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Functional Incapacity and Physical and Psychological Symptoms: How They Interconnect in Chronic Fatigue Syndrome

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Key Words

Quality of life • Functional incapacity • Chronic fatigue syndrome

Abstract

Background: It has been argued that perceived functional incapacity might be a primary characteristic of chronic fatigue syndrome (CFS) and could be explained by physical symptoms. If so, it could be expected to be closely associated with physical, but not psychological symptoms. The study tests this hypothesis. **Sampling and Methods:** The sample consisted of 73 patients, with a diagnosis of CFS according to the Oxford criteria, randomly selected from clinics in the Departments of Immunology and Psychiatry at St. Bartholomew's Hospital, London. The degree of fatigue experienced by patients was assessed using the Chalder Fatigue Questionnaire and a visual analogue scale. Self-rated instruments were used to measure physical and social functioning, quality of life, and physical and psychological symptoms. **Results:** Principal-component analysis of all scale scores revealed 2 distinct components, explaining 53% of the total variance. One component was characterized by psychological symptoms and generic quality of life indicators, whilst the other component was made up of physical symptoms, social and physical functioning and indicators of

fatigue. **Conclusions:** The findings suggest that perceived functional incapacity is a primary characteristic of CFS, which is manifested and/or explained by physical symptoms.

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Introduction

Patients suffering from chronic fatigue syndrome (CFS) often report, along with fatigue, symptoms such as pains in joints and muscles, headaches, sore throat, lymph node tenderness, cognitive difficulties and sleep problems [1, 2]. CFS is commonly associated with anxiety and depression [3, 4] and usually follows a chronic and fluctuating course, with an essentially unknown aetiology.

Studies measuring different aspects of quality of life and functioning [5, 6] have demonstrated that quality of life is severely disrupted in CFS patients. In the vast majority of these patients, the functional impairment is severe and long lasting, with rates of recovery of only 3–19% [6, 7]. Low social and physical functioning may reflect a perceived incapacity that is central to the experience and symptomatology of CFS patients. The question is whether or not this incapacity is a consequence of other symptoms or a primary and defining feature of CFS [8, 9]. It has indeed been argued that a perceived incapacity in ful-

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filling social roles – or the anticipation of such an incapacity – may be a primary characteristic of CFS, and the symptoms usually reported might have a function to justify this perceived incapacity [3]. Such a justification could be understood in the context of prevailing, socially and culturally determined illness paradigms, and also of the struggle to recognize CFS as a legitimate disease. However, it is possible that the illness itself mediates functional incapacity primarily through physical symptoms. If it were a secondary phenomenon and a consequence of other symptoms, it could be assumed that the level of perceived incapacity would be positively associated with the severity of all psychological and physical symptoms of CFS. As a primary feature, however, it may neither be socially acceptable nor fit into existing medical classifications. Patients might explain or articulate their incapacity in terms of more conventional symptoms, responding in part to prevailing social or medical norms. As social and physical incapacity appears closer to physical than psychological symptoms, and physical symptoms may be regarded as socially less stigmatizing than psychological impairment, one may hypothesize that functional incapacity should be associated with physical, but not necessarily psychological symptoms.

The results of Hardt et al. [10] are consistent with this assumption. They assessed the internal factor pattern of health-related incapacity in CFS patients from three countries with the General Health Survey (Medical Outcome Survey) Short Form 36 (SF-36) and found an 'unusual profile'. In the most common 2-component structure of the SF-36 found in different patient groups, social functioning and vitality load together with the emotional subscales on a 'mental' component, whilst physical role fulfilment and functioning, pain and general health perception load on a 'physical' component. Social functioning and vitality, a measure of non-fatigue, were associated with the physical components; emotional well-being and emotional role functioning were the only subscales that loaded on a different factor than the other 6 [10].

To our knowledge, there have been no studies so far that try to unravel the structural relations between different aspects of functional incapacity and various physical and psychological symptoms in CFS patients. We studied a sample of secondary/tertiary-care patients with CFS to address the following question: how are indicators of perceived functional incapacity associated with physical and psychological symptoms? We hypothesized that the level of perceived incapacity would be associated with the severity of physical rather than psychological symptoms.

