



Original Article

Symptom frequency and development of a generic functional disorder symptom scale suitable for use in studies of patients with irritable bowel syndrome, fibromyalgia syndrome or chronic fatigue syndrome

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Abstract

Objectives: To describe the extent to which irritable bowel syndrome (IBS), fibromyalgia syndrome (FMS), and chronic fatigue syndrome (CFS) exhibit symptom overlap, and to validate a patient-derived, generic symptom questionnaire.

Methods: A patient-derived 61-item symptom-frequency questionnaire was completed by participants recruited through IBS, FMS and CFS self-help websites. Principal axis factor analysis with oblimin rotation was performed separately for those reporting an IBS, FMS or CFS diagnosis.

Results: Questionnaires were completed by 1751 participants of whom 851 reported more than one of the three diagnoses. Stomach pain on at least a weekly basis was reported by 79% of IBS, 52% of FMS, and 43% of CFS single diagnosis participants. Pain increasing the day after activity was reported by 32% of IBS, 94% of FMS, and 85% of CFS single diagnosis participants. Waking still tired at least once weekly was reported by 75% of IBS, 97% of FMS, and 95% of CFS single diagnosis participants. Exploratory factor analysis produced consistent results across all three diagnostic groups, the 61 items loading on 12 correlated factors with a single higher order factor on which all items loaded. Frequency analysis led to the rejection of one item (cold sores on or near lips), and freeform reporting by participants of additional symptoms identified an additional five, namely, restless legs, hair loss/brittle hair/thinning, dizziness/balance problems, blurred vision and urination problems.

Conclusions: IBS, FMS and CFS are polysymptomatic spectrum disorders with a wide range of overlapping symptoms, many of which are unrelated to diagnostic criteria. Frequency analysis and factor analysis confirm the validity of using the same questionnaire across different diagnostic categories. The 65-item general symptom questionnaire (GSQ-65) is a valid generic symptom scale suitable for assessing the many different symptoms of people with IBS, FMS and CFS.

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Introduction

Functional disorders are diagnosed by symptoms after other biomedical causes of these symptoms are ruled out. Three common functional disorders are irritable bowel syndrome (IBS), fibromyalgia syndrome (FMS) and chronic fatigue syndrome (CFS), with prevalence (but varying with population diagnostic criteria) of approximately 10%, 2.5% and 0.2%, respectively.^{1–3} Each of these different functional disorders is diagnosed by a different set of symptoms, and symptom specific scales exist to assess outcome in intervention studies.^{4–7}

Research shows that there is considerable comorbidity between the different functional disorders, and that patients with one functional disorder have a higher probability of having symptoms characteristic of other functional disorders.^{8–14} Whether or not functional disorders should be classified as separate (“splitters”) or not (“lumpers”), there is consensus that functional disorders should be considered, at least to some extent, spectrum disorders, and that patients with any classification are polysymptomatic.¹⁵

If functional disorders are spectrum disorders and polysymptomatic, then scales that are designed to measure the symptoms of one particular functional disorder may not provide a comprehensive picture of the patient's symptoms. A comprehensive, generic functional disorder measure of symptoms is useful in outcome studies because interventions for functional disorders (e.g., psychological interventions and exercise regimens) can have a range of benefits that may not be measured in a disorder specific scale.

The Composite Autonomic Symptom Score (COMPASS) is a commonly used generic scale for functional disorders. The COMPASS consists of 84 symptoms selected from the 169-symptom autonomic symptom profile (ASP).¹⁶ A shorter 31-item version of the COMPASS, the COMPASS 31 scale, has also been published.¹⁷ Although the COMPASS is valid as a generic functional disorder scale, it is not simple to score and has not been optimised for the three functional disorders that are the focus of this study, namely, IBS, FMS, and CFS, and where optimisation includes sensitivity to change in clinical trials.

There are three aspects to optimising a generic symptom scale for use in intervention studies of IBS, FMS or CFS. First, comprehensiveness can be

achieved only by including symptoms that are experienced by a subset of the total population. However, if the proportion of people within a population experiencing that symptom is very low, then there will be little possibility for improvement. Symptoms that are not experienced cannot improve, nor can symptoms that always occur. Although floor and ceiling effects should be avoided, sensitivity to change (and cross-sectional discrimination) over the full range of severities requires a questionnaire made up of symptoms with varying degrees of frequency. A scale that is sensitive to change in more severe patients requires symptoms that are comparatively infrequent, whereas a scale that is to be sensitive to change for mild patients requires symptoms that are comparatively frequent. Thus, in order to select symptoms for inclusion in a scale, it is necessary to identify prevalence and distribution of responses.

Second, there are some symptoms that are highly indicative of particular functional disorders, and it is important that these indicative symptoms should be included. For example, in FMS a common symptom is the experience of pain shifting from one part of the body to another. Shifting pain is unlikely to be caused by peripheral damage and can be an indicator of the centralised pain of FMS. Similarly, CFS patients report that they feel extremely tired the day after increased activity. The “boom and bust” phenomenon of over and under activity is a clinical feature of some patients. Thus, a generic functional disorder symptom scale for IBS, FMS and CFS requires some items that are specific to these disorders, and expressed in the language of patients with these disorders.

Finally, questionnaires are susceptible to anchoring effects,^{18,19} also known as response shift.²⁰ As they improve, patients can change their perceptions of the two end points of a scale (the anchors), and this change in “anchoring” or “response shift” then leads to an underestimation of real change. Symptom scales with severity response scales (e.g., mild, severe) or with non-numeric frequency response scales (e.g., seldom, often) are subject to response shift. Symptom scales with numeric frequency response scales (e.g., once a week, once a day) are less susceptible, and will therefore reduce the impact of response shift.

