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How to assess common somatic symptoms in large-scale studies: a systematic review of questionnaires

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ABSTRACT

Objective
Many questionnaires for assessment of common somatic symptoms or functional somatic symptoms are available and their use differs greatly among studies. The prevalence and incidence of symptoms are partially determined by the methods used to assess them. As a result, comparison across studies is difficult. This article describes a systematic review of self-report questionnaires for somatic symptoms for use in large-scale studies and recommends two questionnaires for use in such studies.

Methods
A literature search was performed in the databases Medline, PsycINFO and EMBASE. Articles that reported the development, evaluation, or review of a self-report somatic symptom measure were included. Instrument evaluation was based on validity and reliability, and their fitness for purpose in large scale studies, according to the PhenX criteria.

Results
The literature search identified 40 questionnaires. The number of items within the questionnaires ranged from 5 to 78 items. In 70% of the questionnaires, headaches were included, followed by nausea/upset stomach (65%), shortness of breath/breathing trouble (58%), dizziness (55%), and (low) back pain/backaches (55%). Data on validity and reliability were reported and used for evaluation.

Conclusion
Questionnaires varied regarding usability and burden to participants, and relevance to a variety of populations and regions. Based on our criteria, the Patient Health Questionnaire-15 and the Symptom Checklist-90 somatization scale seem the most fit for purpose for use in large-scale studies. These two questionnaires have well-established psychometric properties, contain relevant symptoms, are relatively short, and are available in multiple languages.

INTRODUCTION

A symptom is a self-reported bodily sensation or mental experience that is perceived by a person as a change from normal health [1]. A British study showed that the mean number of symptoms reported in the general population is between three and four in the last two weeks [2] and a recent Norwegian study found a strong association between the number of symptoms and functional status [3]. Symptoms may be mediated by a change in bodily function or may be associated with disease. It is commonly the case that a symptom cannot be conclusively explained by organic pathology. These symptoms are referred to as functional somatic symptoms (FSS). The more symptoms reported, the more likely symptoms are functional in nature [4,5]. Patients who frequently complain of physical symptoms that either lack a demonstrable organic basis, or that are judged to be in excess of what would be expected based on medical findings, are thought to be suffering from the process of somatization. This view is qualified by the knowledge that future research may find medical explanations for some of these FSS. Somatization refers to a tendency to experience and communicate somatic distress in response to psychosocial stress and seek medical help for it [6]. Functional somatic symptoms are common [7-9], disabling [10-12], costly [13], and patients often feel misunderstood, guilty and even ashamed [14].

The occurrence of symptoms is often assessed by using a self-report symptom questionnaire. Many different questionnaires are available and the use of these questionnaires differs greatly among current studies, complicating the comparison of studies. Firstly, the questionnaires differ greatly in the number of symptoms questioned. Secondly, there is a large variety in the type of symptoms included in the questionnaires. Previous studies have suggested that certain types of symptoms cluster together [15-17]. Although not found in all studies, the following four clusters are commonly reported: cardiopulmonary (including autonomic symptoms), gastrointestinal, musculoskeletal, and general symptoms. Thirdly, some of these questionnaires assess symptoms in general, while others focus on medically unexplained symptoms. Being certain that a symptom is medically unexplained can be difficult, has low inter-rater reliability [18,19], and would be impossible to assess in large-scale studies. Fourthly, the time frame of assessment varies largely. Some questionnaires are based on life-time symptoms; but several researchers suggest that recall of lifetime symptoms is unreliable and inconsistent [20-22]. Others address time frames of between a week and a month. Fifthly, some questionnaires enquire only about the categorical presence of symptoms, while others inquire about symptom severity; both symptom diversity and severity may be important [9].

Given the heterogeneity of scales with respect to content, scaling, and dimensionality, severity scores from different FSS or somatic symptom scales are incomparable. Using cut-off-scores, each scale identifies a unique subgroup that differs in various aspects from subgroups identified by other scales. It would be very useful to have a gold standard measure for the assessment of both FSS and somatic symptoms in general in large-scale studies. Agreement regarding the use of such an instrument can facilitate systematic comparisons or meta-analytical studies and thereby contribute to the understanding of the etiology of functional somatic symptoms.

To the best of our knowledge, an overview of the currently available symptom questionnaires has not been reported. This article describes a systematic review of self-report questionnaires for common somatic symptoms for use in large-scale studies. It will conclude with a recommendation for which symptom questionnaires are the best to use. This recommendation will be based on validity and reliability on the one hand, and applicability in large-scale studies on the other hand. The first aspects will be evaluated in terms of number and types of symptoms included, the response scale, time frame covered, and data on validity and reliability. The second aspects will be evaluated using the PhenX (Phenotypes and eXposures) criteria, according to which a measure should be well-established; easy in its use; of low burden to participants; relevant for future use; and applicable to a variety of populations and regions [23].

METHODS

Search strategy

A literature search was performed in the databases Medline, EMBASE and PsycINFO on the 15th of October 2012. A search term was formulated for searching the databases, which contained a combination of somatoform disorder or synonyms and questionnaire or synonyms and symptoms. For Medline, the following search term was used: ("somatoform disorders/classification"[MeSH Major Topic] OR "somatoform disorders/diagnosis"[MeSH Major Topic] OR "somatoform disorders/epidemiology"[MeSH Major Topic] OR "functional somatic symptoms" [Title/Abstract]) AND (questionnaire[Title/Abstract] OR screen*[Title/Abstract] OR "self report"[Title/Abstract] OR "index"[Title/Abstract]) AND symptoms. For EMBASE and PsycINFO comparable search terms were used. The search was conducted without language restrictions. Personal files of the authors were also reviewed for relevant articles. Additional searches were performed using the

search engine Google and the authors of the questionnaires were contacted to obtain supplemental information of the symptom questionnaires, if needed.

Screening and selection procedure

The titles and abstracts of the retrieved articles were screened by two independent researchers. The articles were chosen for the development, evaluation, or review of somatic symptom or somatization questionnaires. Additionally, the measure had to be a self-report symptom checklist. Interviews were excluded, as these are not suitable for use in large studies. Furthermore, the questionnaires chosen had to include symptoms from more than one symptom cluster; not just symptoms of the gastrointestinal tract or cardiopulmonary system. When the symptom questionnaire was a sub-scale derived from a larger questionnaire, the symptom subscale had to have been separately validated and used. There were no criteria for the target population of the questionnaire. Discrepancies between the two researchers were resolved by consensus. Full articles were then obtained for all included studies. Based on the full text, articles that still fulfilled the inclusion criteria were included in the review.

