Do people with and without medical conditions respond similarly to the Short Health Anxiety Inventory? An assessment of differential item functioning using item response theory ☆

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ABSTRACT

Objective: Individuals with medical conditions are likely to have elevated health anxiety; however, research has not demonstrated how medical status impacts response patterns on health anxiety measures. Measurement bias can undermine the validity of a questionnaire by overestimating or underestimating scores in groups of individuals. We investigated whether the Short Health Anxiety Inventory (SHAI), a widely-used measure of health anxiety, exhibits medical condition-based bias on item and subscale levels, and whether the SHAI subscales adequately assess the health anxiety continuum.
Methods: Data were from 963 individuals with diabetes, breast cancer, or multiple sclerosis, and 372 healthy individuals. Mantel–Haenszel tests and item characteristic curves were used to classify the severity of item-level differential item functioning in all three medical groups compared to the healthy group. Test characteristic curves were used to assess scale-level differential item functioning and whether the SHAI subscales adequately assess the health anxiety continuum.
Results: Nine out of 14 items exhibited differential item functioning. Two items exhibited differential item functioning in all medical groups compared to the healthy group. In both Thought Intrusion and Fear of Illness subscales, differential item functioning was associated with mildly deflated scores in medical groups with very high levels of the latent traits. Fear of Illness items poorly discriminated between individuals with low and very low levels of the latent trait.
Conclusions: While individuals with medical conditions may respond differentially to some items, clinicians and researchers can confidently use the SHAI with a variety of medical populations without concern of significant bias.

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Introduction

Health anxiety involves concern about one's health or about having or acquiring a serious disease [6]. The trait is highly prevalent; indeed, as many as 81% of undergraduate students experience at least some level of health anxiety [7] and approximately 6% of people report experiencing a significant degree of health anxiety in their lifetime [25]. Individuals with medical conditions are particularly likely to report high health anxiety, as evidenced by the prevalence of clinically significant health anxiety in individuals attending clinics in neurology (24.7%), respiratory medicine (20.9%), gastroenterology (19.5%), cardiology

(19.1%) and endocrinology (17.5%; [28]). A recent investigation of individuals with type 1 or type 2 diabetes shows a similar rate of elevated health anxiety of 24.1% [16]. There are several potential explanations for higher rates of elevated health anxiety in those with medical conditions. Individuals with medical conditions may be more likely to experience somatic sensations that they perceive as dangerous (e.g., as indicating the seriousness of their condition), to appreciate the negative consequences of their condition, and to experience reduced pleasure in their lives due to social isolation and reduced participation in pleasurable activities [10].

Severity of health anxiety in research settings is typically assessed by means of self-report inventories. Existing studies demonstrate that individuals with medical conditions have higher health anxiety scores than those without [3,23]; but, researchers have not tested whether these higher scores reflect true differences in health anxiety or measurement bias associated with medical conditions. For example, individuals with medical conditions could be more likely to endorse being highly aware of bodily sensations and changes because of their medical

symptoms. As a result, individuals with medical conditions could potentially score higher on measures of health anxiety even though they may have similar levels of health anxiety compared to healthy individuals.

A difference in scores on an instrument between two groups of individuals who share similar levels of a latent trait (e.g., health anxiety) is known as differential item functioning [11,24,30]. Many psychological instruments, ranging from personality inventories (e.g., Abridged Big Five Circumplex of personality traits; [19]) to clinical measures (e.g., Center For Epidemiologic Studies Depression Scale; [9]), exhibit differential item functioning. To illustrate, men with depression are less likely to endorse the item pertaining to crying spells on the Center For Epidemiologic Studies Depression Scale compared to women with a similar level of depression [9]. Differential item functioning may lead to overestimates or underestimates of a latent trait assessed by an instrument comprised of several items (e.g., a self-report scale). These overestimates and underestimates may cancel each other out on a scale level or they may result in an overall instrument bias known as differential *test* functioning [27]. Differential test functioning can undermine the validity of a questionnaire and have notable implications, both in clinical and in research settings. This type of bias could cause certain individuals to unduly meet (or fail to meet) predetermined cut-off scores, resulting in inappropriate use of resources (e.g., further assessments, treatment) and in skewed epidemiological estimates (e.g., the prevalence of depression), or it could lead to inappropriate conclusions regarding group differences (e.g., women are more depressed than men) [27].

Instruments can skew response patterns in other ways. A measure of health anxiety can be biased if its scores do not adequately represent varying levels of the trait. Consider a measure on which individuals with different levels of health anxiety (e.g., average, severe) obtain similar or identical scores. Scores on this measure cannot effectively discriminate between these individuals, and the measure offers little information. Scores on a superior measure would represent incremental differences in health anxiety. Similar to differential item functioning, failure to adequately estimate the severity of a trait can lead to erroneous measurement and classification.

