**1.12**	
3	.81	.34	2.58	0.72	
4	**.80**	**.35**	**2.51**	**0.76**	
5	**.84**	**.29**	**2.78**	**−0.05**	
7	**.87**	**.23**	**3.45**	**0.34**	
8	**.91**	**.16**	**4.14**	**0.15**	
9	**.82**	**.32**	**2.90**	**0.95**	
10	**.75**	**.44**	**2.04**	**−1.23**	
11	**.93**	**.13**	**4.77**	**0.31**	
13	**.83**	**.30**	**3.39**	**1.47**	
15	**.89**	**.20**	**4.03**	**0.68**	
18	.43	.81	0.88	1.29	
19	**.76**	**.41**	**2.18**	**0.49**	
21	**.85**	**.28**	**3.20**	**0.70**	
22	.76	.41	2.40	1.11	

Table 2 (*continued*)

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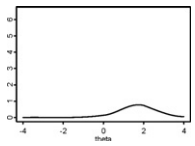
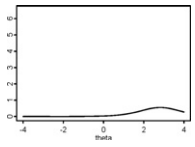
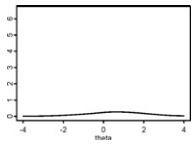
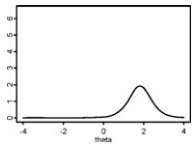
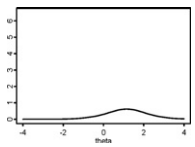
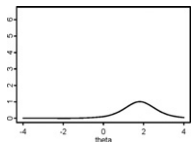
Table 2 (*continued*)

Item	Factor loading	h^2	a	b	Psychometric information
23	.65	.58	1.77	1.72	
24	.51	.73	1.49	2.82	
26	.53	.72	1.05	0.68	
29	**.75**	**.42**	**2.78**	**1.82**	
30	.62	.60	1.58	1.15	
31	**.67**	**.54**	**2.01**	**1.81**	

Note. In bold print are the 15 items retained for the abbreviated SPQ; h^2 = communality.

A structural equation model (SEM) was then employed to asses the validity of the abbreviated SPQ. The common factor model was fitted to a matrix of tetrachoric correlations using the robust weighted least squares estimator ("WLSMV") implemented in Mplus (version 4.21; Muthén & Muthén, 2007). Four indices were considered to assess model fit: (a) the incremental fit index of Tucker and Lewis (1973), TLI, (b) the comparative fit index, CFI (Bentler, 1990), (c) the root mean square error of approximation, RMSEA (Steiger & Lind, 1980, as cited in Hu & Bentler, 1998), and (d) the standardized root mean square residual (SRMR; Bentler, 1995; Jöreskog & Sörbom, 1981). Better fit is indicated as TLI and CFI approach 1 and as RMSEA and SRMR approach 0. A rough cut-off criterion for good fit is near .95 for TLI and CFI, near .06 for RMSEA, and near .08 for SRMR (Hu & Bentler, 1999).

Results

UNIDIMENSIONALITY OF THE SPQ

To our knowledge, the latent structure of the SPQ has not been previously examined. Thus an EFA was undertaken. Promax rotation, the only oblique rotation available in Mplus at the time of this analysis, was performed to allow for nonzero correlations among the factors. The number of factors was selected based on substantive interpretability and two fit indices: the RMSEA and the root mean square residual (RMSR), an unstandardized version of the SRMR. Fit improves as RMSR approaches 0. A 2-factor solution was interpretable and fit the data well (RMSEA = .03, RMSR = .06). Table 1 shows that 22 items loaded .40 or above on the first factor and 4 items loaded .40 or above on the second factor (correlation between factors = .54). Importantly, the 4 items that loaded on the second factor were all reverse-scored items. Furthermore, the majority of the items that failed to yield loadings of .40 or above were also reverse-scored items.

Although many self-report measures include items worded in the direction opposite to that of other items, reverse-worded items can reduce internal consistency, reliability, and validity (Benson, 1987; Conrad et al., 2004; Marsh, 1986, 1996; Motl, Conroy, & Horan, 2000; Pilotte & Gable, 1990; Rodebaugh et al., 2004; Rodebaugh, Woods, Heimberg, Liebowitz, & Schneier, 2006), and frequently form a separate method factor that does not appear to be substantively meaningful (Brown, 2003). Given the findings of the EFA and the documented psychometric limitations of reverse-worded items, the 9 reverse-scored SPQ items were removed. EFA was then redone using the remaining 22 SPQ items. The number of factors was selected based on substantive interpretability and the RMSEA and RMSR. A 1-factor solution was interpretable and fit the data well (RMSEA = .04, RMSR = .06). As shown in Table 2, the factor loadings for the 22 SPQ items ranged from .43 to .93.

ITEM RESPONSE MODELING OF THE SPQ

The 22 SPQ items were analyzed together using RC-IRT. Figure 1 shows a plot of the 25 candidate