Data extraction

Authors, year of publication, name of questionnaire, purpose of questionnaire, questionnaire instructions, list of symptoms, answering scale, and language of questionnaire, were extracted for every questionnaire. Data extraction from papers describing the validation of a questionnaire also included validity data, characteristics about the population used (clinical or general, gender and age distribution, nationality or race), and number of participants. Data extraction from articles written in languages other than English was done by native speakers.

Instrument evaluation

The questionnaires were evaluated according to the following criteria; the first set of criteria concerned the validity and reliability of the instrument. Firstly, we examined the type of symptoms included. We assumed that the proportion of questionnaires including a specific symptom reflected expert knowledge on the importance of that specific symptom for the underlying construct. To ensure that the questionnaire was not too restrictive with regard to the type of symptom, we evaluated whether the questionnaires included at least one symptom from each of the following symptom clusters identified in previous studies [15-17]: cardiopulmonary (including autonomic symptoms), gastrointestinal, musculoskeletal, and general symptoms. Since being certain that a symptom is medically unexplained can be difficult, has low inter-rater reliability [18,19], and would be

impossible to assess in large-scale studies, we proposed that self-report symptom questionnaires should preferably question symptoms in general, as opposed to medically unexplained symptoms. Secondly, we noted the time frame covered by the questionnaire. Studies have shown that the recall of lifetime symptoms is unreliable [20-22]. We therefore do not recommend the use of lifetime as a recall period. Thirdly, we assessed the response scale. We looked at the format of the questionnaires' responses: severity, frequency, and the number of response categories. Fourthly, we recorded the psychometric characteristics. The internal consistency was assessed, which reflects whether items in a questionnaire are correlated, thus measuring the same concept. The factor structure of a questionnaire indicates which symptom clusters are present within the questionnaire. Correlations of the symptom questionnaire with other related constructs, for example health anxiety and illness behavior, also inform the validity of the questionnaire. In addition, the test-retest reliability of a questionnaire is an important indicator for the stability of the questionnaire. It is likely that symptom reporting fluctuates over time. Therefore, short time intervals for test-retest reliability would be most appropriate, and an interval of 3-4 weeks is commonly used [24]. We therefore chose to report the test-retest reliability for time intervals no longer than 1 month.

The second set of criteria concerns the applicability to large-scale studies, which we based on the PhenX (Phenotypes and eXposures) criteria [23]. PhenX is an initiative that aims to reach consensus about which measures should be used in large-scale genomic studies, but also applies to other large-scale studies. Within the PhenX initiative several criteria for the selection of well-established, low-burden, high-quality measures were developed. Firstly, the questionnaire should be a well-established measure (used repeatedly over time and coming from highly regarded sources). Secondly, the questionnaire can be used by scientists who do not have expertise in that specific domain. Thirdly, the questionnaire should be a relatively low burden to participants and investigators. Fourthly, the questionnaire should be relevant for the near future. Fifthly, the questionnaire should be applicable to a variety of populations (different ethnic groups, ages and gender); and sixthly, the questionnaire should not be constricted to a particular country/ region [23].

RESULTS

Search results

The search retrieved a total of 1214 articles. 1136 articles were excluded, of which 127 were duplicates; 928 were not about FSS, somatization or were not self-report questionnaires; 5 were about questionnaires with a relevant subscale, but the subscale was not separately validated and used; and 76 were about question-naires already included, but contained no validity data. Additionally, 21 articles were added from our personal files. Thus, 99 articles were included, describing 40 questionnaires (figure 1).
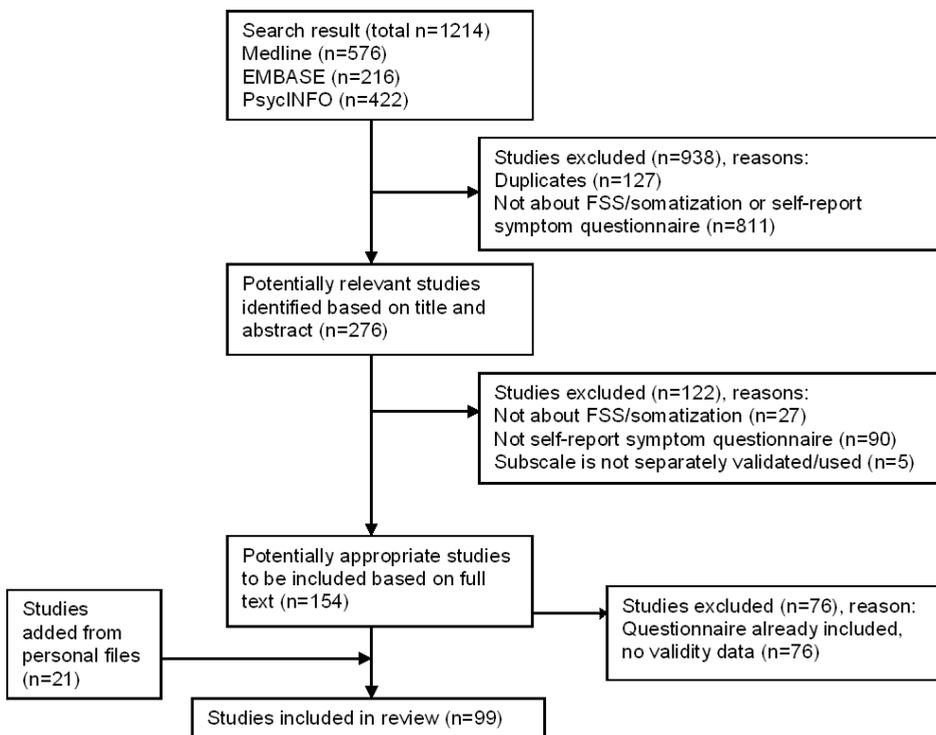
Figure 1. Flow chart of systematic review process

Part 1: Validity and reliability

Evaluation of questionnaires

Table 1 shows the types of questionnaires that were reported within the 99 in-cluded articles. The 40 questionnaires showed considerable overlap in their aims

and sometimes even in their abbreviations (e.g., the PHQ and the BSI each refer to two different instruments). Furthermore, some of the questionnaires are adapted versions of other questionnaires. For example, the SOMS has several versions which differ in the number of items and the time frame for symptom recall, and the BSI-6 is a shortened version of the SCL-90 SOM. The majority of questionnaires assessed the frequency of symptoms (57%). Symptom severity was assessed by 28% of the questionnaires, and 15% assessed both frequency and severity.

