

A one-item question with a Likert or Visual Analog Scale adequately measured current anxiety

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Abstract

Objective: To determine whether a single question with a Likert Scale or a Visual Analog Scale (VAS) response adequately measures current anxiety.

Study Design and Setting: Consecutive English-speaking adult women attending a dedicated breast clinic in a major Australian city were invited to complete a demographic questionnaire, the State Trait Anxiety Inventory (STAI), and a single question with a five-point Likert Scale response and a VAS in random order. Only women who completed the STAI were included in analyses.

Results: Four hundred of 497 (80%) eligible women agreed to participate. Both measures were adequate predictors of the STAI score; correlation with STAI was 0.78 (95% confidence interval [CI] 0.73–0.82) for the VAS and 0.75 (95% CI 0.70–0.79) for the Likert Scale. However, 11% of women incorrectly completed the VAS limiting its usefulness.

Conclusion: A single question with either a Likert Scale or VAS response may be an adequate replacement for the STAI. Both measures quickly and easily assess anxiety and may be useful for research purposes when researchers have very limited time or questionnaire space or need to reduce the burden on participants of completing many measures. © 2007 Elsevier Inc. All rights reserved.

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1. Introduction

The State form of the Spielberger State Trait Anxiety Inventory (STAI) is one of the most commonly used instruments for assessing anxiety at a specific time [1]. It is valid, reliable, and easy to complete and has been used extensively in psychological and health research to measure anxiety in populations as diverse as medical students [2], pregnant women [3], palliative care patients [4], and people with a drug dependence [5]. The major drawback of the STAI is that it is 20 items long, thus it can be burdensome for participants to complete when researchers want to measure anxiety on multiple occasions, such as during a longitudinal study, or when little time is available to measure anxiety.

Attempts have been made to overcome these problems by developing shorter forms of the STAI. The first of these

uses eight of the original 20 items from the state form of the STAI [6]. The number of items for this shortened scale was arbitrarily chosen. The second uses six of the original 20 items, three anxiety present (e.g., I feel upset) and three anxiety absent (e.g., I feel calm) [7]. Unlike the eight-item version, the number of items in this shortened scale was selected on the basis of the smallest number of items (which included an equal number of anxiety present items, e.g., “I feel tense,” and anxiety absent items, e.g., “I feel calm”) that could be used without too much loss of data. The authors of this shortened scale tested two-, four-, six-, eight-, and 10-item forms of the STAI, with a six-item form chosen because it provided the most comparable score to the STAI. It should be noted that the eight-item form was based on the Dutch version of the STAI, and the six-item form the Form Y of the American version, and that although both shortened scales resulted in some loss of information, this loss was not substantial.

Although these represent an improvement on the STAI in terms of completion time and burden on the person completing the measure, the researchers were interested in whether completion time and burden could be further

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reduced by the use of a single question with Likert Scale or Visual Analog Scale (VAS) response or a VAS could be used in place of the 20-item state form of the STAI. The Likert Scale and VAS were chosen because both are frequently used in psychological and health measures, for example quality of life [8,9] and pain [10,11], and are easy to complete. Although the authors are not aware of any one-item Likert Scale for measuring state anxiety, VASs have been shown to be useful in the measurement of anxiety in students and psychiatric patients [12], women with rheumatoid arthritis [11], and patients with generalized anxiety disorder or panic disorder [13]. However, these studies used different VASs, included small numbers of participants, and provided no information on what evidence was used in designing the VAS. Thus, although VASs have been used in a number of populations, there have been problems with these studies.

The objective of this study was to determine whether a single question with a Likert Scale or VAS could be used in place of the 20-item state form of the STAI.

2. Method

2.1. Participants

Women were eligible to participate if they were 18 years or older, able to read and complete a consent form and questionnaires in English, and had been referred to a specialist breast clinic in a major Australian city for diagnostic or screening tests.

2.2. Materials

Demographic questionnaire: This self-administered questionnaire elicited information on women's age, marital status, highest level of education, occupation, country of birth, main language spoken at home, purpose of current visit, current and past breast symptom(s), and diagnostic and screening tests.