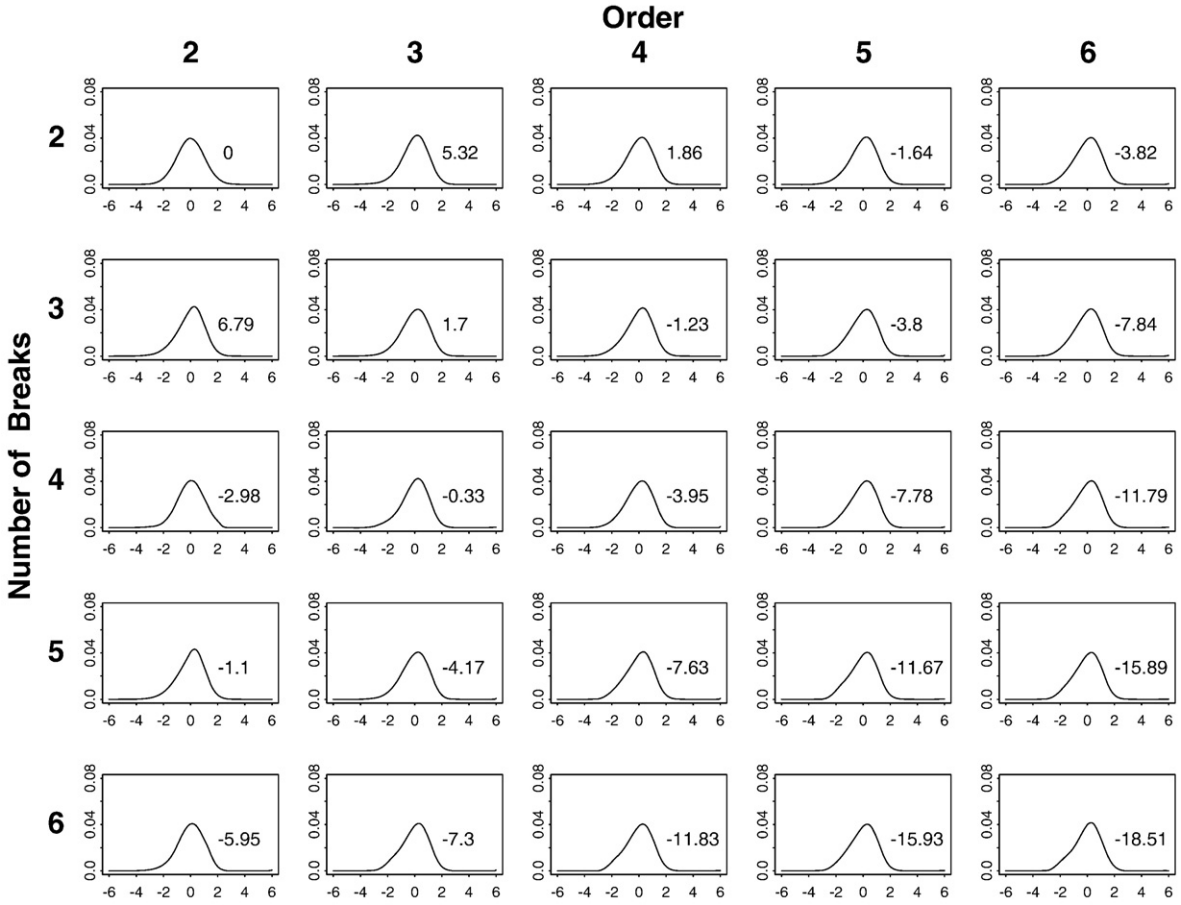


FIGURE 1 Candidate Ramsay curves for the set of 22 SPQ items analyzed with RC-IRT. The order-2 model with 3 breaks was selected for interpretation. The number in each box is the Hannan-Quinn (HQ) index for the normal (2-breaks-order-2) model less the HQ for that model.

curves. The number in each box is the amount by which the HQ index for that model improves upon the normal model (negative values indicate that the normal model is preferable). The consistency in shape among the nonnormal curves provides evidence against the normal (2-breaks-order-2) model for these data. The HQ was best for the 3-breaks-order-2 (3-2) model, and this model was selected for interpretation. Based on the 3-2 model, the latent variable was moderately nonnormal (skew = −0.43, kurtosis = 3.31; 3 has not been subtracted from kurtosis).

Item parameter estimates from the 3-2 RC-IRT model were used to select items for the SPQ short form which discriminated highly among people with varying levels of spider fear. Two specific criteria were used to select or eliminate items. First, to insure inclusion of SPQ items with good to excellent discriminant validity in the abbreviated format, items showing the lowest discrimination ability ($a < 1.75$) were removed. Though this particular cutoff value (1.75) is arbitrary, the important point is that we selected items with higher rather than lower discrimination ability. As listed in Table 2, this exclusion criterion eliminated 5 SPQ items. To illustrate this selection criterion, Fig. 2 displays the item response function for 2 items: one (Item 11) that satisfied the inclusion criterion, and one (Item

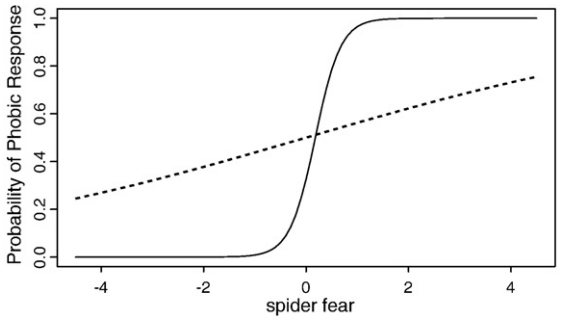


FIGURE 2 Item response functions for two SPQ-31 items. Item 27 is poorly discriminating (dotted line) whereas Item 11 is a highly discriminating item (solid line).

27) that failed to meet the inclusion criterion. As is shown in Figure 2, the probability of endorsing the phobic response option is highly dependent on a person's level of spider fear for Item 11, but increases only minimally with increases in latent spider fear for Item 27.