Methods

Sample

A random sample of patients, with a diagnosis of CFS attending clinics in the Departments of Immunology and Psychiatry at St. Bartholomew's Hospital, London, were approached to take part in the study. Patients attending these clinics were selected using random number tables so that between 2 and 4 patients were approached each week, a number chosen to give a manageable number of subjects for the study every week. Thirty-seven of 146 patients approached in the immunology clinic (response rate 25.3%) and 36 of 50 patients (response rate 72%) approached in the psychiatry clinic participated in the study (response rate 37.2%, i.e. 73/196). Members of the research team interviewed the patients to obtain informed consent and to ensure they met Oxford criteria for CFS [1]. Patients were excluded if they were unable to complete the questionnaires for reasons of either language or severe disability. Data were collected from medical notes and using a questionnaire designed specifically for the study.

The patients from the two clinics did not statistically significantly differ in terms of their sociodemographic characteristics (age, ethnicity, sexuality, marital status, previous education, employment, number of children, having close friends or receipt of benefits). They did not statistically significantly differ in their specific symptoms, disability, quality of life, psychological distress and previous attendance to mental health professionals either. Therefore, there was no reason for not treating them as one sample in the analyses. The comparisons of patient characteristics between the two settings and the sample characteristics are described in detail in White et al. [11] and Rakib et al. [12].

Measures

The degree of fatigue experienced by patients was assessed using the Chalder Fatigue Questionnaire [13] and a visual analogue scale [14]. The Chalder Fatigue Questionnaire (11-item scale) assesses the degree of physical and mental fatigue in the last month. The respondent rates each item on a categorical 0, 0, 1, 1 point scale.

Several instruments were used to measure physical and psychological symptoms and aspects of functioning and quality of life. The Symptom Checklist 90 Revised (SCL-90-R) [15] has 90 items of which 83 are grouped into 9 primary symptom dimensions: somatization, obsessive-compulsive behaviour, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation and psychoticism. The remaining 7 items are used in the calculation of global scores. The Spielberger Trait Anxiety Questionnaire [16] has 20 items that measure trait anxiety (how one generally feels). Items are rated on a 4-point Likert rating scale, ranging from 1 (almost never) to 4 (almost always). Scores on the Spielberger Trait Anxiety Questionnaire range from a minimum of 20 to a maximum of 80. The Health Anxiety Questionnaire [17] is a 21-item scale that measures worry and preoccupation about health, fear of illness and death, reassurance-seeking behaviour and interference with life. Items are rated on a 4-point Likert scale, ranging from 1 (not at all/rarely) to 4 (most of the time), with scores therefore varying between 21 and 84. The Somatic Discomfort Questionnaire (SDQ) [18] has 50 items that assess how bothering symptoms have been in the past week. Each symptom is rated on a 4-point Likert scale, ranging from 1 (not at all bothersome) to 4 (a lot bothersome). Scores on the SDQ range

from 50 to 200. The Beck Hopelessness Scale [19] has 20 true-false items that measure 3 major aspects of hopelessness: feelings about the future, loss of motivation and expectations. Items are rated 1 if true and 2 if false, with scores ranging from a minimum of 20 to a maximum of 40.

The Medical Outcome Study SF-36 [20] was used as a self-report questionnaire to assess perceived incapacity based on physical functioning, social functioning, pain, mental health, role limitations due to physical problems, role limitations due to emotional problems, vitality and general health perception. The social and physical functioning subscales were regarded as indicators of functioning and incapacity in this study.

The Manchester Short Assessment of Quality of Life (MANSA) [21] was used to assess generic quality of life. The MANSA contains 16 questions of which 4 are termed objective and the rest are ratings of satisfaction with life as a whole and the following life domains: leisure activities, financial situation, living situation, personal safety, social relations, mental health and family relationship. As far as psychometric properties are concerned, results of the MANSA have been found to have high concordance with results of the much longer Lancashire Quality of Life Profile [22]. The mean score of satisfaction ratings was used as an indicator of generic subjective quality of life.