State form of the STAI [1]: The scale was originally developed as an objective measure of current anxiety. It contains 20 items covering apprehension, tension, nervousness, and worry. The current form (Form Y) was constructed and standardized using approximately 5,000 people. It contains anxiety present (e.g., "I feel confused") and anxiety absent (e.g., "I feel calm") items and has good reliability and validity. Norms are available for working adults, college students, high school students, and military recruits to enable researchers to determine if people in their study have higher or lower anxiety levels than those of the most closely related normative group. Although the norms were not established using representative or stratified samples, they are considered accurate by Spielberger because studies involving similar groups are comparable to Spielberger's norms. To complete the scale, participants color in a numbered circle (1 = not at all; 2 = somewhat; 3 = moderately

so; 4 = very much so) to indicate their current state for each statement. The score range is 20–80, with a higher score indicating greater anxiety. Research has shown that anxiety absent items are more sensitive for lower levels of anxiety, whereas anxiety present items only really affect anxiety scores when anxiety is moderate to high [14].

Anxiety VAS: We followed recommendations made in two reviews on the use of VASs [15,16]. Although these reviews are not systematic they provide the best available information on constructing VAS. Our scale consisted of a 10-cm horizontal line, anchored on the left by the words "not at all anxious" and on the right by "extremely anxious." Participants were provided with written instructions on how to complete the scale, "Please mark the line below with a vertical stroke to show how anxious you feel at the moment." and three written examples, "A mark at the extreme left would show that you are feeling not at all anxious at the moment. A mark at the extreme right would show that you are feeling the most anxious you could ever imagine. A mark near the centre would show that you feel moderately anxious." A higher score indicated greater anxiety.

Anxiety Likert Scale: This one-item scale consisted of five evenly spaced numbers each anchored to a level of anxiety (1 = not at all anxious, 2 = a little anxious, 3 = moderately anxious, 4 = very anxious, 5 = extremely anxious). Participants were given written instructions on how to complete the scale, "Please circle the number that shows how anxious you feel at the moment." and three written examples, "If you circle '1' you are feeling not at all anxious at the moment. If you circle '5' you are feeling the most anxious you could ever imagine. If you circle '3' you are feeling moderately anxious." A higher score indicated greater anxiety.

Copies of materials are available from the corresponding author.

2.3. Procedure

Consecutive eligible women were invited to participate in the study by a receptionist. Interested women were directed to a researcher based in the waiting room. She explained the purpose of the study. Women willing to participate were given the next numbered, sealed study pack, which contained an information sheet, consent form, demographic questionnaire, three anxiety measures (STAI, VAS, and Likert Scale), and reply envelope.

To ensure anxiety questionnaires were completed in random order, one questionnaire was included with the information sheet, consent form, and demographic questionnaire; a second was sealed in an envelope labeled "Please open and complete this questionnaire SECOND"; and a third in an envelope labeled "Please open and complete this questionnaire THIRD." The order of completion was determined using a random number table generated on STATA 7 for Windows [17]. Women completed all anxiety

questionnaires at the same time. The researcher was available at all times to answer questions.

2.4. Analysis

Only women who completed the STAI were included in analyses because its completion was necessary for comparison with the Likert Scale and VAS. The STAI was scored according to instructions in the manual [1]. STAI missing more than two items were excluded from analysis, with up to two missing items replaced with the mean response for that individual. The VAS was scored by measuring how far along the line (in mm) from the “not at all anxious” anchor the line was marked. It was decided a priori to exclude from analysis any VAS where the participant had not marked the line (circled or ticked an anchor or drawn a horizontal line above or below the VAS) or marked it in more than one place (using an asterisk) because their inclusion would have involved making assumptions about the anxiety level indicated by the participant. Thirty-five VASs were excluded. A random 10% of completed VASs were measured by a second person, blind to the results of the first. There was complete agreement. The Likert Scale score was the number circled.