Second, to insure inclusion of items that identify spider phobia along various points on the latent continuum (i.e., low, middle, high fear), 5 items with the highest *b* parameters, 5 items with the lowest *b* parameters, and 5 items with *b* parameters near 0 were selected. As indicated in Table 2, the abbreviated SPQ consists of 15 items with high face validity (SPQ items 1, 2, 4, 5, 7, 8, 9, 10, 11, 13, 15, 19, 21, 29, and 31). A plot of the psychometric information each item contains, over the range of the latent variable, is also included in Table 2. Most items that were not selected for the short form had flat, noninformative curves. Other unselected items had psychometric properties interchangeable with a selected item (e.g., Item 3). Figure 3 shows that the amount of psychometric information contained in the whole scale with all 22 items (upper panel) is virtually identical to that for the selected 15 items (lower panel). The square root of test information is the inverse of the standard error of measurement:

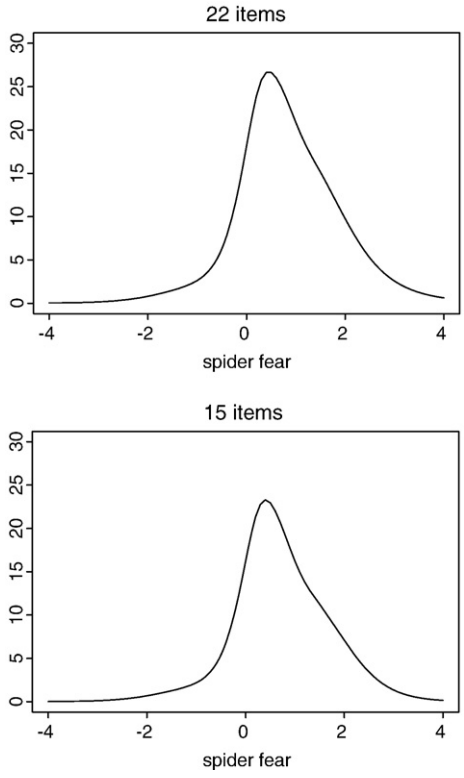


FIGURE 3 Test information curves for the SPQ with 22 items (upper panel) versus with the 15 items selected for the short form (lower panel).

SE = 1/sqrt(test information) (see Embretson & Reise, 2000, p. 185). Thus, although the curve for 22 items has a higher peak, there is little practical difference between test information of about 26 (upper plot) versus about 24 (lower plot): The standard error of measurement is about .20 either way. Thus, eliminating these 7 items had no important impact on the amount of psychometric information provided by the scale.

DESCRIPTIVE STATISTICS OF THE ABBREVIATED SPQ IN A GENERAL SAMPLE

The descriptive statistics for the abbreviated SPQ summed scores were first examined for participants in the present study ($N = 1{,}405$; 63% women; mean age = 20.88, $SD = 5.14$) recruited from undergraduate courses at a large southern university. This subset was not screened for the presence or absence of spider phobia. The overall alpha coefficient for the SPQ-15 ($M = 4.07$, $SD = 3.73$) was good ($\alpha = .89$; average inter-item correlation = .27) and comparable to that for the full SPQ ($\alpha = .89$; average inter-item correlation = .31; $M = 9.71$, $SD = 6.43$). Further, the SPQ-15 total score was highly correlated with the full SPQ total score ($r = .94$), even when corrected for redundancy due to the shared items ($r = .88$) as described by Levy (1967). Also, as expected, SPQ-15 total scores were significantly higher among women ($M = 5.22$, $SD = 3.88$) than among men ($M = 2.30$, $SD = 2.60$), $t = -14.24$, $p < .001$, $d = 0.78$ (Cohen's *d* was calculated as the difference between the mean scores in each group divided by the pooled standard deviation). Finally, each item of the SPQ-15 demonstrated acceptable corrected item-total correlations (range = .35 to .78) based on the criterion of .30 recommended by Nunnally and Bernstein (1994). Taken together, these results suggest that little information is lost from the removal of 16 SPQ items.

CONVERGENT VALIDITY OF THE ABBREVIATED SPQ

A subset of participants in the present study ($n = 323$; 59% women; mean age = 22.36, $SD = 6.41$) also completed the DES. This allowed for examination of the convergent validity of the SPQ-15 given that research has shown that disgust sensitivity, particularly towards small animals, is associated with spider phobia (de Jong & Merckelbach, 1998). To assess the relationships between the SPQ-15 and disgust, an SEM was fitted with spider fear (measured by items of the SPQ-15) as the latent dependent variable, predicted by six latent variables corresponding to subscales of the DES (Animals, Injections/Blood Draws, Mutilation/Death, Rotting Foods, and Smells). Spider fear

was expected to be best predicted by the core disgust (i.e., animals, rotting foods) and less strongly by subscales that remind humans they are animals (i.e., injections and blood draws, and mutilation and death). The WLSMV estimator in the Mplus program was used to fit the model. Global model fit was evaluated with the TLI and RMSEA described earlier, as well as the weighted root mean square residual (WRMR), a statistic similar to SRMR except that it is weighted by the variance of the parameter estimates. WRMR ranges from 0 to infinite, with smaller values indicating better fit. Global fit was acceptable (TLI = .96, RMSEA = .08, WRMR = 1.42). Spider fear was significantly predicted by DES Animals with a standardized regression coefficient (*B*) of .96. The SPQ-15 factor was also significantly predicted by DES Mutilation and Death. However, this relationship was in the inverse direction (*B* = –.26). Multiple R^2 showed that the DES predictors explained 64% of variance in SPQ-15.[1]