Analysis

The data were analysed using SPSS for Windows version 11. The hypothesis was tested in a multivariate analysis to reduce the probability of type I error and consider all different symptoms and aspects of incapacity in one analysis. For this, principal-component analysis (PCA) was used. The Kaiser-Meyer-Olkin measure of sampling adequacy was conducted to ensure there was adequate and high variability in the data (values greater than 0.5 for the Kaiser-Meyer-Olkin measure indicate that the data could be subjected to PCA). Bartlett's test of sphericity was conducted to ensure that the different instruments were sufficiently correlated. PCA with rotation of component(s) was conducted, and several rotations were tried in order to identify the solution that would provide meaningful and distinct components. Data on the rotated solutions are only presented for the best solution. As the analysis is exploratory, the best solution was chosen based on the eigenvalues (explained variances extracted by the factors) and the meaningfulness of the components extracted. Only cases with valid values on all variables subjected to PCA were included in the analysis.

Results

Sum Scores of Various Subjective Measures

Table 1 shows the sum scores of the administered instruments.

Appropriateness of the Data

The Kaiser-Meyer-Olkin measure was 0.84, suggesting sufficient and high variability in the data to conduct PCA. The results of Bartlett's test of sphericity (approximate $\chi^2 = 1,169.6$, d.f. = 276, $p < 0.0001$) suggested that the scales were sufficiently correlated to perform PCA.

Table 1. Patients' scores on instruments of symptoms' experience, functional status and quality of life (n = 73)

Instruments	Mean score ± SD
(1) Chalder Fatigue Questionnaire (CFQ)	9.0 ± 3.1
(2) Spielberger Trait Anxiety Scale (STAI)	45.8 ± 5.0
(3) Beck Hopelessness Scale (BHS)	6.6 ± 5.3
(4) Fatigue Visual Analogue Scale (FVAS)	343.3 ± 41.9
(5) Health Anxieties Questionnaire (HAQ)	37.8 ± 9.5
(6) Somatic Discomfort Questionnaire (SDQ)	100.0 ± 21.8
(7) Medical Outcomes Study Short Form (MOS SF-36)	
Bodily pain	38.1 ± 20.3
General health perception	30.2 ± 16.0
Limitations due to emotional problems	52.5 ± 45.1
Limitations due to physical problems	8.2 ± 20.4
Mental health	60.1 ± 20.0
Physical functioning	41.1 ± 21.3
Social functioning	42.6 ± 24.7
Vitality	22.4 ± 16.6
(8) Symptom Checklist 90 Revised (SCL-90-R)	97.4 ± 48.5
Anxiety	10.9 ± 8.5
Depression	19.5 ± 10.4
Hostility	5.3 ± 4.7
Interpersonal sensitivity	8.3 ± 6.3
Obsessive-compulsive behaviour	19.5 ± 8.6
Paranoid ideation	3.8 ± 4.4
Phobic anxiety	5.1 ± 5.7
Somatization	20.5 ± 8.6
(9) MANSA mean score of subjective quality of life	4.2 ± 0.8

Tables 2 and 3 show the correlations between the sum scores of various subjective measures.

Component Solution

When all the scales were subjected to PCA, the analysis resulted in a solution with 5 components with eigenvalues greater than 1. Component 1 had an eigenvalue of 9.9 (41.3% of the variance). Component 2 had an eigenvalue of 2.8 (11.7% of the variance). Components 3, 4 and 5 had eigenvalues of 1.5, 1.1 and 1.0, respectively (15.4% of the variance). However, most of the scales loaded heavily on components 1 and 2. None of the scales had their highest loading in either component 3 or 5. The Chalder Fatigue Scale was the only scale that loaded the highest on component 4 as compared to its loading on the other components. The other chronic fatigue measure, the Fatigue Visual Analogue Scale, loaded the highest on component 1. Given that components 3, 4 and 5 had much lower eigenvalues than components 1 and 2, and had almost no high loading scales in them, it was decided to choose a 2-component solution.