Table 1. Overview of the 40 symptom questionnaires and their properties[a]

Questionnaire	Items	Domain assessed	Scale	Time frame	Target population	Multiple languages
4DSQ [25]	16[b]	somatization	5 categories: *no* to *very often or constantly*	past week	primary care patients	yes
ASR [26]	11[b]	somatic complaints	3 categories: *not true* to *very true or often true*	past six months	adults	yes
BDS Checklist [27]	25	BDS; pattern of symptoms rather than a simple symptom count (based on SCAN interview)	5 categories: *not at all* to *a lot*	past month	patients	yes
BSI-6 [28]	6[b]	somatization	5 categories: *not at all* to *always*	past week	adolescents and adults	yes
BSI [29,30]	44	somatic symptoms associated with anxiety and depression	3 categories: *symptom absent* to *present on more than 15 days during the past month*	past month	patients	yes
Cambodian SSI [31]	23	somatic symptoms and cultural syndromes; with a 12-item somatic subscale and an 11-item syndrome subscale	5 categories: *not at all* to *extremely*	past month	traumatized Cambodian refugees	yes
C-PSC [32]	12	psychosomatic symptoms	frequency, 5 categories: *not a problem* to *every day*; severity, 5 categories: *not a problem* to *very, very bad*		children	no
CSI [33,34]	36	intensity of somatic complaints	4 categories: *not at all* to *a whole lot*	past two weeks	children	no
FBL [35]	78	somatic complaints	frequency, 5 categories: *almost every day* to *almost never*; intensity, 5 categories: *very strongly* to *insensitive*	'lately'		yes

Table 1. Overview of the 40 symptom questionnaires and their properties[a] (continued)

Questionnaire	Items	Domain assessed	Scale	Time frame	Target population	Multiple languages
GBB-24 [36]	24	physical complaints	5 categories: *never* to *severe*		patients and general population	yes
GSL [37]	37	psychosomatic stress symptoms	4 categories: *never* to *constantly*			no
HEALTH-49 [38]	7[b]	somatoform complaints	5 categories: *not at all* to *very much*	past two weeks	primary care patients	yes
ICD-10 Symptom List [39,40]	14	somatization disorder	*yes/ no*	past two years	patients	yes
Kellner's SQ [41]	17[b]	somatic symptoms	*yes/ no* or *true/ false*	past week to day	patients and general population	yes
Malaise Inventory [42]	8	psychiatric morbidity	*yes/ no*	'no specific time frame is defined, but the focus on recent state is evident'		no
Manu [43]	5	somatization disorder	*yes/ no*			no
MSPQ [44]	13	heightened somatic and autonomic awareness	4 categories: *not at all* to *extremely, could not have been worse*	past week	designed specifically for chronic backache patients	no
NSS [45]	6	nonspecific symptoms for nonpsychotic morbidity	*present/ not present*	at least three months	patients	yes
Othmer & DeSouza [46]	7	somatization disorder	*yes/ no*	lifetime	general population	yes
PHQ [47,48]	14	somatic symptoms	items 1-11, 7 categories: *not at all* to *all of the time*; items 12-13, 7 categories: *0 times* to *7+* times; item 14, 7 categories: *1 day* to *7+ days*			no
PHQ-15 [15,20]	15	probable somatoform disorder	3 categories: *not at all* to *bothered a lot*	past month	primary care patients	yes
PILL [49]	54	common physical symptoms and sensations	5 categories: *never or almost never* to *more than once every week*	lifetime		no
PSC-17 (SUNYA) [50]	17	psychosomatic symptoms	frequency, 5 categories: *daily* to *not a problem*; intensity, 5 categories: *extremely bothersome* to *not a problem*	frequency scores	general and clinical populations; initially developed for muscle contractions headache patients	no

Table 1. Overview of the 40 symptom questionnaires and their properties[a] (continued)

Questionnaire	Items	Domain assessed	Scale	Time frame	Target population	Multiple languages
PSC-51 [51]	51 or 55	somatization	4 categories: *not at all* to *most of the time*	past week	primary care patients	yes
PSS [52]	35	psychosomatic symptoms	frequency, 4 categories: *never* to *almost every day*; disturbance, 3 categories: *none* to *strong*	past three months	children and adolescents	no
PVPS [53]	14[b]	somatization	3 categories: *never occurred* to *frequently occurred*	past month	people of Vietnamese origin	yes
RPSQ [54]	26	somatization in irritable bowel syndrome patients	5 categories: *never or only once* to *every day*	past month	IBS patients	no
R-SOMS-2 [55]	29	somatization	*yes/no*	past two years	primary care patients	yes
SCI [56]	22	various physical symptoms	frequency, 5 categories: *never* to *daily*; intensity, 5 categories: *no problems* to *extremely troublesome*	past month	general population	no
SCL [57]	11	common somatic complaints	5 categories: *almost never* to *quite often*	past month	children	yes
SCL-90 SOM [58]	12b	somatization	5 categories: *not at all* to *extremely*	past week	psychiatric medical out-patients/general population	yes
SHC [59]	29	subjective health complaints	severity, 4 categories: *not at all* to *serious*; duration: *number of days*	past month	general population	yes
SOMS-7 [60,61]	53	intervention effects in somatoform disorders	5 categories: *not at all* to *very severe*	past week	primary care patients	yes
SSI [62]	35	somatization	*yes/no*	lifetime	primary care patients	yes
SQ-48 [63]	7b	somatization	5 categories: *never* to *very often*	past week	clinical and non-clinical populations	yes
Swartz [64]	11	symptoms that potentially predict a diagnosis of DIS/DSM-3 somatization disorder	*yes/no*	lifetime	general population	no
Syrian Symptom Checklist [65]	19	psychosomatic symptoms; diagnose individuals, follow up treatment, evaluate treatment intervention	4 categories: *never* to *always*	past few weeks		no