DIVERGENT VALIDITY OF THE ABBREVIATED SPQ

A second (independent from those used for the convergent validity analysis) subset of participants in the present study (n = 430; 61% women; mean age = 20.86, SD = 4.84) also completed the IPS-Anx and the ASI. This allowed for examination of the divergent validity of the SPQ-15. Anxiety sensitivity (AS), as assessed by the ASI, refers to the fear of anxiety-related bodily sensations derived from beliefs that these symptoms have harmful consequences (Reiss & McNally, 1985). The literature suggests that AS is a risk factor for the development of anxiety-related conditions, especially panic disorder, but not for specific phobias (e.g., Taylor, Koch, McNally, 1992). Furthermore, there is evidence that specific phobias co-occur at a high rate (Magee et al., 1996). Consequently, the SPQ-15 was expected to be modestly predicted by the IPS-Anx, a measure of injection phobia, but not by the ASI. An SEM was fitted with spider fear predicted by two latent variables corresponding to the ASI (Physical Concerns, Mental Incapacitation) and one additional injection phobia latent variable that consisted of the 18-item IPS-Anx, injection-related fainting, and injection-related avoidance. Global fit was acceptable (TLI = .97, RMSEA = .06, WRMR = 1.39). As predicted, the SPQ-15 factor was significantly predicted by injection phobia with a standardized regression coefficient of .34. The SPQ-15 factor was not predicted by AS related to Physical Concerns (*B* = .14) or Mental Incapacitation (*B* = .00). Multiple R^2 showed that the predictors explained 17% of variance in SPQ-15.[2]

Study 2 Methods: Behavioral Validation of the SPQ-15

PARTICIPANT SELECTION

Participants were selected from a pool of undergraduate students enrolled in introductory psychology courses. Fifty participants (mean age = 19.86; SD = 5.18) were selected and classified into two mutually exclusive groups. The spider fearful group (n = 22; 96% women) consisted of participants reporting yes on a single item question inquiring about avoidance of situations in which spiders may be present. The nonfearful group (n = 28; 100% women) consisted of participants reporting no avoidance of situations in which spiders may be present.

MEASURE

The SPQ (Klorman et al., 1974), described in Study 1, was administered.

BEHAVIORAL AVOIDANCE TASK (BAT)

Participants completed a BAT in which they were instructed to open a black box with a spider inside that was placed 13 feet away on a small table. The spider was a realistic-looking, but fake tarantula that was 4 inches in length.

PROCEDURE

Following the informed consent and self-report assessment process, participants were given a brief introduction to the BAT. The participants were instructed to open the black box in order to look at the spider that was inside. Participants were given the option to comply or refuse the task. If the participant chose not to comply, the experimenter opened the black box and the participant was asked how close she would be willing to get to the opened box in order to look at the spider. The participant's physical approach to the stimulus was then measured in feet and inches (scores ranged from 0 to 13 feet) using a scale that was disguised on the side wall.

Results

PRELIMINARY ANALYSIS

The alpha coefficient for the SPQ-15 (M = 6.24, SD = 5.44) was good (α = .95; average inter-item

[1] These analyses were repeated using the full SPQ and the findings were identical.

[2] These analyses were repeated using the full SPQ and the findings were identical.

correlation = .56) and comparable to that of the full SPQ (α = .96; average inter-item correlation = .45; $M = 13.05$, $SD = 9.96$). The SPQ-15 total score was highly correlated with the full SPQ total score ($r = 0.97$), even when corrected for the redundant items ($r = 0.94$). SPQ-15 total scores were significantly higher among participants reporting avoidance of situations in which spiders may be present ($M = 11.90$, $SD = 2.26$) than among those participants who reported no avoidance of situations in which spiders may be present ($M = 1.78$, $SD = 1.77$), $t = 17.74$, $p < .001$ ($d = 1.86$).

SPQ-15 AND BEHAVIORAL AVOIDANCE

The association between the SPQ-15 total score, the full SPQ total score, and behavioral avoidance on the BAT for the full sample was then examined. Percent refusal on the BAT was 36% (18/50), with a mean approach of 10.30 feet ($SD = 4.06$). The SPQ-15 was significantly associated with compliance ($r = -.79$) and approach behavior ($r = -.75$) on the spider BAT (p's $< .001$). The association between the SPQ-15 and the behavioral avoidance outcomes was also comparable to that of the full SPQ (r's = −.78 and −.74, respectively). A hierarchical multiple regression analysis was then conducted to examine the specific contribution of the SPQ-15 in predicting approach behavior on the BAT when controlling for group membership. Sets of predictor variables were entered in two blocks. In the first block, group status was entered as a predictor. In the second block, the SPQ-15 was entered as a predictor. In the first step, group status explained a significant portion of the variance in approach behavior [$B = .73$, $p < .001$; F (1, 48) = 56.91, $p < .001$]. The SPQ-15 explained marginally significant additional variance in predicting approach behavior ($B = -.47$, $p < .09$).

Study 3 Methods: Pictorial Validation of the SPQ-15

PARTICIPANT SELECTION

One hundred sixteen students were selected based on their scores on brief measures of injection and spider fear and were classified into three mutually exclusive groups. They participated in exchange for research credit.

The Spider Fearful group ($n = 39$; mean age = 19.44, $SD = 2.89$; 74% women) consisted of participants meeting the following criteria: scoring at least 1 *SD* above their respective gender means from the selection pool on the SPQ; reporting avoidance of situations in which spiders may be present; scoring equal to or less than 2 *SD* below the injection phobia patient mean on the IPS-Anx; and reporting neither dizziness in the presence of blood-injection stimuli nor avoidance of medical procedures.