Data were entered in STATA 7 for analysis [17]. Agreement was measured using Spearman’s correlation. The nature of the relationship between STAI and single-item responses was characterized by regression coefficients (beta), which describe the size of the change in STAI for a standardized unit change in each measure, the residual standard deviation (SD) from the regression, which describes the size of the error of a prediction of STAI based on each measure, and the percentage of variability in STAI explained by variability in each measure. Regression used standardized values of the Likert Scale and VAS calculated by dividing the scale by its SD to facilitate comparability. Prediction graphs for the VAS and the Likert Scale against the STAI were derived from the regression.

Analysis of the demographic variables was conducted using SPSS [18]. Differences were considered significant at $P < 0.05$.

This study was approved by The University of Sydney Human Research Ethics Committee.

3. Results

Of 497 eligible women, 400 (80%) agreed to participate. The STAI was completed by 356 women, with 350 of them also completing the Likert Scale and 316 the VAS. Women were generally married, well educated, and spoke English at home (Table 1). Participants ranged in age from 19 to 83 years, with a mean age of 47 years (SD = 12 years). Most women had previously had a breast symptom, and were attending for diagnostic tests to investigate a lump. Women having diagnostic tests (mean age = 44 years,

Table 1
Demographic and breast test characteristics of participants ($n = 381$)

Characteristic		Women ^a	
		<i>n</i>	(%)
Age (years)	≤39	103	(28)
	40–59	209	(59)
	60+	40	(11)
Highest education level ^b	> Compulsory	280	(78)
	Compulsory or less	69	(19)
English as home language	Yes	337	(94)
	No	17	(5)
Reason for attendance	Diagnostic test	263	(74)
	Screening	88	(25)
Current symptom(s) ^c	Lump/lumpiness	195	(55)
	Pain/tenderness	65	(18)
	Other	57	(16)
Past breast symptom(s)	Yes	257	(72)
	No	91	(26)
Screening mammogram	≤2 years ago	204	(57)
	≥2 years ago	49	(14)
	Not sure/never had one	97	(27)

^a *n* may not add to 356 or % to 100 because of missing data and rounding.

^b 11 years of schooling is compulsory in New South Wales, Australia.

^c Women may have nominated more than one current symptom.

SD = 12) were on average younger than women attending for screening (mean = 52 years, SD = 11 years, $t = -5.527$, $df = 349$, $P < 0.001$). STAI scores ranged from 20 to 77, with a mean of 41 (SD = 13), which is significantly higher than the norm for working women (mean = 35, SD = 10; $t = 7.030$, $df = 806$, $P < 0.001$) [1].

Correlation between the STAI and both of the one-item measures was reasonably high indicating a strong relationship between the measurement tools (Table 2). Prediction graphs show the range of the predicted STAI score for an individual based on their score on the VAS or the anxiety Likert Scale (Fig. 1) The centre line on the graph shows the STAI score that would be predicted based on the Likert Scale or VAS score, and the dotted lines show the 95% confidence intervals (CI) for this predicted value. These graphs indicate that predicted STAI scores vary between a minimum of 25 and a maximum of 65 for both VAS and Likert Scales, indicating a small reduction in the range of responses. Standardized regression coefficients for both single-item scales are similar indicating that they both relate to the STAI score in a similar way, the VAS score explaining slightly more variability in STAI than the Likert Scale.

Table 2
Comparison of anxiety measures

Measure	Spearman	Beta (95% CI)	R^2	SD of residuals
VAS	0.78	9.86 (9.01–10.72)	0.62	7.66
Likert	0.75	9.77 (8.89–10.65)	0.58	8.13