Table 1. Overview of the 40 symptom questionnaires and their properties[a] (continued)

Questionnaire	Items	Domain assessed	Scale	Time frame	Target population	Multiple languages
WHO-SSD [66]	12	somatoform disorders	*yes/ no*	past six months	general population	yes
YSR [67]	9b	somatic complaints	3 categories: *not true* to *very true or often true*	past six months	11-18 yr. olds	yes
von Zerssen [68]	24	somatic complaints	4 categories: *not at all* to *strong*			no

[a]According to original questionnaire publication. [b]Subscale of a larger questionnaire

Abbreviations: 4DSQ: Four-Dimensional Symptom Questionnaire; ASR: Adult Self Report; BDS Checklist: Bodily Distress Syndrome Checklist; BSI: Bradford Somatic Inventory; BSI-6: Brief Symptom Inventory; Cambodian SSI: Cambodian Somatic Symptom and Syndrome Inventory; C-PSC: Children's Psychosomatic Symptom Checklist; CSI: Children's Somatization Inventory; FBL: Freiburger Beschwerden Liste (Freiburg Complaint List); GBB-24: Giessener Beschwerdebogen (Giessen Subjective Complaints List); GSL: Goldberg Symptom List; HEALTH-49: Hamburger Module zur Erfassung allgemeiner Aspekte psychosozialer Gesundheit für die thera-peutische Praxis (Hamburger modules to measure general aspects of psychosocial health for therapeutic prac-tice); ICD-10 Symptom List: International Classification of Diseases-10 Symptom List; MSPQ: Modified Somatic Perception Questionnaire; NSS: Nonspecific Symptom Screen; PHQ: Physical Health Questionnaire; PHQ-15: Patient Health Questionnaire; PILL: Pennebaker Inventory of Limbic Languidness; PSC-17 (SUNYA): Psycho-somatic Symptom Checklist; PSC-51: Physical Symptom Checklist; PSS: Upitnika Psihosomatskih Simptoma (Psychosomatic Symptoms questionnaire); PVPS: Phan Vietnamese Psychiatric Scale; RPSQ: Recent Physical Symptoms Questionnaire; R-SOMS-2: Revised Screening for Somatoform Symptoms; SCI: Somatic Symptom Checklist Instrument; SCL: Somatic Complaint List; SCL-90 SOM: Symptom Checklist-90 somatization scale; SHC: Subjective Health Complaints Inventory; SOMS-7: Screening for Somatoform Symptoms; SSC: Syrian Symptom Checklist; SSI: Somatic Symptom Index; SQ-48: Symptom Questionnaire-48; WHO-SSD: World Health Organization-Screener for Somatoform Disorders; YSR: Youth Self Report
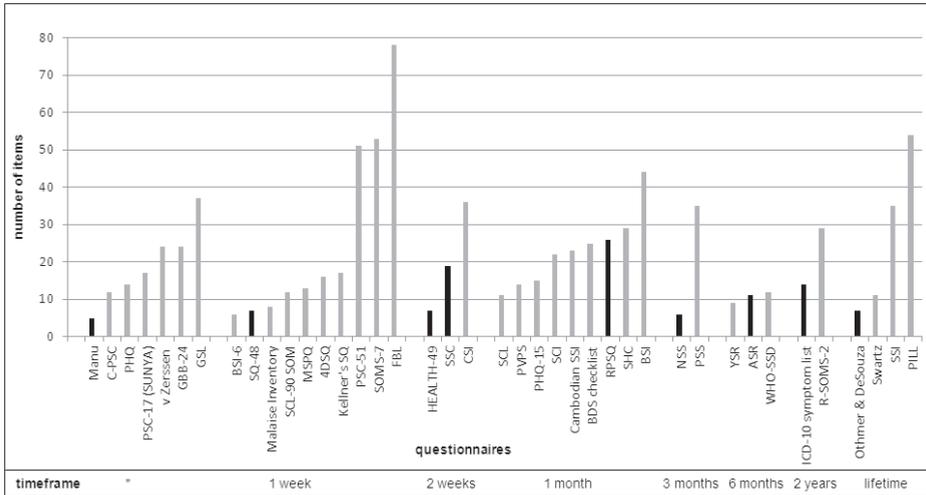
Questionnaire content

Almost 500 descriptions of symptoms were used in the 40 symptom question-naires. After combining descriptions referring to the same symptoms, we found 31 symptoms that were present in at least six questionnaires (table 2). The symp-tom of headache was most often included in the symptom questionnaires (70%). Other frequent symptoms included nausea/upset stomach (65%), shortness of breath/breathing trouble (58%), dizziness (55%), and (low) back pain/backache (55%). We grouped the symptoms into the above-mentioned clusters cardiopul-monary (including autonomic symptoms), gastrointestinal, musculoskeletal, and general symptoms. Remaining symptoms that did not fit into one of the clusters were classified under the category other symptoms. The latter category included symptoms of the sensory organs (e.g. blurred vision), neurological symptoms (e.g. numbness, amnesia), and symptoms of the urinary tract or sexual organs (e.g. pain during urination, pain during intercourse). Nine out of 40 questionnaires did not include at least one symptom from each symptom cluster (Othmer & DeSouza questionnaire, SQ-48, ASR, Manu questionnaire, NSS, Syrian Symptom Checklist, ICD-10 symptom list, RPSQ, HEALTH-49; figure 2).

Table 2. Overview of most included symptoms in the 40 symptom questionnaires. Symptom types that were included in ≥6 questionnaires are shown.