The aims of this paper were to examine the symptomatology of people with IBS, FMS and CFS to determine to what extent they are spectrum disorders,

and on the basis of that evidence to produce a generic functional disorder questionnaire suitable for patients with a diagnosis of IBS, FMS, and CFS, that (a) is easy to score and produces a single, valid score, (b) uses a numeric frequency response rating scale, (c) uses language adopted by patients and has a single simple response format and (d) is based on the frequency of symptoms in this population so that the final scale comprises symptoms with a range of frequencies.

Methods

Initial questionnaire construction

An initial symptom questionnaire was constructed by comparing and selecting items from a variety of sources including questionnaires designed for the general population^{7,21,22} using the numeric response scale of one of these scales,²¹ adding symptoms that are clinical features of IBS, FMS and CFS so as to produce a 59-item questionnaire. The 59-symptom questionnaire was completed by thirteen non-epileptic seizure patients attending a neurology clinic as part of a separate study²¹ and twenty-five FMS patients attending a rehabilitation course as part of a separate study.²² Patients were encouraged to identify additional symptoms and to suggest ways in which the wording of the symptoms could be improved. Additionally, a group of physically active healthy people commented on the 59-symptom questionnaire and suggested changes to avoid ambiguity (e.g., pain or fatigue that had a lifestyle based explanation). These various forms of feedback led to modifications to produce the 61-symptom questionnaire used in this study. Modifications included changes or expansions to symptom descriptors to improve clarity and avoid ambiguity as well as adding additional symptoms (e.g., double vision). The list of symptoms includes many that are used in other questionnaires, but also some that are unique.

For each symptom, respondents had 6 response options (value of response for scoring shown in parenthesis): never or almost never (1), less than 3 or 4 times per year (2), every month or so (3), every week or so (4), more than once per week (5), every day (6).

Data collection

Questionnaire completion was advertised on websites of IBS, FMS and CFS and IBS self-help groups in the UK and Canada. The advertisements directed participants to a website that provided information about

the study and where patients provided a positive response to show that they had understood and were willing to take part. After providing online consent by clicking the consent box, participants were asked to indicate which of the following three diagnoses they had been given “by a doctor” (any combination was allowed, but patients were required to select at least one). Participants then viewed the list of symptoms and responded to each symptom with one of the six response options. At the end of the questionnaire, there was a textbox in which participants were able to write “any other symptom”. Ethical approval for the study was given by the University of Plymouth, Faculty of Health and Social Science human participants ethical committee.

Statistical analysis

In order to determine to what extent patients were polysymptomatic, respondents were allocated to one of seven groups: IBS-only, FMS-only, CFS-only, IBS + CFS, CFS + FMS, IBS + FMS, and IBS + CFS + FMS. The 61-symptom questionnaire was scored in three ways. The number of symptoms experienced on at least a weekly basis was calculated by counting the number of symptoms with values 4 or above to give the weekly symptom score. The number of symptoms experienced every day was calculated by counting the number of symptoms with value 6 to give the daily symptom score. A symptom scale score was calculated by taking the average score (1–6) of all 61 symptoms.

Differences between the seven groups were tested with one-way analysis of variance for data distributed normally followed by paired comparison using the Scheffe test. *F* values were used to compare between different scoring methods. A *P* value <0.05 was considered statistically significant. Exploratory factor analysis was used to compare the factor structures of different groups. For this analysis, respondents were allocated to one of three groups if they reported an IBS, FMS or CFS diagnosis irrespective of other diagnoses, these groups being labelled any-IBS, any-FMS and any-CFS (i.e., the any-IBS group includes the IBS-only, IBS + CFS, IBS + FMS and IBS + CFS + FMS groups). Separate exploratory factor analysis for each of the any-IBS, any-FMS and any-CFS groups was carried out with principal axis factor extraction and oblimin rotation using the scree and Kaiser–Guttman tests to inform factor number and checking for consistency across populations following recommended, theory

driven, exploratory procedures.²² The criterion for a significant loading was 0.3. Symptoms loading <0.3 were assumed to contribute insufficient variance to the latent variable, either because variance is attributable to another latent variable or because of attenuation of range due to floor or ceiling effects. Any symptom with a frequency of <10% both for the total population and in any one of the three groups, IBS, CFS and FMS, was defined as too infrequent for inclusion in any final questionnaire. Cronbach's alpha coefficient was calculated for the total population.

Results

Completed questionnaires were received from 1751 respondents (1592 female, mean age 50 ± 13 years, range 16–88 years). The numbers of participants in each of the groups were IBS-only (370), FMS-only (384), CFS-only (146), IBS + CFS (108), FMS + CFS (99), IBS + FMS (378), and IBS + FMS + CFS (266). There was a significant difference ($P < 0.001$) between groups for each of the three scoring methods; for the daily symptom score $F = 104.3$, for the weekly symptom score $F = 141.9$, and for the symptom scale score $F = 155.1$.