Table 2. Correlations between the scales: instrument sum scores

	BHS	CFQ	FVAS	HAQ	MANSA	MOS SF-36	SCL-90-R	SDQ	STAI
BHS	1.00								
CFQ	0.121	1.00							
FVAS	0.181	0.106	1.00						
HAQ	0.398***	0.011	0.152	1.00					
MANSA	-0.445***	-0.256**	-0.302***	-0.361***	1.00				
MOS SF-36	-0.385***	-0.335***	-0.623***	-0.403***	0.528***	1.00			
SCL-90-R	0.503***	0.147	0.435***	0.469*	-0.586***	-0.682***	1.00		
SDQ	0.256**	0.235*	0.503***	0.301**	-0.477***	-0.739***	0.678***	1.00	
STAI	0.338***	0.154	0.316***	0.291**	-0.239*	-0.427***	0.585***	0.290**	1.00

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.0$. For abbreviations, see table 1.

Table 3. Correlation between the scales and MOS (SF-36) and SCL-90-R

	BHS	CFQ	FVAS	HAQ	MANSA	MOS (SF-36)	SCL-90-R	SDQ	STAI
<i>MOS (SF-36)</i>									
Bodily pain	-0.151	-0.244*	-0.474***	-0.103	0.314**	–	-0.447***	-0.581***	-0.267*
General health	-0.254*	-0.258*	-0.358**	-0.399***	0.447***	–	-0.404***	-0.476***	-0.105
Mental health	-0.580***	-0.211	-0.415***	-0.472***	0.573***	–	-0.581***	-0.518***	-0.341**
Physical functioning	-0.022	-0.127	-0.611***	-0.091	0.233*	–	-0.394***	-0.540***	-0.231*
Role – emotional	-0.412***	-0.168	-0.360**	-0.502***	0.396**	–	-0.600***	-0.505***	-0.456***
Role – physical	0.031	-0.333**	-0.183	-0.003	0.223	–	-0.239	-0.398***	-0.209
Social functioning	-0.308**	-0.281*	-0.559***	-0.270*	0.459***	–	-0.521***	-0.561***	-0.241*
Vitality	-0.246*	-0.312**	-0.521***	-0.115	0.201	–	-0.377***	-0.471***	-0.278*
<i>SCL-90-R</i>									
Anxiety	0.545***	-0.001	0.357**	0.503***	-0.448***	-0.547***	–	0.567***	0.612***
Depression	0.488***	0.220	0.398***	0.426***	-0.596***	-0.674***	–	0.571***	0.570***
Hostility	0.459***	0.057	0.339**	0.283*	-0.490***	-0.438***	–	0.409***	0.519***
Interpersonal sensitivity	0.451***	0.120	0.203	0.322**	0.437***	-0.386***	–	0.387***	0.463***
Obsessive-compulsive behaviour	0.366***	0.179	0.490***	0.303**	-0.422***	-0.682***	–	0.643***	0.388***
Paranoid ideation	0.590***	0.042	0.133	0.340**	-0.520***	-0.365***	–	0.254	0.421***
Phobic anxiety	0.239*	0.027	0.277*	0.387***	-0.340	-0.480***	–	0.495***	0.475***
Psychoticism	0.420***	0.061	0.239*	0.483***	-0.483***	-0.405***	–	0.403***	0.513***
Somatization	0.094	0.197	0.430***	0.275*	-0.406***	-0.584***	–	0.771***	0.212

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.0$. For abbreviations, see table 1.

Table 4 shows the loadings of the various items in the rotated 2-component solution.