SYMPTOMS	%
Cardiopulmonary/autonomic	
Shortness of breath; breathing trouble; breathing difficulties	58
Chest pain; pains in heart or chest	43
Palpitations; heart palpitations; palpitations (heart pounding)	38
Sweating; sweating a lot; excessive perspiration	28
Gastrointestinal	
Nausea or upset stomach; nausea; nausea, feel sick; nauseated (sick to stomach)	65
Constipation; diarrhea (constipation); diarrhea; constipated (diarrhea); frequent diarrhea	55
Abdominal pain, stomachaches, stomach pain; pain in stomach	53
Bloating; bloating (gassy); belching	35
Vomiting; vomiting, throwing up; vomiting spells	30
Trouble swallowing; difficulty swallowing; difficulty swallowing/lump in throat	28
Heartburn; heartburn or acid regurgitation	23
Loss of appetite, poor appetite	23
Dry mouth	20
General symptoms	
Headaches	70
Dizziness	55
Fatigue; fatigability; feeling tired/little energy; tired; overtired	43
Fainting	25
Weakness; feeling weak	18
Musculoskeletal	
Back pain; pains in lower back; backache; low back trouble	55
Pain in extremities	33
Neck pain; neck or shoulder pain; pain or tension in neck and shoulders; neck/shoulder muscle ache; neck soreness; shoulder pain	28
Painful muscles; soreness of muscles	23
Joint pain	23
Heaviness in arms/legs	15
Other	
Numbness/tingling; numbness/tingling in individual body parts; numbness/tingling; numbness	43
Blurred vision; double/blurred vision; double vision	28
Irregular menstrual periods; painful menstruation; menstrual cramps/other problems with period	23
Pain during urination; difficulty urinating	18
Lump in throat	18
Amnesia; memory loss	18
Pain during intercourse; sexual problems; pain/problems sexual intercourse	15

Symptom clusters are based on previous studies [15-17].

The number of items within the questionnaires ranged from 5 to 78 items. Nineteen of the 40 (48%) questionnaires consisted of 15 items or fewer, as shown in figure 2. The time frames for symptom recall varied between lifetime and the previous week. However, most of the questionnaires inquired about symptoms of the past week or past month (figure 2). Eight out of 40 (20%) questionnaires required the symptoms to be medically unexplained.

Figure 2. Number of items and time frames for symptom recall. Black bars indicate questionnaires that do not contain symptoms from each symptom cluster. *No information about time frames were available from these questionnaires. Abbreviations: 4DSQ: Four-Dimensional Symptom Questionnaire; ASR: Adult Self Report; BDS Checklist: Bodily Distress Syndrome Checklist; BSI: Bradford Somatic Inventory; BSI-6: Brief Symptom Inventory; Cambodian SSI: Cambodian Somatic Symptom and Syndrome Inventory; C-PSC: Children's Psychosomatic Symptom Checklist; CSI: Children's Somatization Inventory; FBL: Freiburger Beschwerden Liste (Freiburg Complaint List); GBB-24: Giessener Beschwerdebogen (Giessen Subjective Complaints List); GSL: Goldberg Symptom List; HEALTH-49: Hamburger Module zur Erfassung allgemeiner Aspekte psychosozialer Gesundheit für die therapeutische Praxis (Hamburger modules to measure general aspects of psychosocial health for therapeutic practice); ICD-10 Symptom List: International Classification of Diseases-10 Symptom List; MSPQ: Modified Somatic Perception Questionnaire; NSS: Nonspecific Symptom Screen; PHQ: Physical Health Questionnaire; PHQ-15: Patient Health Questionnaire; PILL: Pennebaker Inventory of Limbic Languidness; PSC-17 (SUNYA): Psychosomatic Symptom Checklist; PSC-51: Physical Symptom Checklist; PSS: Upitnika Psihosomatskih Simptoma (Psychosomatic Symptoms questionnaire); PVPS: Phan Vietnamese Psychiatric Scale; RPSQ: Recent Physical Symptoms Questionnaire; R-SOMS-2: Revised Screening for Somatoform Symptoms; SCI: Somatic Symptom Checklist Instrument; SCL: Somatic Complaint List; SCL-90 SOM: Symptom Checklist-90 somatization scale; SHC: Subjective Health Complaints Inventory; SOMS-7: Screening for Somatoform Symptoms; SSC: Syrian Symptom Checklist; SSI: Somatic Symptom Index; SQ-48: Symptom Questionnaire-48; WHO-SSD: World Health Organization-Screener for Somatoform Disorders; YSR: Youth Self Report

Internal consistency

Most questionnaires had an acceptable internal consistency; except for the BSI-6 and the Malaise Inventory, for which an internal consistency of <0.70 was found (table 3).

Factor structure

The factor structure was investigated for some questionnaires, which referred to whether the items within a questionnaire clustered into meaningful factors. Factor analysis of the PHQ-15 revealed three factors: cardiopulmonary, gastrointestinal, and general pain/fatigue; which explained 46% of the variance. Factor analysis of the PSC-17 (SUNYA) resulted in one factor, explaining 67% of the variance; however another study reported a five factor solution with a total variance of 36%. Overall, most factor analyses of the questionnaires resulted in multiple factors, often including factors with symptoms originating from the same organ system (data not shown).

Test-retest reliability

The test-retest reliability was reported for a few questionnaires, and referred to the variation of measurements at different time points, for the same individual (table 3). Stability within a short time interval (≤ two weeks) was found for the PVPS, RPSQ, Syrian Symptom Checklist, PHQ-15, SCL-90 SOM, PSC-17 (SUNYA), C-PSC, and the SOMS-2.

Validity

Some of the questionnaires were correlated with other instruments that aimed to measure symptoms, FSS or somatization. Sometimes correlations with structured interviews were found, ranging from 0.52 to 0.80 (table 3). Correlations with the SCL-90 SOM were often investigated. For example, the correlation of the SOMS (time frame of two years) with the SCL-90 SOM was 0.44; however investigating another version of the SOMS in a much larger sample, the SOMS-7 (time frame of seven days, which is equal to the SCL-90 SOM) showed a correlation of 0.76. Furthermore, the SCL-90 SOM and 4DSQ showed a correlation of 0.82, and the correlation of the SCL-90 SOM and the PHQ-15 was 0.38 (table 3). Correlations of the symptom questionnaires with related concepts such as health anxiety and illness behavior were also investigated (table 3). Strong correlations with health anxiety were found for the PHQ-15 and SOMS-7; and less strong for the BSI. For illness behavior, significant correlations were found for the RPSQ, SCL-90 SOM, and the PHQ-15. As found by our literature search, the questionnaires that were most often validated were the PHQ-15 and SCL-90 SOM.