The Blood-Injection-Injury (BII) Fearful group ($n = 37$; mean age = 19.78, $SD = 3.44$; 83% women) consisted of participants meeting the following criteria: scoring equal to or higher than the injection phobia patient mean on the IPS-Anx (Öst et al., 1992); endorsement of dizziness in the presence of blood-injection stimuli and/or avoidance of medical procedures; scoring equal to or less than their respective gender means on the SPQ; and reporting no avoidance of situations in which spiders may be present.

The Nonfearful group ($n = 40$; mean age = 20.15, $SD = 3.85$; 75% women) consisted of participants meeting the following criteria: scoring equal to or less than 2 *SD* below the injection phobia patient mean on the IPS-Anx; reporting neither dizziness in the presence of blood-injection stimuli nor avoidance of medical procedures; scoring equal to or less than their respective gender means on the SPQ; and reporting no avoidance of situations in which spiders may be present.

MEASURES

The SPQ and IPS-Anx, described in Study 1, were administered.

The *Picture Rating Scale* (PRS; Tolin et al., 1997) was used to assess participants' responses to the pictorial stimuli across subjective, motoric, physiological, and cognitive indicators of fear and disgust. The picture rating scale is an 8-item, 11-point Likert-type scale ranging from 0 (*not at all true*) to 10 (*very true*). Each response domain was preceded by the question, "This picture makes me feel …": (1) afraid; (2) disgusted; (3) like running away; (4) like pushing the picture away from me; (5) like my heart is pounding; (6) sick to my stomach; (7) like I am in danger; and (8) like I might be contaminated or infected. Two composite scores were generated based on the PRS. First, the composite fear score was calculated by summing the items referring to the subjective ("This picture makes me feel afraid"), physiological ("This picture makes my heart pound"), motoric ("This picture makes me want to run away"), and cognitive ("This picture makes me feel like I am in danger") dimensions of fear. Second, the composite disgust score was determined by summing the items referring to the subjective/emotional ("This picture makes me feel disgusted"), physiological ("This picture makes me feel sick to my stomach"), motoric ("This picture makes me want to push the picture away from me") and cognitive ("This picture makes me feel like I will be contaminated or infected") components of disgust.

Table 3
Association Between the Spider Phobia Questionnaire-15 (SPQ-15), the Spider Phobia Questionnaire (SPQ), and Fear and Disgust Ratings of Pictorial Stimuli

Emotion Picture Type	SPQ-15	SPQ	Mean (SD)
Fear			
Surgical operations	.08	.02	6.14 (8.71)
Spiders	.57***	.56***	10.52 (11.07)
Rotting foods	.07	.04	2.42 (5.24)
Body products	.15	.08	2.98 (5.02)
Flowers	−.04	−.09	0.01 (0.13)
Disgust			
Surgical operations	.06	.03	10.89 (11.10)
Spiders	.61***	.59***	7.57 (9.57)
Rotting foods	.16	.15	11.74 (10.76)
Body products	.22**	.21*	14.60 (10.71)
Flowers	.10	.07	0.01 (0.13)

Note. $N = 116$. *$p < .05$, **$p < .01$, ***$p < .001$.

PICTORIAL STIMULI

A total of 100 pictures were selected for computer presentation, comprised of five categories, each containing 20 color photographs: (1) surgical operations (thoracic and abdominal regions); (2) spiders; (3) rotting foods; (4) body products (e.g., feces, vomit); and (5) flowers. The pictures served as target and distracter stimuli for a recognition memory experiment, the results of which are presented elsewhere (Sawchuk, Meunier, Lohr, & Westendorf, 2002). The pictures were roughly matched for size, brightness, and figure-ground proportions.

APPARATUS

An Apple Macintosh Quadra 700 computer using PsyScope software presented the pictorial stimuli on a 17″ Vivitron 1776 color monitor.

PROCEDURE

The presentation of the pictorial stimuli for the memory experiment began each testing session. Following completion of the second phase of the memory experiment, one picture from each of the five stimulus categories was randomly selected and presented individually to the participant. Participants then completed a PRS for each of the selected pictures.

Results

PRELIMINARY ANALYSIS

The alpha coefficient for the SPQ-15 ($M = 4.15$, $SD = 3.50$) was good ($\alpha = .87$; average inter-item correlation = .27) and comparable to that of the full SPQ ($\alpha = .88$; average inter-item correlation = .19; $M = 9.62$, $SD = 6.15$). The SPQ-15 total score was also highly correlated with the full SPQ total score ($r = .93$, corrected $r = .86$). Univariate analysis indicated that the spider fearful, blood fearful, and nonfearful groups were different with regards to their scores on the SPQ-15, $F(2, 112) = 149.13$, $p < .001$, and Tukey HSD comparisons suggested that these differences were in the expected direction, with the spider fearful group ($M = 8.28$; $SD = 2.29$) scoring significantly ($p < .001$; $d = 1.66$) higher than the blood fearful group ($M = 2.47$; $SD = 1.71$), who scored ($p = .05$; $d = .52$) higher than nonfearful controls ($M = 1.65$; $SD = 1.42$).