For the symptom scale score, the means (standard deviation [SD]) are IBS = 2.81 (0.78), CFS = 3.46 (0.72), CFS + IBS = 3.65 (0.84), FMS = 3.67 (0.76), FMS + CFS = 3.96 (0.63), IBS + FMS = 4.06 (0.71), and IBS + FMS + CFS = 4.29 (0.75). Paired comparison using the Scheffe test showed that only the first two and last two adjacent pairs of this sequence were significantly different (Table S1 in the [Supplementary Appendix](#)). All other comparisons were significantly different except for IBS + CFS versus CFS + FMS. For the daily symptom score, the means are IBS = 6.95 (7.4), CFS = 13.29 (7.7), IBS + CFS = 15.61 (9.8), FMS = 16.16 (9.0), FMS + CFS = 18.96 (8.6), IBS + FMS = 19.64 (10.2), and IBS + CFS + FMS = 23.60 (19.5). The results from paired comparisons for the daily symptom scores are the same as those for the symptom scale score with the exception that the pair of CFS and FMS were not significantly different (Table S2 in the [Supplementary Appendix](#)). The weekly symptom scores are IBS = 21.89 (11.7), CFS = 31.60 (10.7), IBS + CFS = 34.05 (12.7), FMS = 35.25 (10.9), CFS + FMS = 38.12 (9.1), IBS + FMS = 40.94 (9.8), and IBS + CFS + FMS = 43.56 (10.4). The results from the paired comparison showed that only the first adjacent pair in this sequence were significantly different. All

other non-adjacent comparisons were significantly different (Table S3 in the [Supplementary Appendix](#)).

The number of symptoms reported on a daily or at least weekly basis as a function of each of the seven groups is shown in [Table 1](#). Although the number of symptoms increases as the number of diagnoses increases, there is a considerable overlap between groups. For example, 12.4% of IBS-only participants reported 37 or more symptoms weekly, showing that some single-diagnosis IBS participants report many symptoms. By contrast, 21.8% of the IBS + FMS + CFS participants reported fewer than 37 symptoms weekly showing that some of these multiple diagnosis patients have fewer symptoms than the single-diagnosis IBS participants. Of those participants with an IBS-only diagnosis, 18.4% had 13 or more symptoms daily whereas 14.7% of IBS + FMS + CFS participants had 12 symptoms or fewer daily. The mean numbers (SD) of symptoms for IBS-only, FMS-only, CFS-only, IBS + CFS, IBS + FMS, CFS + FMS, IBS + FMS + CFS groups on a daily basis were 7.0 (7.4), 16.2 (9.1), 13.3 (7.7), 15.2 (9.9), 19.6 (10.2), 19.0 (8.6) and 23.6 (10.5), respectively, and those on at least weekly basis were 21.9 (7.0), 35.3 (10.9), 31.6 (10.7), 34.1 (12.7), 41.0 (9.8), 38.1 (9.2), and 43.6 (10.4), respectively; the mean scale scores (SD) were 2.90 (0.78), 3.81 (0.73), 3.55 (0.70), 3.78 (0.82), 4.21 (0.67), 4.05 (0.61) and 4.42 (0.70), respectively. The standard deviations also show the wide variation in participants.

Some of the 61 symptoms measured are highly indicative of either IBS (gastric symptoms), FMS (pain symptoms), or CFS (fatigue symptoms). In order to demonstrate to what extent the symptoms used in the diagnosis of one functional disorder also feature in the symptomatology of those with a different functional disorder, [Table 2](#) shows the frequency of these key symptoms on a daily and at least weekly basis as a function of the IBS-only, FMS-only, and CFS-only groups.

In order to provide data on the prevalence of each of the symptoms, [Table 3](#) provides weekly frequency data where participants are allocated to three groups, according to whether they report an IBS, FMS or CFS diagnosis, irrespective of whether they reported additional functional disorder diagnoses. The symptoms are ordered by the relative frequency of the symptoms in the sample as a whole. One symptom, "cold sores on or near lips" fails the criterion for eventual acceptance in the final symptom questionnaire, but is included in all analyses for consistency.

The first four unrotated factors of a principle factor analysis accounted for 35.5%, 4.5%, 3.7% and 2.6% of

Table 1

Frequency (%) of participants reporting different numbers of symptoms on a daily and at least weekly basis ($n=1751$).

Number of symptoms reported	IBS-only ($n = 370$)		FMS-only ($n = 384$)		CFS-only ($n = 146$)		IBS+CFS ($n = 108$)		IBS+FMS ($n = 378$)		CFS+FMS ($n = 99$)		IBS+FMS+CFS ($n = 266$)	
	Daily	Weekly	Daily	Weekly	Daily	Weekly	Daily	Weekly	Daily	Weekly	Daily	Weekly	Daily	Weekly
0–6	232 (62.7)	26 (7.0)	58 (15.1)	2 (0.5)	27 (18.5)	1 (0.7)	22 (20.4)	1 (0.9)	34 (9.0)	0	5 (5.1)	0	10 (3.8)	1 (0.4)
7–12	70 (18.9)	53 (17.1)	90 (23.4)	7 (1.8)	51 (34.9)	5 (3.4)	23 (21.3)	6 (5.6)	69 (18.2)	1 (0.3)	17 (17.1)	0	29 (10.9)	1 (0.4)
13–18	35 (9.5)	78 (21.0)	97 (25.3)	22 (5.8)	37 (25.4)	8 (5.5)	27 (25.0)	3 (2.8)	81 (21.5)	5 (1.3)	29 (29.3)	3 (3.0)	52 (19.5)	3 (1.1)
19–24	19 (5.1)	62 (16.8)	69 (18.0)	30 (7.8)	20 (13.7)	24 (16.4)	18 (16.0)	14 (12.9)	78 (20.6)	21 (5.5)	26 (26.3)	4 (4.1)	53 (19.9)	6 (2.2)
25–30	10 (2.7)	56 (15.1)	39 (10.1)	68 (17.7)	5 (3.4)	30 (20.6)	15 (13.9)	20 (18.5)	56 (14.8)	34 (9.0)	13 (13.1)	16 (16.1)	55 (20.7)	21 (7.9)
31–36	0	39 (10.6)	25 (6.5)	76 (19.8)	5 (3.4)	28 (19.2)	1 (0.9)	18 (16.7)	36 (9.6)	55 (14.6)	7 (7.1)	17 (17.2)	30 (11.3)	26 (9.8)
37–42	4 (1.1)	25 (6.7)	5 (1.3)	69 (18.0)	1 (0.7)	27 (18.4)	1 (0.9)	15 (13.9)	18 (4.7)	84 (22.2)	0	24 (24.2)	25 (9.4)	54 (20.3)
43–48	0	13 (3.5)	0	72 (18.7)	0	14 (9.6)	0	16 (14.8)	4 (1.1)	78 (20.6)	1(1.0)	24 (24.2)	11 (4.1)	52 (19.6)
49–54	0	6 (1.7)	1 (0.3)	27 (7.0)	0	8 (5.5)	0	10 (9.3)	1 (0.3)	77 (20.4)	1 (1.0)	8 (8.1)	0	67 (25.1)
55–61	0	2 (0.5)	0	11 (2.9)	0	1 (0.7)	1 (0.9)	5 (4.6)	1 (0.3)	23 (6.1)	0	3 (3.0)	1 (0.4)	35 (13.2)