Table 3. Internal consistency, test-retest reliability and validity of 28[a] symptom questionnaires

Questionnaire	Internal consistency (Cronbach's α)		Test-retest reliability	Validity
	overall scale	subscales		
4DSQ [25]	0.80-0.84 [25]			correlation with SCL-90 SOM =0.82 (p<0.001) [25]
BDS Checklist [27]		0.82-0.86 [27]		
BSI-6 [28]	=0.62 [69]			
BSI [29]				correlation with GHQ somatic symptoms =0.64 (British sample) and =0.55 (Pakistani sample) 29; WI (hypochondria) no significant association [70]
C-PSC [32]	=0.83 [32]		at 1 week interval: Pearson product-moment correlation coefficient =0.90 [32]	
CSI [33]	0.90-0.92 [34,71,71]			
FBL [35]	0.95-0.97 [35,72]			
GBB-24 [36]	=0.93 [36]	0.80-0.85 [36]		
HEALTH-49 [38]	=0.82 [38]			
Malaise Inventory [42]	0.47-0.53 [42]			
MSPQ [44]	0.78-0.85 [44]			
PHQ [47,48]		0.60-0.88 [48]		
PHQ-15 [15,20]	0.78-0.87 [20,73-76]		at 2 weeks interval: dichotomized PHQ score (≥3) κ coefficient =0.60; PHQ means of scores of 2 (severe somatic symptoms) intraclass correlation coefficient =0.83 [74]; at 2 weeks interval correlation =0.65 (p<0.001) [76]; at 1 month interval correlation =0.54 [77]	correlation with SCL-90 SOM =0.38 (p<0.001) [77]; proportion of variance R^2 explained by PHQ-15 for SF-20 scales: clinic visits =7.8; disability days =1.4 [20]; correlation with CIDI symptom count =0.52 [73]; correlation WI (hypochondria) =0.50 (males), =0.55 (females), (both p<0.001) [78], =0.33 (p<0.001) [77]; correlation with nr. of symptoms reported in interview =0.63 (p≤0.001); nr. of medically unexplained symptoms assessed by general practitioner =0.63 (p≤0.001) [4]

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Table 3. Internal consistency, test-retest reliability and validity of 28[a] symptom questionnaires (continued)

Questionnaire	Internal consistency (Cronbach's α)		Test-retest reliability	Validity
	overall scale	subscales		
PILL [49]	0.88-0.91 [49]			correlation with Cornell Medical Index (interview symptom count) =0.57 [49]
PSC-17 (SUNYA) [50]	0.74-0.81 [79,80]		at 1 week interval correlation =0.88 (p<0.0001); at 4 weeks interval =0.84 (p<0.0001) [50]	
PSC-51 [51]	=0.88 [81]			
PSS [52]	0.90-0.93 [52]		at 4 days interval: correlation =0.84 [53]	
PVPS [53]	=0.90 [53]			correlations with Cornell Medical Index (interview symptom count) =0.80; doctor visits (self-report) =0.50; self-rated health =0.31; BSI-18 (somatization subscale) =0.70 [54]
RPSQ [54]	=0.86 [54]		at 2 weeks interval: =0.88 [54]	
R-SOMS-2 [55]	=0.83 [55]; 19-items version: KR-20 =0.88 [82]			Correlation with clinical symptom evaluation =0.63 [55]
SCL [57]	=0.83 [57]			
SCL-90 SOM [58]	0.70-0.90 [58,79,83-87]		at 1 week interval: test-retest coefficient =0.82 [58]	correlation highly structured interview by trained clinicians =0.73 [58]; Disease conviction scale =0.67 [88]; correlation with nr. of primary care consultations =0.27 (yr. before baseline) and =0.16 (yr. after baseline), (both p<0.001) [89]
SHC [59]	0.75-0.82 [90]	0.49-0.77 [90]		
SOMS-2 [91]	for items 1-42, 0.87-0.89; for items 1-35, 0.84-0.87 [91]		35-items version: at 72 hours interval correlation =0.85; =0.71 (males); =0.93 (females); =0.97 (tinnitus patients); =0.91 (anxiety and depression patients); =0.75 (pain patients) [92]	group with somatization disorder (according to SOMS) had highest scores on WI (hypochondria) [93]; correlation with SCL-90 SOM =0.44 [91]

Table 3. Internal consistency, test-retest reliability and validity of 28[a] symptom questionnaires (continued)

Questionnaire	Internal consistency (Cronbach's α)		Test-retest reliability	Validity
	overall scale	subscales		
SOMS-7 [60]	=0.92 (gender-unspecific items) [60]			correlation with DSM-4 somatization =0.66; SCL-90 SOM =0.76; WI (hypochondria) =0.46; Mark's scale (disability) =0.40 (all p<0.001) [60]
SQ-48 [63]	=0.89 [63]			
Syrian Symptom Checklist [65]		0.56-0.85 [65]	at 7-10 days interval: Pearson's correlation coefficient =0.89 (males), =0.91 (females) [65]	
YSR [67]	0.76-0.77 [94]			

[a]Data were not available for all 40 questionnaires. The full table with validity data including information about study population and other psychometric properties is available from the authors. Abbreviations: 4DSQ: Four-Dimensional Symptom Questionnaire; BDS Checklist: Bodily Distress Syndrome Checklist; BSI: Bradford Somatic Inventory; BSI-6: Brief Symptom Inventory; BSI-18: Brief Symptom Inventory; CIDI: Composite International Diagnostic Interview; C-PSC: Children's Psychosomatic Symptom Checklist; CSI: Children's Somatization Inventory; FBL: Freiburger Beschwerden Liste (Freiburg Complaint List); GBB-24: Giessener Beschwerdebogen (Giessen Subjective Complaints List); GHQ: General Health Questionnaire; HEALTH-49: Hamburger Module zur Erfassung allgemeiner Aspekte psychosozialer Gesundheit für die therapeutische Praxis (Hamburger modules to measure general aspects of psychosocial health for therapeutic practice; MMPI: Minnesota Multiphasic Personality Inventory; MSPQ: Modified Somatic Perception Questionnaire; PHQ: Physical Health Questionnaire; PHQ-15: Patient Health Questionnaire; PILL: Pennebaker Inventory of Limbic Languidness; PSC-17 (SUNYA): Psychosomatic Symptom Checklist; PSC-51: Physical Symptom Checklist; PSS: Upitnika Psihosomatskih Simptoma (Psychosomatic Symptoms questionnaire); PVPS: Phan Vietnamese Psychiatric Scale; RPSQ: Recent Physical Symptoms Questionnaire; R-SOMS-2: Revised Screening for Somatoform Symptoms; SCL: Somatic Complaint List; SCL-90 SOM: Symptom Checklist-90 somatization scale; SF-20: Short-Form General Health survey-20; SHC: Subjective Health Complaints Inventory; SOMS-7: Screening for Somatoform Symptoms; SSC: Syrian Symptom Checklist; SSPS: Shalling Sifneos Personality Scale; SQ-48: Symptom Questionnaire-48; TAS: Toronto Alexithymia Scale; WI: Whitely Index; YSR: Youth Self Report

5

Part 2: PhenX criteria

Usability and burden to participants

Questionnaires should be of relatively low burden to participants and investigators, and should therefore be both as short as possible and understandable to a wide range of persons. As shown in figure 2, the number of items within questionnaires ranged from 5 to 78, with 48% of the questionnaires being 15 items or shorter. All questionnaires assessed could be used by scientists with no specific expertise in the assessment of somatic symptoms, FSS or somatization, and no training is needed.