SPQ-15 AND AFFECTIVE RESPONDING TO PICTORIAL STIMULI

The association between the SPQ-15 total score, the full SPQ total score, and affective responding to pictorial stimuli for the full sample was then examined. As shown in Table 3, the SPQ-15 was significantly associated with fear and disgust affective responding to pictures of spiders (p's $< .001$). The association between the SPQ-15 and affective responding to the spider pictures was also comparable to that of the SPQ. The SPQ-15 was also significantly associated with disgust responding to pictures of body products ($p < .01$). No other significant associations were observed between the SPQ-15 and fear and disgust responding to the various picture categories. A hierarchical multiple regression analysis was then conducted to examine the specific contribution of the SPQ-15 in predicting fear and disgust responding to spider pictures when controlling for group membership (see Table 4). Sets of predictor variables were entered in two blocks. In the first block, group status was entered as a

Table 4
Specificity of the Spider Phobia Questionnaire-15 (SPQ-15) in the Prediction of Affective Responding to Spider Pictures

	ΔR^2	*b*	*SE*	*B*	*t*
Spider fear					
Step 1	.08**				
Condition		−3.85	1.23	−.28	−3.13**
Step 2[a]	.29***				
SPQ-15		1.73	.23	.54	7.25***
Spider disgust					
Step 1	.05*				
Condition		−2.77	1.07	−.23	−2.57*
Step 2[b]	.34***				
SPQ-15		1.61	.20	.59	7.97***

Note. *b* = unstandardized regression coefficient; *SE* = standard error; *B* = standardized regression; Condition: 1 = blood phobic, 2 = spider phobic, 3 = nonphobic; [a]$R^2 = 0.37$, $F(2, 112) = 33.44$, $p < .001$; [b]$R^2 = 0.39$, $F(2, 112) = 36.90$, $p < .001$. *$p < .05$, **$p < .01$, ***$p < .001$.

predictor. In the second block, the SPQ-15 was entered as a predictor. Group status explained a significant portion of the variance in the first step predicting spider fear, $F(1, 113) = 9.81$, $p < .01$, and spider disgust, $F(1, 113) = 6.62$, $p < .05$. As shown in Table 4, the SPQ-15 explained significant additional variance in predicting fear ($B = .54$, $p < .001$) and disgust ($B = .59$, $p < .001$) responding to the spider pictures.

Study 4 Methods: Further Validation of the SPQ-15 in a Dutch Sample[3]

PARTICIPANT SELECTION

Participants were those with a strong fear of spiders who applied for treatment at the Ambulatorium of the Department of Psychology of the University of Groningen. After a telephone interview, applicants were asked to write down in their own words how fear of spiders interfered with their daily lives. Only individuals with high fear levels who indicated that fear of spiders strongly interfered with daily life were invited for diagnostic assessment. During a focused clinical interview, it was determined whether the fearful individuals met *DSM-IV* criteria for specific phobia. Interviewers were trained and supervised by a Ph.D.-level clinical psychologist specializing in anxiety disorders. Sixty-one participants (mean age = 33.82; $SD = 11.05$; 82% women) met diagnostic criteria. The control group consisted of 30 participants (mean age = 35.18; $SD = 13.07$; 80% women) reporting minimal fear, who did not meet diagnostic criteria for specific phobia.

MEASURE

The SPQ was administered.

BAT

A BAT was used to assess avoidance of a medium-sized house spider (Tegenaria atrica). The spider was placed in a glass jar on a table. A pencil and a plastic washing bowl were also placed on this table. The participants were instructed as follows: "To get an impression of how far you dare to approach a spider, I will ask you to perform a number of steps. You are free to refuse each step, you are not required to force yourself. But, you should do your very best so that we get an impression of how far you dare to go. Do you have any questions concerning this procedure?" The participant was instructed to perform each step following verbal instructions given by the assistant, who remained in the corner of the room. There were 8 steps: (1) walk as close to the spider as you can; (2) touch the jar; (3) open the jar; (4) take the jar in your hands; (5) touch the spider with the pencil; (6) put the spider in the washing bowl; (7) touch the spider with a finger; (8) let the spider walk over your hands.

After each instruction, the assistant asked the participant whether he or she was willing to carry out the step or not. When participants refused, the instructions describing the step were repeated. To get a positive rating, participants had to start with the step immediately after the instruction and had to perform it successfully within 1 minute. Visual Analogue Scales (VASs) were used to assess peak fear (*extremely not fearful* = 0; *extremely fearful* = 100) and peak disgust (*extremely not disgusted* = 0; *extremely disgusted* = 100) after each step. The BAT was scored on an 8-point scale ranging from 1 (*spider at 4 meters*) to 8 (*spider on hand for at least 30 s*).

PRELIMINARY ANALYSIS

The alpha coefficient for the SPQ-15 ($M = 7.43$, $SD = 4.99$) was good ($\alpha = .93$; average inter-item correlation = .48) and comparable to that of the full SPQ ($\alpha = .96$; average inter-item correlation = .41; $M = 14.81$, $SD = 9.61$). The SPQ-15 total score was highly correlated with the full SPQ total score ($r = .97$, corrected $r = .93$). SPQ-15 total scores were significantly higher among spider phobic participants ($M = 10.67$, $SD = 1.79$) than among the control group ($M = 0.86$, $SD = 2.04$), $t = 23.37$, $p < .001$ ($d = 1.96$).

SPQ-15, BEHAVIORAL AVOIDANCE, AND AFFECTIVE RESPONDING

The association between the SPQ-15 total score, the full SPQ total score, and behavioral avoidance and affective responding on the spider BAT for the full sample was then examined. The SPQ-15 was significantly negatively associated with approach behavior avoidance ($r = -.76$; $M = 5.08$, $SD = 2.58$), fear ($r = .79$; $M = 54.37$, $SD = 39.59$) and disgust ($r = .68$; $M = 38.85$, $SD = 40.62$) (p's $< .001$), and these associations were comparable to associations with the full SPQ (r's $= -.79$, .81, and .70, respectively). A hierarchical multiple regression analysis was then conducted to examine the specific contribution of the SPQ-15 in predicting behavioral avoidance on the BAT controlling for group membership. Sets of predictor variables were entered in two blocks. In the first block, group status was entered as a predictor. In the second block, the SPQ-15 was entered as a predictor.