IBS: irritable bowel syndrome; FMS: fibromyalgia syndrome; CFS: chronic fatigue syndrome.

Table 2

Frequency (%) of key symptoms at least weekly and daily in the IBS-only, FMS-only and CFS-only groups ($n = 900$).

Symptoms	IBS-only ($n = 370$)		FMS-only ($n = 384$)		CFS-only ($n = 146$)	
	Daily	Weekly	Daily	Weekly	Daily	Weekly
Stomach pain	100 (27.0)	291 (78.6)	40 (10.4)	201 (52.3)	13 (8.9)	62 (42.5)
Diarrhoea	44 (11.9)	250 (67.6)	7 (1.8)	125 (32.6)	3 (2.1)	41 (28.1)
Constipation	31 (8.4)	186 (50.3)	34 (8.9)	197 (51.3)	9 (6.2)	47 (32.2)
Pain increasing the day after you are active	32 (8.6)	119 (32.2)	229 (59.6)	361 (94.0)	57 (39.0)	125 (85.6)
Pain in legs and arms which is not due to hard exercise	39 (10.5)	109 (29.5)	274 (71.4)	364 (94.8)	54 (37.0)	105 (71.9)
Fatigue for no reason	73 (19.7)	230 (62.2)	249 (64.8)	366 (95.3)	114 (78.1)	140 (95.9)
Waking up still feeling tired	134 (36.2)	279 (75.4)	303 (78.9)	372 (96.9)	114 (78.1)	139 (95.2)

IBS: irritable bowel syndrome; FMS: fibromyalgia syndrome; CFS: chronic fatigue syndrome.

Table 3
Number (%) of patients reporting a symptom on at least a weekly basis and factor loadings.^a