The Short Health Anxiety Inventory (SHAI; [24]) is a measure of health anxiety used frequently by researchers and clinicians (for a review, see [2]). The instrument has historically been used to assist in the diagnosis of hypochondriasis [2,24], a somatoform disorder described in the Diagnostic and Statistical Manual of Mental Disorders, fourth edition, text revision (DSM-IV-TR; [4]). The category *somatoform disorders* in the DSM-IV-TR has been renamed *somatic symptom and related disorders* in the DSM-5, and individuals previously diagnosed with hypochondriasis would most likely meet criteria for the new DSM-5 diagnoses of illness anxiety disorder or complex somatic symptoms disorder [5].

Although the SHAI was designed for use in populations with and without medical conditions [24], research on the measure has focused largely on non-clinical and undergraduate samples, and its properties in medical samples are relatively unknown. The utility of the SHAI in medical samples is particularly important given that individuals with severe health anxiety also often report a medical condition [25]. Moreover, changes in the DSM-IV-TR to the DSM-5 may change the rate at which researchers and clinicians use the SHAI in populations with medical conditions. While DSM-IV-TR *somatoform disorders* focused on medically unexplained symptoms, DSM-5 *somatic symptom and related disorders* focus on distress due to somatic symptoms, regardless of their origin. Individuals with medical conditions who report severe distress due to their condition could thus be more likely to meet criteria for a DSM-5 diagnosis [22], and instruments such as the SHAI will likely see greater use in these populations. Consequently, it is imperative that measures of health anxiety, such as the SHAI, are unbiased in individuals with medical conditions. To date, researchers have not yet tested whether the SHAI exhibits measurement bias based on the presence of medical diagnosis and whether individuals with medical conditions respond to the SHAI similarly to healthy individuals.

The primary aim of the current study was to examine item-level and scale-level response bias in the SHAI in individuals with and without medical conditions using two indices of differential item functioning, namely the Mantel–Haenszel chi-square test and item and test characteristic curves (i.e., functions of item response theory). We interpreted these results in the context of their potential impact on the use of the SHAI in clinical and research settings. A secondary aim of our study was to examine whether incremental scores in the SHAI represent incremental differences in health anxiety along the continuum of the trait. Test characteristic curves are a reliable and useful means to test this assumption [8,13].

Methods

Participants

Data were from four previously published studies with medical samples comprising individuals with type 1 or 2 diabetes ([16]; $n = 360$, $M_{age} = 46.6$, $SD = 15.4$, 37.5% female), breast cancer ([17]; $n = 279$, $M_{age} = 50.8$, $SD = 10.1$, 100% female), or multiple sclerosis ([18]; $n = 324$, $M_{age} = 41.6$, $SD = 9.8$, 81.3% female), as well as healthy university students and community individuals ([18]; $n = 372$, $M_{age} = 27.5$, $SD = 11.4$, 76.9% female). The total sample comprised mostly Caucasian ($n = 1216$, 91.1%), Aboriginal ($n = 29$, 2.2%), and Asian individuals ($n = 29$, 2.2%).

SHAI

The SHAI can be administered either as a 14-item or 18-item version. In both versions, each item consists of four statements (e.g., "I [do not; occasionally; frequently; constantly] have images of myself being ill.") and individuals are asked to select the statement that best reflects their feelings over the past six months. Items are scored on a scale ranging from 0 to 3 according to the statement selected. The 18-item SHAI contains four additional items assessing the perceived negative consequences of having a serious illness (e.g., "A serious illness would ruin [some; many; almost every; every] aspect of my life."). The 14-item SHAI is preferred for use in medical populations because the four additional items may not appropriately assess health anxiety in individuals who already have a serious medical condition [3]. Accordingly, the 14-item version of the SHAI was used in the current study. The SHAI had high internal consistency in all diagnostic groups in the current study, all Cronbach's $\alpha \geq .84$ (see Table 1).

Although multiple exploratory and confirmatory factor analyses have been conducted on the SHAI, there appears to be little consensus on its

Table 1
Descriptive statistics for SHAI scores

Group	M	SD	Cronbach's α	Minimum	Maximum
Total scores					
Healthy	9.77[a]	5.23	.86	0	37
Diabetes	14.69[b]	6.97	.87	1	38
Breast cancer	14.81[b]	6.65	.89	2	34
Multiple sclerosis	14.17[b]	5.86	.83	0	32
Thought Intrusion					
Healthy	7.26[a]	3.43	.80	0	25
Diabetes	10.28[b]	4.54	.81	1	26
Breast cancer	10.53[b, c]	4.19	.82	2	23
Multiple sclerosis	11.41[b, c]	4.36	.82	0	26
Fear of Illness					
Healthy	2.51[a]	2.23	.74	0	12
Diabetes	4.41[b]	2.95	.76	0	13
Breast cancer	4.28[b]	2.86	.81	0	13
Multiple sclerosis	2.76[a]	2.42	.72	0	10

Note. Under each table spanner, different superscripts indicate statistically significant differences in means, $p < .001$.