The quartimax rotation was found to provide the most meaningful solution. In this solution, component 1 comprised 14 variables and had an eigenvalue of 7.9 (32.9% of the variance). It had positive loadings of the SCL-90-R subscales depression, anxiety, obsessive-compulsive symptoms, psychoticism, hostility, phobic anxiety, interpersonal sensitivity, paranoid ideation, the Spielberger Trait Anxiety Questionnaire, Health Anxiety Question-

naire and Beck Hopelessness Scale, and negative loadings of the SF-36 subscales of mental health and emotional role fulfilling. Component 2 consisted of 10 scales and had an eigenvalue of 4.8 (20.1% of the variance). Component 2 was made up of the following scales with positive loadings: the SF-36 subscales of social functioning, general health, vitality, role – physical, and physical functioning. The Fatigue Visual Analogue Scale, SCL-90-R subscale somatization, SDQ and SF-36 subscale bodily pain loaded negatively on this component. The Chalder

Fatigue Questionnaire also loaded negatively on this component, but the loading was less than 0.5. The first component captures psychological aspects, the second one physical phenomena. The total variance explained by the 2 components was 53.0%.

Discussion

This study investigated the association between self-ratings of incapacity and quality of life and various physical and psychological symptoms in CFS patients. Our study is different from other studies in this area [23, 24] because it focused on symptom patterns, while taking into account data on quality of life and aspects of functioning. The PCA yielded a satisfactory 2-component solution that explained 53% of the variance. The 2 components reflect a physical and a psychological side of CFS, and reveal that generic subjective quality of life and functional incapacity are not homogeneously associated with symptoms of CFS.

The perceived incapacity in fulfilling social and physical roles may be best captured by the subscales of the SF-36 on social and physical functioning. The scores on these subscales are associated with vitality and inversely with one of the defining symptoms of CFS, i.e. fatigue (Chalder Fatigue Scale, Fatigue Visual Analogue Scale). They are also associated with other physical symptoms (SDQ, SCL-90-R subscale 'somatization'), but not with psychological symptoms such as depression (Beck Hopelessness Scale, SCL-90-R subscale 'depression') and anxiety (Spielberger Trait Anxiety Questionnaire, SCL-90-R subscale 'anxiety'). These psychological symptoms are linked to a generic measure of quality of life (MANSA), reflecting satisfaction with life in general and life domains, and to emotional role functioning and mental health (SF-36, subscale).

These findings demonstrate that there are clinically meaningful patterns to be found beyond the general statement that functioning and quality of life are severely disrupted in CFS patients. Perceived incapacity, not only on the physical, but also on the social level of functioning, is particularly associated with fatigue [25], vitality and other physical symptoms, whilst deficits in generic quality of life have a strong association with psychological symptoms. The latter association between generic subjective quality of life and general psychopathological symptoms, particularly mood symptoms, is in line with results from other studies.

Table 4. Two-component quartimax solution with Kaiser normalization

Instruments	Rotated component loading	
	C1 (‘psychological’)	C2 (‘physical’)
Depression (SCL-90-R)	0.828	−0.315
Anxiety (SCL-90-R)	0.869	−0.164
Obsessive-compulsive behaviour (SCL-90-R)	0.621	−0.496
Psychoticism (SCL-90-R)	0.790	−0.008
Mental health (MOS SF-36)	−0.676	0.265
Role – emotional (MOS SF-36)	−0.613	0.351
Hostility (SCL-90-R)	0.739	−0.130
Phobic anxiety (SCL-90-R)	0.663	−0.229
MANSA	−0.610	0.281
Interpersonal sensitivity (SCL-90-R)	0.770	−0.002
Paranoid ideation (SCL-90-R)	0.803	0.007
STAI	0.621	−0.127
BHS	0.695	0.006
HAQ	0.600	−0.003
SDQ	0.456	−0.709
Social functioning (MOS SF-36)	−0.382	0.657
Somatization (SCL-90-R)	0.368	−0.678
FVAS	0.266	−0.662
Bodily pain (MOS SF-36)	0.184	−0.769
General health (MOS SF-36)	−0.348	0.473
Vitality (MOS SF-36)	−0.234	0.585
Physical functioning (MOS SF-36)	−0.131	0.785
Role – physical (MOS SF-36)	−0.004	0.558
CFQ	−0.006	−0.400

For abbreviations, see table 1.