Item no.	Symptom	Frequency (%) of symptom reported at least weekly				Factor loading on the first unrotated factor		
		All (n = 1751)	Any-IBS (n = 1122)	Any-FMS (n = 1127)	Any-CFS (n = 619)	Any-IBS (n = 1122)	Any-FMS (n = 1127)	Any-CFS (n = 619)
13	Waking up still feeling tired	1629 (93.0)	1019 (90.8)	1111 (98.5)	603 (97.4)	0.65	0.41	0.38
10	Fatigue for no reason	1566 (89.5)	961 (85.7)	1095 (97.1)	602 (97.3)	0.73	0.51	0.37
15	Difficulty concentrating	1489 (85.1)	910 (81.1)	1066 (94.6)	587 (94.9)	0.77	0.59	0.57
14	Mental fog	1481 (84.6)	902 (80.5)	1061 (94.1)	583 (94.2)	0.75	0.57	0.54
11	Fatigue increasing the day after you are active	1471 (84.1)	872 (77.8)	1078 (95.7)	602 (97.3)	0.74	0.48	0.38
16	Memory problems	1455 (83.1)	883 (78.7)	1050 (93.4)	574 (92.7)	0.73	0.52	0.52
38	Waking up often at night	1449 (82.7)	906 (80.7)	1032 (91.6)	521 (84.2)	0.54	0.38	0.44
17	Easily feel too cold	1407 (80.4)	883 (78.7)	984 (87.4)	526 (85.0)	0.52	0.33	0.42
9	Pain increasing the day after you are active	1398 (79.8)	818 (72.9)	1070 (94.9)	558 (90.2)	0.77	0.48	0.57
23	Bloating of the stomach	1366 (78.0)	970 (86.5)	893 (79.2)	466 (75.3)	0.36	0.50	0.50
2	Pain in legs and arms which is not due to hard exercise	1357 (77.5)	648 (71.1)	1070 (94.9)	520 (84.0)	0.77	0.48	0.62
7	Back pain	1348 (77.0)	842 (75.1)	1020 (90.6)	486 (78.6)	0.66	0.44	0.56
19	Easily feel too hot/sweating	1340 (76.5)	841 (74.9)	958 (85.0)	510 (82.4)	0.60	0.42	0.47
18	Very cold hands or feet	1339 (76.5)	847 (75.5)	933 (82.8)	499 (80.6)	0.49	0.37	0.45
37	Difficulty getting to sleep	1325 (75.7)	830 (73.9)	957 (84.9)	504 (81.4)	0.62	0.43	0.51
3	Pain moving from one place of body to another on different days	1268 (72.4)	752 (67)	1022 (90.7)	486 (78.6)	0.76	0.46	0.64
36	Sensitivity to noise	1264 (72.2)	769 (68.5)	937 (83.0)	519 (83.8)	0.72	0.58	0.60
5	Stomach pain	1233 (70.4)	910 (81.1)	799 (70.9)	421 (68.0)	0.38	0.60	0.57
8	Sensitive or tender skin	1229 (70.2)	750 (66.8)	969 (86.0)	447 (72.2)	0.70	0.49	0.64
29	Irritable	1220 (69.6)	786 (70.0)	860 (76.2)	434 (70.1)	0.57	0.54	0.53
35	Sensitivity to bright lights	1178 (67.2)	718 (64.0)	888 (78.8)	487 (83.8)	0.73	0.59	0.60
30	Jittery, easily startled, often worried	1175 (67.1)	765 (68.2)	840 (74.5)	423 (68.4)	0.61	0.58	0.58
34	More clumsy than others	1161 (66.3)	713 (63.5)	869 (77.0)	482 (77.8)	0.70	0.58	0.57
20	Thirsty all the time	1154 (65.9)	736 (65.5)	865 (76.7)	440 (71.1)	0.61	0.45	0.51
56	Numbness, tingling, pins and needles	1153 (65.9)	703 (62.7)	894 (79.3)	446 (72.1)	0.76	0.58	0.68
4	Headaches	1149 (65.6)	722 (64.3)	588 (74.5)	453 (73.2)	0.59	0.50	0.52
28	Feeling anxious for no reason	1125 (64.3)	743 (66.2)	793 (70.4)	395 (63.8)	0.54	0.53	0.52
44	Itchy skin	1122 (64.1)	735 (65.5)	836 (74.2)	421 (68.0)	0.61	0.53	0.60
26	Intolerant to some food	1082 (61.8)	806 (71.8)	655 (58.1)	406 (65.6)	0.21	0.36	0.34
45	Itchy eyes	1013 (57.8)	664 (59.2)	756 (67.1)	388 (62.7)	0.58	0.53	0.61
22	Constipation	1002 (57.2)	709 (63.2)	710 (63.0)	347 (56.1)	0.37	0.37	0.41
59	Feeling out of breath for no reason	989 (56.4)	628 (56.0)	739 (65.6)	432 (69.8)	0.70	0.63	0.56
39	Racing heart	959 (54.8)	608 (54.2)	688 (61.0)	391 (63.2)	0.61	0.57	0.49
1	Swollen painful joints	953 (54.5)	582 (51.9)	766 (68.0)	355 (57.4)	0.59	0.38	0.54
55	Cramps in leg, foot or bottom	947 (54.1)	601 (53.5)	743 (65.9)	357 (57.6)	0.68	0.59	0.66
32	Very vivid dreams	944 (53.9)	608 (54.3)	656 (58.2)	381 (61.5)	0.47	0.46	0.45
61	Feeling very ill for no reason	937 (53.4)	579 (51.6)	689 (61.2)	446 (51.0)	0.73	0.62	0.52
27	Depression	920 (52.6)	603 (53.8)	690 (61.2)	330 (53.4)	0.55	0.48	0.50
25	Nausea for no reason	917 (52.4)	619 (55.1)	625 (55.5)	376 (60.7)	0.57	0.60	0.56
12	Fatigue increasing after a cold or sore throat	910 (52.0)	558 (49.8)	691 (61.3)	396 (64.0)	0.61	0.42	0.37
21	Diarrhoea	874 (49.9)	684 (61.0)	518 (45.9)	281 (45.4)	0.09	0.38	0.34
42	Blocked nose	871 (49.7)	575 (51.3)	651 (57.8)	336 (54.3)	0.48	0.42	0.43
58	Urinating two or more times per night	854 (48.8)	563 (50.1)	639 (56.7)	330 (53.3)	0.46	0.41	0.46
41	Face flushes	848 (48.4)	536 (47.7)	638 (56.7)	314 (50.8)	0.54	0.44	0.51
40	Hands tremble or shake	838 (47.8)	529 (47.2)	655 (58.1)	349 (56.4)	0.69	0.63	0.59
31	ringing in ears	823 (47.1)	518 (46.2)	603 (53.5)	347 (56.1)	0.45	0.37	0.41
24	Heartburn	819 (46.8)	569 (50.7)	579 (79.2)	272 (43.9)	0.39	0.39	0.44
43	Running nose	786 (44.9)	533 (47.5)	572 (50.8)	296 (47.8)	0.42	0.40	0.40

(continued on next page)

Table 3 (continued)

Item no.	Symptom	Frequency (%) of symptom reported at least weekly				Factor loading on the first unrotated factor		
		All (n = 1751)	Any-IBS (n = 1122)	Any-FMS (n = 1127)	Any-CFS (n = 619)	Any-IBS (n = 1122)	Any-FMS (n = 1127)	Any-CFS (n = 619)
6	Chest pain	733 (41.8)	475 (42.3)	577 (51.2)	293 (47.4)	0.64	0.57	0.55
54	Feeling faint	658 (37.6)	419 (37.4)	461 (40.9)	333 (53.8)	0.62	0.60	0.52
52	Twitching other than eyelid	558 (31.9)	349 (31.1)	459 (40.7)	265 (42.8)	0.64	0.54	0.56
51	Twitching of eyelid	546 (31.3)	348 (31.0)	434 (38.4)	238 (38.4)	0.61	0.55	0.55
33	Nightmares/night terrors	480 (27.4)	316 (28.2)	353 (31.2)	206 (33.2)	0.53	0.52	0.55
60	Double vision	469 (26.8)	297 (26.6)	372 (33.0)	233 (37.7)	0.59	0.52	0.55
50	Boils or pimples on face or body	448 (25.6)	294 (26.3)	309 (27.4)	196 (31.7)	0.37	0.35	0.34
53	Choking sensations	409 (23.4)	291 (25.9)	413 (29.7)	169 (27.3)	0.58	0.53	0.57
49	Skin rash	365 (20.8)	252 (22.5)	266 (23.6)	146 (23.6)	0.44	0.41	0.41
46	Head colds, sore throat, flu	353 (20.2)	234 (20.9)	260 (23.0)	191 (30.9)	0.52	0.50	0.49
47	Mouth ulcers, sores in mouth	268 (15.3)	177 (15.8)	214 (19.0)	108 (17.5)	0.43	0.41	0.42
57	Loss of voice	259 (14.8)	177 (15.8)	214 (19.0)	113 (18.3)	0.49	0.41	0.40
48	Cold sores on or near lips	79 (4.5)	54 (4.8)	65 (5.8)	34 (5.4)	0.34	0.30	0.33

IBS: irritable bowel syndrome; FMS: fibromyalgia syndrome; CFS: chronic fatigue syndrome.