Relevance for future studies and to a variety of populations and regions

We can assume that most symptoms included in these questionnaires will be relevant for future studies. As shown in table 1, some questionnaires are available in multiple languages, contributing to their relevance to a variety of regions. Most questionnaires are available in English; however, we were not able to find English versions for four questionnaires: the Syrian Symptom Checklist, von Zerssen questionnaire, SCI, and FBL. The Cambodian SSI is a questionnaire that is very region specific, with symptoms that will probably not be recognized in all regions of the world, such as *"Khyal attacks."* Some of the questionnaires were developed for a specific population; the CSI, YSR, SCL, C-PSC, and the PSS were all developed for children or adolescents. The other questionnaires were either applicable to all age categories or the target population was not explicitly mentioned (table 1). The RPSQ is a questionnaire developed to investigate somatization in irritable bowel syndrome patients and therefore included no symptoms from the gastro-intestinal cluster, because these symptoms are assumed to be present in these patients. Finally, it is worth mentioning that there are seven questionnaires that have gender specific or reproduction related items (e.g. painful menstruation or impotence). These are the Goldberg Symptom List, Othmer & DeSouza questionnaire, PHQ-15, PSC-51, SOMS-7, ICD-10 symptom list, and the SSI. In summary, there were five questionnaires that fulfilled all PhenX criteria. These were the ASR, BSI-6, PHQ-15, SCL-90 SOM, and the SQ-48.

DISCUSSION

Of the 40 questionnaires included in this review, we believe many are unsuitable for use in large-scale studies. Many of these questionnaires did not contain the most relevant symptoms, were too lengthy, used a recall period that is too long,

or were inapplicable to a variety of populations and regions. In addition, some of the questionnaires were more extensively validated than others. Based on our criteria, there were two questionnaires that seem reasonably suitable for the use in large-scale studies. These were the PHQ-15 [15,20] and the SCL-90 SOM [58]. Both are not restricted to medically unexplained symptoms but concern symptoms in general, and both measure symptom severity. With the validity of these questionnaires well-established, these instruments would be suitable for use in future studies. These questionnaires are also relatively short, which makes them easy to use and of little burden to participants. No specific training is needed, making them usable by scientists who do not have expertise in this specific domain. Furthermore, they are available in multiple languages and contain relevant symptoms.

However, several questions remain. The first concerns which symptoms should be included in a questionnaire. We decided that questionnaires should not be restricted to medically unexplained symptoms, given the difficulties in establishing the causes of symptoms, especially in large-scale studies. Inquiring into symptoms in general is also in line with the new proposal for the psychiatric classification of patients with somatoform disorder, which abandons the distinction between symptoms that are medically explained and those that are not [95]. Furthermore, research has shown that a high total somatic symptom count, regardless of whether these are medically explained or unexplained, are important predictors of decreased health status and health-related quality of life [96].

Another aspect is which specific symptoms should be assessed. We reasoned that the proportion of instruments including a particular symptom would reflect expert knowledge and empirical data on the importance of that symptom for these questionnaires. Based on this reasoning, important symptoms are headaches, nausea/upset stomach, shortness of breath/breathing trouble, dizziness, and (low) back pain/backache. Both the PHQ-15 and the SCL-90 SOM contain these five symptoms. The importance and relevance of these symptoms for the process of somatization is underlined by a study showing which symptoms often remain medically unexplained in internal medicine outpatients. These were especially headaches, dizziness, constipation, back pain, abdominal pain, chest pain, numbness and impotence (≥75% of these symptoms remained unexplained) [5]. Of the questionnaires with 15 items or less, the PHQ-15, the SCL-90 SOM, and the Swartz questionnaire inquired about at least five of these often unexplained symptoms. These questionnaires also included symptoms from all relevant symptom clusters, and thus covered an appropriate diversity of symptoms, while retaining a reasonable number of items.

The PHQ-15 and the SCL-90 SOM also differ in some aspects. A significant, but not very high correlation was found between the two questionnaires. Subsequently, only six symptoms overlap. This is probably due to the differences in the conceptual background of the symptom questionnaires. The PHQ-15 consists of the most prevalent symptoms in the US primary care [15], whereas the SCL-90 SOM consists of a subset of somatic symptoms associated with psychopathology [58]. Studies focused at somatization might thus preferably include the SCL-90 SOM, whereas studies interested in common somatic symptoms might preferably include the PHQ-15. Although the recent DSM-5 field trials to assess somatic symptoms used a shortened version of PHQ-15 97, showing that this questionnaire is also commonly used to assess somatization.

Another difference is that the PHQ-15 contains items related to reproduction, in contrast to the SCL-90 SOM. These reproduction related items (menstruation problems and pain or problems during sexual intercourse) would make the PHQ-15 less applicable to children. Furthermore, although the PHQ-15 is well validated in both sexes, 'menstruation problems' should be ignored by men when filling out the questionnaire; and a negative answer to 'pain or problems during sexual intercourse' can have multiple interpretations.