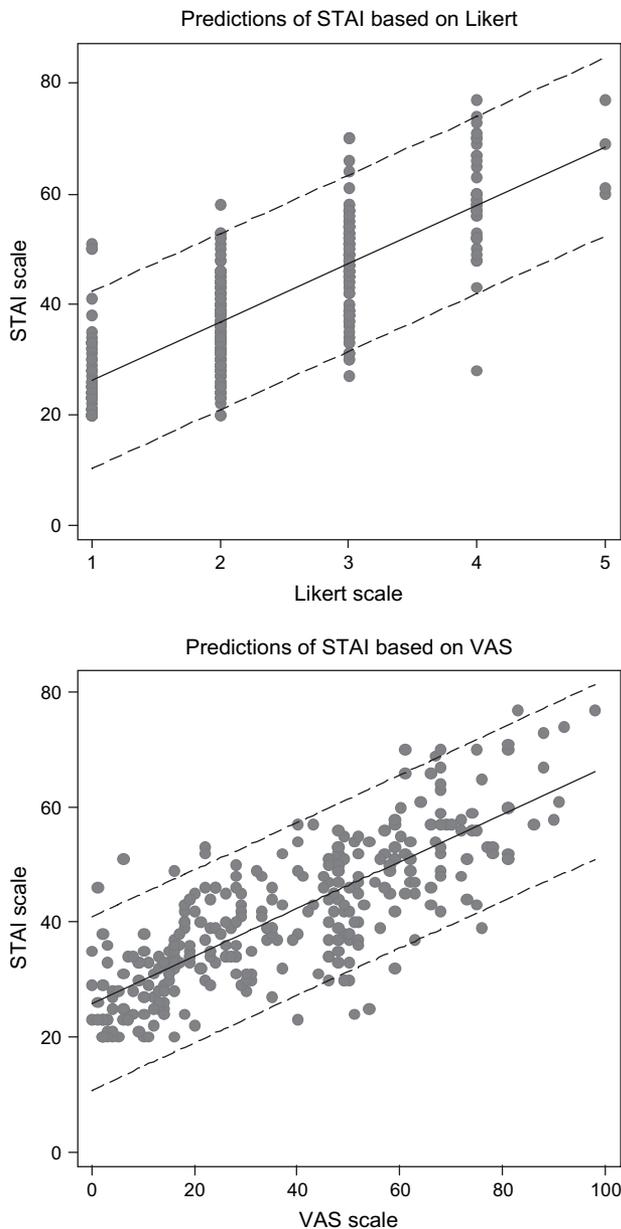


Fig. 1. Prediction interval graphs for Likert scale and VAS.

4. Discussion

The anxiety score obtained using the VAS and Likert Scale showed good comparability with STAI score. However, the smaller possible response range for the Likert Scale compared with the STAI means that it is inevitable that researchers using the Likert Scale will forgo some sensitivity to use a briefer measure. Although comparability with the STAI is the main basis on which a brief measure should be judged, other more practical factors that affect its use, such as completion rates, should also be considered. Almost all women completed the Likert Scale correctly; however, 35 women (11%) incorrectly completed the VAS. This may suggest that the Likert Scale would be preferable, however, this must be weighed against the loss of

responsiveness that comes with using a measure with a potential score from 1 to 5 as opposed to 20 to 80. It should also be noted that there are no normative data for either of the one-item measures. If comparison with norms is wanted the use of a one-item measure of anxiety may not be appropriate.

The English language six-item STAI [7] and the Dutch language eight-item version [6] are good and practical alternatives to using the 20-item STAI [1]. Because the current study formed part of developmental work for a longitudinal study with many repeat measures, we were interested to see if participant burden could be reduced even further by using only a single-item measure of anxiety. Thus, we tested the two single-item measures against the 20-item STAI. Although we recognized that as the longitudinal study would involve English reading persons it would be of interest to compare the two one-item measures against the six-item version as well, this was not possible within the present study, because the six-item version is a subset of the 20-item STAI. Therefore, scores on these measures collected at the same time from the same individuals would be expected to be very highly correlated (if not in perfect agreement) due to familiarization with the questions and therefore comparison with both the six-item and the 20-item STAI seemed redundant. Because the 20-item STAI is regarded as the more comprehensive and accurate measure we used it for comparison purposes.

5. Conclusion

These findings suggest that a very simple, quick, one-item anxiety question with either a five-point Likert response scale or a 100-mm VAS can be readily completed by participants and adequately measures anxiety. It may be useful in some research contexts, particularly if time or questionnaire space is very limited or repeated measures are required.

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