^a The groups refer to participants reporting a diagnosis of IBS, FMS and CFS, irrespective of whether the participant reports other additional functional disorders.

the variance respectively for the any-IBS group, 25.0%, 4.8%, 3.4% and 3.0% of the variance respectively for the any-FMS and 26.7%, 5.0%, 3.9%, and 3.1% of the variance respectively for the any-CFS group, the scree test indicating a one-factor solution. Table 3 provides the factor loadings of the first unrotated factor for the three groups. All except one symptom load >0.3 for each of the three groups on the first unrotated factor. Cronbach's alpha for the total population was 0.96.

The number of factors with eigenvalues above 1.0 was 12 for the any-IBS group, 15 for the any-FMS group, and 14 for the any-CFS groups. A principal axis factor analysis with extraction set for 12 factors and oblimin rotation was carried out for each of the three groups, factor loadings of equal to or above 0.3 were deemed significant, and the pattern matrices of the three factor analyses were compared. For each of the three analyses, at least one third of factor inter-correlations were at or above 0.3 and 17%–40% were below 0.2 (Tables S4–S6 in the Supplementary Appendix).

Tables S7–S9 in the Supplementary Appendix provides the pattern matrices for the three factor analyses. Discounting the factor number, some groups of items loaded on only one factor for all three groups. These consistent factors comprised (a) mood (depression; feeling anxious for no reason; irritable; jittery, easily startled, often worried), (b) stimulus sensitivity (sensitivity to noise; sensitivity to bright lights), (c) dreams (very vivid dreams; nightmares, night terrors), (d) cold (easily feel too cold; very cold hands and feet), and (e) atopy (blocked nose; running nose; itchy skin; itchy

eyes). The three cognitive symptoms (mental fog; memory problems; difficulty concentrating) loaded on only one factor for all groups, but the symptom “waking up still feeling tired” also loaded on this factor (and only this factor) for the any-IBS group. The neurological symptoms (hands tremble or shake; twitching of eyelid; twitching other than eyelid; feeling faint and numbness; double vision) loaded on the same factor for all groups. Five gastric symptoms (stomach pain, heartburn, bloating, nausea, food intolerance) loaded on a single factor for all groups with diarrhoea additionally loading for any-CFS and any-FMS though constipation failed to load for any of the groups. Two skin symptoms (skin rash, boils or pimples on face or body) loaded on a single factor for all groups, but with additional skin-related items loading for some groups. The two sleep items (difficulty getting to sleep, waking up often at night) loaded on the same factor for the any-FMS and any-IBS groups but not the any-CFS group where they failed to load. The pain symptoms (excluding stomach pain but including sensitive or tender skin) and fatigue symptoms loaded on separate factors for the any-FMS and any-CFS groups but both types of symptoms (with the exception of waking up still feeling tired) loaded on one factor for the any-IBS group. There was only one instance of a cross-loading item in all three analyses: itchy skin loaded on atopy and skin symptoms factor for the IBS-any group. Seven symptoms (headaches, easily feel too hot, thirsty all the time, constipation, ringing in ears, face flushes, loss of voice) failed to load on any of the 12 factors for any of the three analyses, though all seven loaded on the first unrotated factor.

The free text responses of additional symptoms were searched for frequently occurring symptoms not included in the 61-symptom questionnaire. Obvious synonyms were discounted. Of the 1751 patients, 52 reported urination problems such as urgency, frequency, pain or hesitation, 48 referred to balance problems of one kind or another, 47 reported restless legs, 40 reported hair loss, brittle hair or hair thinning, 34 patients referred to dizziness and 22 participants referred to blurred vision (in contrast to double vision).

Discussion

There were two related aims for this study: first, to examine the evidence for a generic functional disorder symptom scale, and second to produce such a scale. One reason for using a generic scale is because of high comorbidity between functional disorders. In this internet study of participants recruited through IBS, FMS and CFS websites, 49% reported being diagnosed with more than one functional disorder.^{8,9} However, even where participants report a single diagnosis, symptoms associated with other diagnoses are common. Inspection of [Table 2](#) shows that stomach pain is reported by 78.6% of those in the IBS-only group, 52.3% of the FMS-only group and 42.5% of the CFS-only group on a weekly basis. Although stomach pain is less frequent in those lacking an IBS diagnosis, it is sufficiently common for it to be a relevant symptom for symptom assessment. Furthermore, the frequency that IBS-only participants report stomach pain is similar to the frequency that the IBS-only participants experience waking still feeling tired, and that the frequency of constipation in the FMS-only group is similar to the frequency of those in the IBS-only group.

The scree test indicates a unifactorial solution. The first unrotated factor of a factor analysis of symptoms is a severity factor. The finding that all (with one exception) symptoms loaded on the first factor for the any-IBS, any-FMS and any-CFS analyses demonstrates the wide variety of symptoms that can occur in functional disorders and shows that all symptoms covary with severity and are therefore likely to have some form of common cause.