[3] The SPQ was translated by Dutch colleagues with research interest in spider phobia. Although a backward translation procedure was not employed for the measure used in the present study, a recent back translation resulted in a satisfactory outcome.

Group status explained a significant portion of the variance in the first step ($B = -.70$, $p < .001$) predicting behavioral avoidance, $F(1, 89) = 88.95$, $p < .001$. The SPQ-15 explained significant additional variance in predicting behavioral avoidance ($B = -.78$, $p < .001$).

Study 5 Methods: Treatment Sensitivity of the SPQ-15

PARTICIPANT SELECTION

Individuals with spider phobia ($N = 30$) completing the treatment program (mean age = 32.6 years, $SD = 10.7$, range = 18–55) were predominantly female (83%). In addition to exhibiting extreme fear and avoidance toward spiders, phobic participants were required to be over 17 years old and not suffering from current major depression or psychosis. An additional exclusion criterion was that the spider phobic participants could not have an extreme fear of snakes, as indicated by self-report during the initial telephone screen. Most of the 30 participants in the nonphobic control group were female (77%), and they had a mean age of 24.0 years ($SD = 9.4$, range = 17–56).

MEASURES

Diagnosis. The specific phobia, major depression, and psychotic screening sections of the Structured Clinical Interview for DSM–IV (SCID–IV; First, Spitzer, Gibbon, & Williams, 1997) were administered during an initial telephone interview for all participants. Spider phobia diagnoses were confirmed during an individualized interview in preparation for group treatment.

Questionnaire. The SPQ was administered.

PROCEDURE

Participants were recruited from a university campus and surrounding communities by posting signs and advertisements in local newspapers and offering monetary compensation. Notices directed toward phobic participants also offered free treatment in conjunction with participation in a research study. Interested participants phoned the clinic where they were administered the diagnostic screening interview by telephone. Phobic participants subsequently took part in an idiographic assessment session followed by three weekly 90-min group treatment sessions.

Treatment. The treatment protocol was based on *Mastery of Your Specific Phobia: Therapist Guide* (Antony, Barlow, & Craske, 1997). The protocol was modified to fit a weekly, three-session group format, given evidence that spider phobia can be effectively treated with a short, intensive exposure program (Arntz, Lavy, van den Berg, & van Rijsoort, 1993; Öst, 1996). Groups varied in size from 2 to 6 persons (mean size = 3.7 persons, $SD = 1.0$). The therapist for the study was trained and supervised (using audiotapes of sessions) by a licensed clinical psychologist specializing in the treatment of anxiety disorders, and supervision was maintained throughout the study. A trained research assistant accompanied the therapist during each session to serve as a note taker and to model interactions with the spider. Different assistants were used for various groups, but all were graduate students who were familiar with the principles of cognitive behavior therapy. The treatment involved gradual in vivo exposure. Participants were simultaneously encouraged to counter their maladaptive beliefs, such as that spiders are dangerous or that anxiety is unmanageable. Further, information about the general dangerousness of spiders as well as information about poisonous local spiders was provided (see Teachman & Woody, 2003, for further detail).

Results

PRELIMINARY ANALYSIS

The alpha coefficient for the SPQ-15 (pretreatment $M = 6.11$, $SD = 4.60$; posttreatment $M = 3.85$, $SD = 3.36$) was good (pretreatment $\alpha = .92$, average inter-item correlation = .40; postreatment $\alpha = .85$, average inter-item correlation = .26) and comparable to that of the full SPQ (pretreatment $\alpha = .94$, average inter-item correlation = .31, $M = 12.43$, $SD = 8.31$; postreatment $\alpha = .80$, average inter-item correlation = .12, $M = 8.59$, $SD = 4.76$). The SPQ-15 total score was highly correlated with the full SPQ total score at pretreatment ($r = .97$, corrected $r = .93$) and postreatment ($r = .86$, corrected $r = .75$). Pretreatment SPQ-15 total scores were significantly higher among spider phobic participants ($M = 10.31$, $SD = 2.39$) than the nonphobic group ($M = 2.06$, $SD = 1.50$), $t = 16.35$, $p < .001$ ($d = 1.79$). Pretreatment SPQ-15 total scores were also significantly correlated with posttreatment SPQ-15 total scores among spider phobic ($r = .56$) and nonphobic ($r = .70$) participants.

SENSITIVITY OF THE SPQ-15 TO TREATMENT

A 2 (phobic group vs. control group) × 2 (pretreatment vs. posttreatment) mixed factor analysis of variance with SPQ-15 scores as the repeated measure was calculated to examine treatment efficacy. A significant interaction was expected, showing reduced fear responding following treatment for the phobic group but no change over time for the control group. Consistent with these predictions, a significant Group × Treatment interaction was

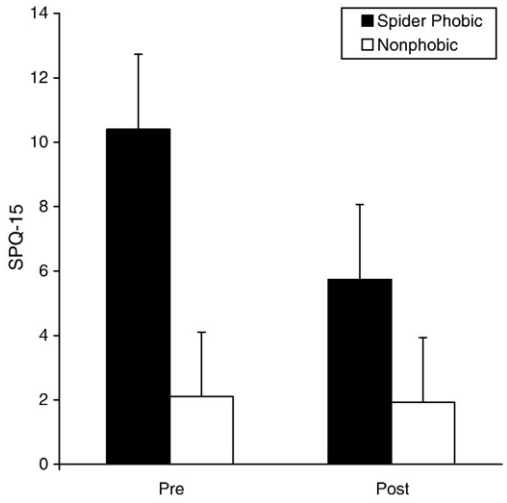


FIGURE 4 Mean scores on the Spider Phobia Questionnaire-15 (SPQ-15) by spider phobic and nonphobic participants pre- and posttreatment.