A second remaining question concerns the timeframe. Most of the questionnaires enquired about symptoms in the last month or a shorter time period, with the PHQ-15 covering the past month and the SCL-90 SOM covering the past week. Answers to questionnaires that enquire about symptoms in a longer time period (e.g. the ASR with six months or the Swartz questionnaire with lifetime) are probably prone to recall bias [21], which could result in a less reliable instrument. On the other hand, a short timeframe might detect fluctuations in symptom levels that are not meaningful for symptom measurement. The ideal time frame for symptom questionnaires remains to be investigated, based on an appropriate balance between the risk of excessive recall bias and the detection of meaningful fluctuations. A related issue concerns the answer modalities, which are typically based on frequency for the questionnaires covering longer time windows and both frequency and severity for the shorter time windows. Severity may be a more appropriate and reliable answering scale, compared to frequency of symptoms. The PHQ-15 and SCL-90 SOM both measure symptom severity with respectively a 3-points scale and a 5-points scale. Further research could determine the optimal number of response categories for these questionnaires.

A third question concerns the relevance to a variety of age groups. A questionnaire should be preferably suitable for all age groups. It is not known whether the PHQ-15 and SCL-90 SOM are also suitable for children or adolescents. The PHQ-15 has four symptoms overlapping with the YSR, a questionnaire specific for

children. As mentioned earlier, the PHQ-15 contains two symptoms about reproductive function which would be inapplicable to children. The SCL-90 SOM has three symptoms overlapping with the YSR, but no items related to reproduction.

Internal consistency, factor structure, test-retest reliability and validity

Both the PHQ-15 and SCL-90 SOM showed acceptable internal consistency and factor analyses resulted in meaningful factors. Results of test-retest reliability indicated that the results of the PHQ-15 and SCL-90 SOM are relatively stable within a short time period. Intercorrelations of the PHQ-15 and SCL-90 SOM with other measures of somatization showed some overlap with these, indicating they measure a comparable construct. Additionally, the PHQ-15 and SCL-90 SOM showed some overlap with other related constructs, such as health anxiety and illness behavior. Correlations with health anxiety and illness behavior are especially relevant, as these constructs are part of the new DSM proposal for the diagnosis of somatic symptom disorder [98]. Although some overlap is expected, high correlations of symptom questionnaires with other constructs can indicate a lack of discrimination.

In addition to these psychometric properties, other areas could be further assessed. Sensitivity to change of the questionnaires could be evaluated, in particular if the questionnaire will be used in longitudinal studies. Especially in anticipation of the DSM-5, it would be important to assess the sensitivity and specificity of the questionnaires for the new diagnostic criteria for somatic symptom disorder. Assessments from an item response theory (IRT) approach are also important to evaluate. For example, with IRT it is possible to investigate whether test scores have the same meaning across different groups. This examination of differential item functioning (DIF) for subgroups can be useful in questionnaire evaluation of, for example, general and clinical populations or different ethnic populations [99]. Another example is that IRT can be used to translate scores of one instrument into the other, using a set of anchor items, which are similar items in different questionnaires, that function similarly across questionnaires. Questionnaire scores are then equated, making the individual scores comparable [100]. This could enhance the comparability between studies, even if different questionnaires are used.

Limitations

Although many efforts were taken to identify all symptom questionnaires currently available, there is still a chance that some questionnaires were missed. Furthermore, it is possible that not all validation studies of the questionnaires were included in this study. The main goal of this study was to identify all the relevant questionnaires and not to identify all the validation studies of these

questionnaires. Therefore, the search term used for the literature search in this review was not constructed to identify all the available validation studies. Another limitation concerning the validity of the questionnaires must be acknowledged: in order to evaluate validity, a gold standard is required. For the assessment of symptoms, a gold standard is not available and the questionnaires' validity can therefore not be compared to a gold standard. Additionally, some characteristics of specific symptom questionnaires were unavailable. Some questionnaires may also be available in more languages than reported here, as our search was not targeted at identifying all available versions of the questionnaires. It was not possible to establish the well-establishment (i.e. used repeatedly over time and coming from highly regarded sources) of the questionnaires, as we could not determine whether every questionnaire was often used or came from a highly regarded source.

CONCLUSION

We believe this is the first study that systematically reviewed somatic symptom questionnaires and evaluated them for use in large-scale studies. We provided an overview of which symptom questionnaires are available and suitable. By providing this review, we hope to end the use of different symptom instruments in different studies, which makes comparisons between studies difficult, if not impossible. Although the recommendation of a symptom list was mainly intended for large-scale studies, this could also apply to other types of studies. Ultimately, this will contribute to the harmonization of studies and thereby contribute to knowledge of the prevalence of somatic symptoms or FSS.

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APPENDIX Abbreviations questionnaires

4DSQ	Four-Dimensional Symptom Questionnaire
ASR	Adult Self Report
BDS Checklist	Bodily Distress Syndrome Checklist
BSI	Bradford Somatic Inventory
BSI-6	Brief Symptom Inventory
Cambodian SSI	Cambodian Somatic Symptom and Syndrome Inventory
C-PSC	Children's Psychosomatic Symptom Checklist
CSI	Children's Somatization Inventory
FBL	Freiburger Beschwerden Liste (Freiburg Complaint List)
GBB-24	Giessener Beschwerdebogen (Giessen Subjective Complaints List)
GSL	Goldberg Symptom List
HEALTH-49	Hamburger Module zur Erfassung allgemeiner Aspekte psychosozialer Gesundheit für die therapeutische Praxis (Hamburger modules to measure general aspects of psychosocial health for therapeutic practice)
ICD-10 Symptom List	International Classification of Diseases-10 Symptom List
MSPQ	Modified Somatic Perception Questionnaire
NSS	Nonspecific Symptom Screen
PHQ	Physical Health Questionnaire
PHQ-15	Patient Health Questionnaire
PILL	Pennebaker Inventory of Limbic Languidness
PSC-17 (SUNYA)	Psychosomatic Symptom Checklist
PSC-51	Physical Symptom Checklist
PSS	Upitnika Psihosomatskih Simptoma (Psychosomatic Symptoms questionnaire)
PVPS	Phan Vietnamese Psychiatric Scale
RPSQ	Recent Physical Symptoms Questionnaire
R-SOMS-2	Revised Screening for Somatoform Symptoms
SCI	Somatic Symptom Checklist Instrument
SCL	Somatic Complaint List
SCL-90 SOM	Symptom Checklist-90 somatization scale
SHC	Subjective Health Complaints Inventory
SOMS-7	Screening for Somatoform Symptoms
SSI	Somatic Symptom Index
SQ-48	Symptom Questionnaire-48
WHO-SSD	World Health Organization-Screener for Somatoform Disorders
YSR	Youth Self Report

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