Severity, as measured by the number of symptoms reported by patients increases with the number of diagnoses but participants were polysymptomatic irrespective of functional disorder diagnosis. IBS-only patients reported the fewest number of symptoms, with a mean weekly symptom number of 21.9, and IBS + FMS + CFS the most with a mean weekly symptom number of 43.6, but there was considerable

overlap between the seven groups, and the standard deviations for the weekly and daily symptom number and scale score are all comparatively high. Variation in severity as measured by a wide spectrum of symptoms is therefore an important feature of functional disorders independently of diagnosis.

The results from the factor analysis are consistent with previous research, namely an over-arching common factor accounting for about one third of the variance,^{23–25} below which are several inter-correlated specific factors.^{15,26} The finding that the first factor accounted for between five and seven times the variance of the second unrotated factor shows that the relative contribution of the specific factors is comparatively small when compared to the higher order factor. Additionally, although 12 factors were identified, this is likely to be an underestimation of the number of different specific factors that are subsumed within the higher order factor. Finally, it should be noted that the present finding that constipation did not load with diarrhoea in the 12 factor solution is replicated elsewhere,¹⁷ which suggests that diarrhoea and constipation may have different specific mechanisms, and the failure of constipation to load on the higher order factor may be due to the importance of a specific mechanism for this symptom.

A difference between this study and previous studies is that the sample size was sufficiently large to replicate the results of factor analysis with different groups. Although loadings on the 12 factor solution were not identical between the any-IBS, any-FMS and any-CFS groups, they were sufficiently similar to conclude that the factor structure, including the proportion of variance explained by the higher-order, common factor, was the same for all three groups, thereby demonstrating the validity of the same generic symptoms scale being used in patients having either an IBS, FMS or CFS diagnosis.

The frequency with which symptoms were reported provides an objective criterion for inclusion in the final questionnaire. Only one symptom (“cold sores on or near lips”) failed the criterion of weekly prevalence of 10% and therefore should be excluded from the final questionnaire. Two other symptoms were infrequent with prevalence of about 15% in the total population, but they should not be excluded as they have a prevalence of 19.0% in the FMS group. “Waking up still feeling tired” was the most prevalent symptom; inspection of the frequency of this symptom in [Tables 2 and 3](#) provides evidence of a ceiling effect, but this symptom had acceptable factor loadings for all groups. Note that the higher factor loading in the any-IBS group

compared to the any-CFS group shows that this symptom may be more sensitive to change and more discriminating in IBS patients as there is less attenuation of range in milder patients with more frequent symptoms. Table 3 shows considerable variation in the frequency of symptoms, which is needed if the scale is to be sensitive to change over the full range of severities.

Participants were asked to identify symptoms not on the original list, and although some of these were versions of symptoms already present, there is evidence that five additional symptoms could be added, namely, restless legs, hair loss/brittle hair/thinning, dizziness/balance problems, blurred vision and urination problems. Note that three free text reporting of symptoms would underestimate the frequency when solicited by an item in a questionnaire.

Combining the data from Table 3 with the freely elicited symptoms, a comprehensive, 65-item generic symptom questionnaire (the GSQ-65 in the Supplementary Appendix) can be constructed from data reported here (i.e., the original 61, less one plus five new ones obtained from free text responses).

Three methods of scoring the questionnaire were considered: weekly symptoms, daily symptoms and the scale score. Of these methods, the scale score was the best discriminator between the seven different diagnostic categories (i.e., had the highest *F* value) closely followed by the number of symptoms experienced weekly or more often. The number of daily symptoms was a poorer discriminator. These results show that the scale score is the optimum scoring method, but the number of symptoms experienced on a weekly basis or more is an acceptable alternative.

The limitation of this study lies in the fact that the sample is predominantly female. The prevalence of females is greater for functional disorders than males, but the predominance of females in our sample may reflect a greater willingness of women to complete health related questionnaires. The duration of time since diagnosis of participants is unknown.

Functional disorders are spectrum disorders. Although specific symptom scales are useful for measuring the defining features of IBS, FMS or CFS, there is such an overlap in symptoms that a generic symptom questionnaire is required for a comprehensive measure of the symptomatology of people with any of these three diagnoses or, more generally, people given the diagnostic label of “bodily distress syndrome”.²⁷ However, care must be taken in the words chosen to describe patients with functional disorders as some labels are known to offend.²⁸

Many of the symptom descriptors in the GSQ-65 are common to other scales, but some are unique to this scale due to the patient-derived method of symptom wording and method of symptom selection. For example, the comprehensive rating scale for fibromyalgia symptomatology (CRSFS)²⁶ is a well-constructed 60-symptom questionnaire based on focus groups of FMS patients. However, this scale does not include the symptoms of diarrhoea, constipation or stomach pain, nor the symptom of feeling cold, both of which are shown in this study to be common in FMS. A likely reason for this omission is that FMS patients did not perceive IBS-complaints and being cold as being due to FMS. Similarly, the COMPASS questionnaire, in both long and short formats^{16,17} does include IBS-related symptoms but does not include symptoms relating to cognitive dysfunction. The CRSFS includes several cognitive dysfunction symptoms as does the GSQ-65 (there are fewer in the GSQ-65), and the present data show this to be a comparatively frequent type of symptom. In this study the procedure for identifying symptoms meant that symptoms were not selected on the basis of perceptions of diagnosis (as in the case of the CRSFS) or perceived cause (as in the case of the COMPASS). The GSQ-65 is more heterogeneous than other scales, and therefore more suited when the aim is to assess a wide range of symptoms.

In sum, the GSQ-65 is a valid, generic functional disorder scale. Sensitivity to change and retest reliability are yet to be determined.

Conflicts of interest

The authors declare that they have no competing interests. None of the authors have interests in any company or institution that might benefit from the publication of this manuscript.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.cdtm.2019.05.003>.