found on the SPQ-15, $F(1, 54) = 56.03$, $p < .0001$, ${}_p\eta^2 = .51$. As depicted in Fig. 4, examination of this significant interaction indicated significant improvement on the SPQ-15 from pretest to posttest for the spider phobic group, $F(1, 26) = 67.05$, $p < .0001$, ${}_p\eta^2 = .72$. However, no significant differences were observed on the SPQ-15 from pretest to posttest for the nonphobic group $F(1, 28) = 0.54$, $p = .466$, ${}_p\eta^2 = .01$.[4]

General Discussion

Establishing a brief but reliable, valid and sensitive assessment of spider phobia is crucial for both research and treatment of the disorder, as well for advancement of research in anxiety disorders in general. The SPQ has been shown to possess good psychometric properties, including adequate reliability, as well as the ability to discriminate spider phobia from other anxiety disorders. The SPQ, however, has been criticized for its inability to sensitively assess the full range of spider fear (Muris & Merckelbach, 1996). Furthermore, the SPQ consists of 31 items, which is considerably longer than other available measures of spider fear (e.g., FSQ). To provide a spider phobia measure that is brief and psychometrically sound, IRT was applied to a large database of SPQ measurements in a mixed sample of clinical and nonclinical participants.

IRT was used to select 15 of the 31 SPQ items that demonstrated good to excellent discrimination along the spider fear continuum for the final abbreviated SPQ (now SPQ-15). In fact, several of the original 31 SPQ items did not have strong psychometric properties. For example, several items yielded low discrimination parameters, suggesting that these items do not relate well to the latent variable of spider phobia. One important observation was that the majority of items that did not have strong psychometric properties were the reverse-scored items. This indicates that perhaps the reverse-scored items are somehow different than the straightforwardly worded items on the SPQ, such that they do not perform as strongly as a measure of spider phobia. As a result, these items were not able to efficiently discriminate people across a broad range of fearfulness towards spiders. SPQ-15 items were highly discriminating with regards to the latent trait. Moreover, item distribution along the latent trait continuum addresses a major criticism of the SPQ and is consistent with the goals of the SPQ-15 being used for both screening and clinical purposes.

Examination of the SPQ-15's psychometric properties indicated high internal consistency with negligible statistical change from the original. Consistent with the recommendations of Smith, McCarthy, and Anderson (2000) on the development of short forms, classification rates remain high with the SPQ-15 when compared to the original form. Specifically, the SPQ-15 discriminated well between spider phobic (analogue and clinical) and nonphobic groups. The SPQ-15 was also found to be highly correlated with the original SPQ. The use of structural models was also employed to examine the divergent and convergent validity of the SPQ-15. Consistent with prior research (i.e., de Jong & Merckelbach, 1998), disgust reactions towards small animals was found to be uniquely positively associated with spider phobia, as assessed by the SPQ-15, relative to disgust reactions to other stimuli. A second structural model also found specific associations between phobic reactions towards injections and phobic reactions towards spiders, as assessed by the SPQ-15. However, the same model found no association between the SPQ-15 and symptoms of anxiety sensitivity. The results of these models were essentially identical when using the full SPQ, suggesting that there is little to no decrement in the SPQ-15's ability to tap into the overarching spider phobia construct compared with the original.

To address the limitation of exclusive reliance on self-report questionnaires for establishing the convergent validity of the SPQ-15, we also examined the convergence of the SPQ-15 with other assessment modalities. The SPQ-15 was found to be significantly associated with fear and disgust

[4] These analyses were repeated using the full SPQ and the findings were identical.

ratings to pictures of spiders, and generally unrelated to fear and disgust ratings to pictures of other stimulus categories. Furthermore, the SPQ-15 predicted avoidance of spiders above and beyond phobic group membership, indicating incremental validity. Moreover, Study 5 found that the SPQ-15 showed significant change over time during exposure-based treatment, thereby highlighting the potential clinical utility of the SPQ-15.

The results of this study offer supportive evidence for a brief measure of spider phobia that demonstrates initial psychometric strengths and potential clinical utility. With regards to "time-saving benefits," the original SPQ takes approximately 5 minutes to complete (Antony et al., 2001). By reducing the SPQ to 15 items, a valid assessment of spider phobia may be obtained in less than 2 minutes. This time savings could allow for additional brief assessments of related constructs in the research setting. Overall, the SPQ-15 shows promise as a brief measure of spider phobia that, despite its brevity, demonstrates initial psychometric properties on par with the longer SPQ. Consequently, the SPQ-15 appears suitable for use in clinical and research settings where time and resources do not permit administration of lengthy symptom interviews. Despite these encouraging results, however, additional refinement and validation of the SPQ-15 may be required. One specific issue is the response format of the SPQ-15. Like the original, the SPQ-15 consists of a true/false response format, but converting it to a Likert-type response format may improve its predictive utility. Although the present study provides normative SPQ-15 scores for various samples, including a Dutch clinical sample, additional psychometric research is needed to determine potential clinical cutoff scores across different cultures. Future research employing independent administrations (from the SPQ-31) of the SPQ-15 will also be needed to examine whether the short from is predictive of clinically meaningful reductions in spider phobia rather than statistical symptom change, as reported in the present study.

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