The identified pattern is consistent with the hypothesis that a perceived incapacity in social and physical functioning is linked to the severity of physical rather than psychological symptoms [3]. It also corresponds exactly with the distribution of subscales of the SF-36 between the 2 identified components, the ‘unusual profile’ that Hardt et al. [10] described without interpreting it further.

One interpretation of our findings rests on the assumption that attributive processes of the patients influence the pattern of reported symptoms and their association with both functional incapacity as well as generic quality of life. There is some evidence supporting this assumption. For instance, Moss-Morris and Petrie [8] examined cognitive behavioural styles that differentiated depressive disorders and CFS among 73 patients. For different levels of depressive symptoms, but equivalent levels of energy loss and disability, they found a highly signifi-

cant preponderance of psychological attributions in the pure depressed and of physical attributions in the pure CFS group. They conclude that CFS and depression can be distinguished by unique cognitive styles characteristic of each condition, and CFS is a disorder notable for the patients' emphasis of an organic causal attribution.

The results suggest that CFS patients perceive their general quality of life more in tune with their current mood than their fatigue, whereas their functioning is more related to physical symptoms and fatigue, as the defining symptom of the illness. Thus, functional incapacity might be understood as a primary characteristic of CFS that is manifested and possibly explained by physical symptoms. Cultural and social factors can evidently influence the expression of illness by symptoms. Alternatively however, the nature of this illness could itself cause functional incapacity primarily through physical symptoms, with psychological symptoms having a limited impact on incapacity, although influencing quality of life; this would negate one of our stated assumptions. If so, this may relate to the nature of the distinctive experience underlying the use of the word fatigue in CFS. The direction of causality and the role of attributions have not been assessed in this study. Clinically, one may conclude that fatigue and physical symptoms need attention to reduce perceived incapacity and to improve functioning, whilst psychological and mood symptoms may require treatment to influence subjective quality of life.

Our study has several methodological limitations. We used PCA which is based on correlations between variables found in a cross-sectional assessment. The findings do therefore not allow a conclusion on causal relationships. Also, the findings of the multivariate analysis depend on the selection and specificity of the scales that were chosen to capture functional incapacity and different types of symptoms. Most of the scales we used had been originally developed and validated for patient groups with disorders other than CFS. Although we regarded the instruments used as the most appropriate ones for the study, one might question their validity for the specific purpose. Moreover, the selection of psychological and physical variables tested for their associations with key features of CFS and with functioning and quality of life may be seen as unbalanced, because the majority of physical symptoms that were assessed was measured on only 2 scales, the somatization subscale of the SF-36 and the SDQ. However, both subscales comprise items on physical symptoms like pain and muscular soreness that have been suggested to be specific for CFS on the one hand and correlate closely with other non-pain physical symptoms

on the other. Thus, it may be argued that the sum scores of physical complaints used in our study reliably reflect single scores for more specific symptoms.

In further research, qualitative methods and longitudinal designs may be required to assess the patients' experiences and their views of symptoms, functional incapacity and quality of life in more depth and to understand better the components and also the underlying mechanisms of illness and of attribution. It should also be possible to identify factors that influence these over time, with or without interventions.

To conclude, this paper has focused on a significant issue relating to investigating whether perceived functional incapacity is linked to physical or psychological symptoms in CFS. The uniqueness of the analyses stems from the fact that they used a comprehensive set of criteria to unravel the structural relations between different aspects of functional incapacity and various physical and psychological symptoms in CFS patients. Our finding that there are distinct 'physical' and 'psychological' factors inherent in CFS is new – and specific – to the CFS literature. Although patients were recruited from two different settings, there were no statistically significant differences in their sociodemographic, clinical and service use characteristics, thus reducing significantly the possibility of bias that could have resulted from combining the two in one analysis. However, the data were collected in secondary/tertiary care, and the results may not be generalizable to patients in primary care and community settings. Finally, the design was cross-sectional; therefore, the correlations do not indicate causal relationships.

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