References

- Jones GT, Atzeni F, Beasley M, Flüß E, Sarzi-Puttini P, Macfarlane GJ. The prevalence of fibromyalgia in the general population: a comparison of the American College of Rheumatology 1990, 2010 and modified 2010 classification criteria. *Arthritis Rheum.* 2015;67:568–575.
- Sperber AD, Dumitrascu D, Fukudo S, et al. The global prevalence of IBS in adults remains elusive due to the heterogeneity of studies: a Rome Foundation working team literature review. *Gut.* 2017;66:1075–1082.
- Nacul LC, Lacerda EM, Pheby D, et al. Prevalence of myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS) in three regions of England: a repeated cross-sectional study in primary care. *BMC Med.* 2011;9:91.
- Wiklund IK, Fullerton S, Hawkey CJ, et al. An irritable bowel syndrome-specific symptom questionnaire: development and validation. *Scand J Gastroenterol.* 2003;38:947–954.
- Mujagic Z, Keszthelyi D, Aziz Q, et al. Systematic review: instruments to assess abdominal pain in irritable bowel syndrome. *Aliment Pharmacol Ther.* 2015;42:1064–1081.
- Fukuda K, Straus SE, Hickie I, Sharpe MC, Dobbins JG, Komaroff A. The chronic fatigue syndrome: a comprehensive approach to its definition and study. *Ann Intern Med.* 1994;121:953–959.
- Wolfe F, Clauw DJ, Fitzcharles MA, et al. Fibromyalgia criteria and severity scales for clinical and epidemiological studies: a modification of the ACR Preliminary Diagnostic Criteria for Fibromyalgia. *J Rheumatol.* 2011;38:1113–1122.
- Aaron LA, Buchwald D. A review of the evidence for overlap among unexplained clinical conditions. *Ann Intern Med.* 2001;134:868–881.
- Aaron LA, Buchwald D. Chronic diffuse musculoskeletal pain, fibromyalgia and co-morbid unexplained clinical conditions. *Best Pract Res Clin Rheumatol.* 2003;17:563–574.
- Hausteiner-Wiehle C, Henningsen P. Irritable bowel syndrome: relations with functional, mental, and somatoform disorders. *World J Gastroenterol.* 2014;20:6024–6030.
- Janssens KA, Zijlema WL, Joustra ML, Rosmalen JG. Mood and anxiety disorders in chronic fatigue syndrome, fibromyalgia, and irritable bowel syndrome: results from the LifeLines cohort study. *Psychosom Med.* 2015;77:449–457.
- Kanaan RA, Lepine JP, Wessely SC. The association or otherwise of the functional somatic syndromes. *Psychosom Med.* 2007;69:855–859.
- Wessely S, Nimnuan C, Sharpe M. Functional somatic syndromes: one or many. *Lancet.* 1999;354:936–939.
- Wessely S, White PD. There is only one functional somatic syndrome. *Br J Psychiatry.* 2004;185:95–96.
- Lacourt T, Houtveen J, van Doornen L. “Functional somatic syndromes, one or many?” An answer by cluster analysis. *J Psychosom Res.* 2013;74:6–11.
- Suarez GA, Opfer-Gehrking TL, Offord KP, Atkinson EJ, O'Brien PC, Low PA. The Autonomic Symptom Profile: a new instrument to assess autonomic symptoms. *Neurology.* 1999;52:523–528.
- Sletten DM, Suarez GA, Low PA, Mandrekar J, Singer W. COMPASS 31: a refined and abbreviated composite autonomic symptom score. *Mayo Clin Proc.* 2012;87:1196–1201.
- Furnham A, Boo HC. A literature review of the anchoring effect. *J Socio Econ.* 2011;40:35–42.
- Mussweiler T, Strack F, Pfeiffer T. Overcoming the inevitable anchoring effect: considering the opposite compensates for selective accessibility. *Pers Soc Psychol Bull.* 2000;26:1142–1150.
- Sprangers MA, Schwartz CE. Integrating response shift into health-related quality of life research: a theoretical model. *Soc Sci Med.* 1999;48:1507–1515.
- Pennebaker JW, Hoover CW. Visceral perception versus visceral detection: disentangling methods and assumptions. *Biofeedback Self Regul.* 1984;9:339–352.
- Hyland ME, Sodergren SC. Relationship between lifestyle and minor health complaints: evidence for two clusters of association. *J Nutr Environ Med.* 1998;8:233–244.
- Nimnuan C, Rabe-Hesketh S, Wessely S, Hotopf M. How many functional somatic syndromes? *J Psychosom Res.* 2001;51:549–557.
- Maes M, Leunis JC, Geffard M, Berk M. Evidence for the existence of Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS) with and without abdominal discomfort (irritable bowel) syndrome. *Neuro Endocrinol Lett.* 2014;35:445–453.
- Brown AA, Jason LA. Validating a measure of myalgic encephalomyelitis/chronic fatigue syndrome symptomatology. *Fatigue.* 2014;2:132–152.
- López-Pousa S, Garre-Olmo J, de Gracia M, Ribot J, Calvó-Pexas L, Vilalta-Franch J. Development of a multidimensional measure of fibromyalgia symptomatology: the comprehensive rating scale for fibromyalgia symptomatology. *J Psychosom Res.* 2013;74:384–392.
- Budtz-Lilly A, Schröder A, Rask MT, Fink P, Vestergaard M, Rosendal M. Bodily distress syndrome: a new diagnosis for functional disorders in primary care. *BMC Fam Pract.* 2015;16:180.
- Stone J, Wojcik W, Durrance D, et al. What should we say to patients with symptoms unexplained by disease? The “number needed to offend”. *BMJ.* 2002;325:1449–1450.