Published in final edited form as:

Qual Life Res. 2016 May ; 25(5): 1257–1263. doi:10.1007/s11136-015-1160-y.

Neurocognitive complaints and functional status among patients with chronic fatigue syndrome and fibromyalgia

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Abstract

Purpose—The purpose of this study was to conduct a longitudinal examination of cognitive complaints and functional status in patients with chronic fatigue syndrome (CFS) alone and those who also had fibromyalgia (CFS/FM).

Methods—A total of 93 patients from a tertiary care fatigue clinic were evaluated on four occasions, each 6 months apart. Each evaluation included a tender point assessment, and self-reported functional status and cognitive complaints.

Results—Patients with CFS/FM reported significantly worse physical functioning, more bodily pain, and more cognitive difficulties (visuo-perceptual ability and verbal memory) than patients with CFS alone. Over time, bodily pain decreased only for participants with CFS alone. Verbal memory problems were associated with more bodily pain for both patient groups, whereas visuo-perceptual problems were associated with worse functional status for patients with CFS alone.

Conclusions—This study adds to the literature on functional status, longitudinal course, and cognitive difficulties among patients with CFS and those with CFS and FM. The results suggest that patients with CFS/FM are more disabled, have more cognitive complaints, and improve more slowly over time than patients with CFS alone. Specific cognitive difficulties are related to worse functional status, which supports the addition of cognitive difficulties to the FM case criteria.

Keywords

Functional status; Neurocognitive symptoms; Fibromyalgia; Chronic fatigue syndrome

Introduction

Chronic fatigue syndrome (CFS) is an illness of unknown etiology associated with significant disability; characteristic symptoms include profound fatigue for greater than 6

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Conflict of interest The authors declare that they have no conflict of interest.

Compliance with ethical standards

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

months' duration, impaired memory or concentration, sore throat, tender lymph nodes, myalgia, arthralgia, headaches, unrefreshing sleep, and post-exertion malaise [1]. Memory impairment is common among patients with CFS, reported by 75 % on average (range 62–89 %) [2–4]. Self-reported attention-concentration difficulties also are common, experienced by 86.6 % of patients on average (range 67.5–100 %) [2–5]. In addition to these studies of symptom prevalence, other studies have reported symptom severity. For example, patients with CFS rated impaired memory severity as 63 out of 100 [6], mental fatigue as 14 out of 20 [7], and cognitive failures as 58 out of 100 [8]. Moreover, a number of studies have demonstrated significantly more self-reported cognitive problems among patients with CFS compared to healthy subjects [9, 10]. When these studies are considered together, there is consistent evidence that the majority of patients with CFS report significant difficulties with cognitive symptoms.

CFS and fibromyalgia (FM) often co-occur: FM is characterized by widespread pain, and like CFS, is also a diagnosis of exclusion. Prior to the current diagnostic criteria for FM published in 2010 [11], FM was defined by a history of widespread pain and pain in 11 of 18 tender point sites on digital palpation [12]. The current FM case criteria involve widespread pain and symptom severity above a significant level for at least 3 months [11]. These FM criteria overlap with the CFS case criteria: Fatigue, headaches, unrefreshing sleep, and impaired cognitive functioning are common to both [1, 11]. The comorbidity of FM—based on the previous 1990 case criteria [12]—among those who meet criteria for CFS averages 53 % (range 15.6–80 %) [3, 5–7, 13–15]. The variability in FM comorbidity among persons with CFS may be due to multiple factors such as sample selection and case ascertainment methods. CFS and FM may share common pathophysiological mechanisms, such as a high degree of central nervous system sensitivity to sensory stimuli [16].

Cognitive difficulties, including memory and concentration difficulties, are among the symptoms shared by CFS and FM case definitions. Studies of patients with FM have found self-reported cognitive difficulties to be common [17]. Memory impairments were reported by 60 % of patients with FM [18], and mental confusion or concentration difficulties were reported by 76 % [18] to 91 % [5]. With higher scores reflecting less cognitive impairment, patients with FM rated concentration symptoms as 2.3 out of 5, and memory symptoms as 2.4 out of 5 [13].

In the studies summarized above, the goal was to characterize the cognitive complaints of samples with CFS or with FM. Few studies have assessed FM in patients with CFS, which is the focus of the present study, or CFS in patients with FM. Two previous studies have examined self-reported cognitive functioning among patients with CFS compared to those with CFS and FM. The CFS/FM sample in a study by Ciccone and Natelson [7] reported their level of mental fatigue as 16 out of 20, which was not significantly different from level reported by patients with CFS only. Patients with CFS/FM in another study by Brown and Jason [6] reported impaired memory that was rated 65 out of 100, which again did not differ from the level reported by patients with CFS alone. Taken together, in the studies of cognitive symptoms among patients with CFS, FM, and CFS/FM, no clear pattern emerges that the presence of one or both conditions is associated with different prevalence or severity of cognitive symptoms.

CFS and FM are associated with functional impairment, but the extent to which cognitive complaints contribute to impaired functional status is unknown. The Medical Outcomes Study Short-Form 36 (SF-36) [19] has been used to assess functional status in numerous studies. The SF-36 has eight subscales with scores that range from 0 to 100: Higher scores indicate better functioning, and the normal range is 80 and above [19]. In the present study, two of its subscales are of particular interest: physical functioning and bodily pain, because of their relevance for patients with chronic fatigue and pain. Studies that have compared the SF-36 scores of patients with CFS to those with CFS/FM have found the scores for both groups to be significantly below normal limits, and have found physical functioning and bodily pain subscales to be significantly more impaired among patients with CFS and FM than among those with CFS alone [6, 7, 20].

The present study sought to examine cognitive complaints and functional status among patients with CFS alone and CFS/FM, and the association of cognitive complaints with functional status over an 18-month longitudinal study. This study used a multi-dimensional self-report questionnaire of cognitive complaints, the Multiple Ability Self-Report Questionnaire (MASQ) [21], which has been recommended for inclusion in the assessment of FM [22] and in clinical trials of FM [23]. Based on the results of previous studies, it was predicted that self-reported cognitive symptoms would not differ between patients with CFS and patients with CFS/FM, but that physical functioning and bodily pain would be worse among patients with CFS/FM compared to those with CFS alone. The final hypothesis was that more cognitive symptoms—specifically attention—concentration and memory, which are the two clusters of cognitive functions specifically identified in both CFS and FM case definitions—would be associated with worse functional status over time.

Patients and methods

Patients and procedures

Participants included 93 patients selected from a tertiary care fatigue clinic associated with a university-affiliated medical center between the ages of 18–65 who met criteria for chronic fatigue syndrome (CFS) [1]. These participants were evaluated on four occasions, each 6 months apart.

The medical and psychiatric evaluations consisted of: a set of laboratory tests which included a complete blood count with differential, erythrocyte sedimentation rate, 12-factor automated chemical analysis, liver function tests, thyroid-stimulating hormone, and any other tests deemed medically necessary to fully evaluate other potential causes of fatigue; a review of the patient's current and former medical records; a self-report questionnaire which probed for the presence and absence of all the major and minor CFS case criteria; and a computer-assisted structured psychiatric diagnostic interview, the Diagnostic Interview Schedule (DIS) version III-A [24].

A physical examination also was conducted, including a tender point examination to determine whether FM was evident, consistent with the 1990 case criteria [12]. While 72 % of participants maintained the same FM classification from the first to the second examination, 23 % had fewer than 11 tender points at the index evaluation but more than 11

tender points at the second evaluation, consistent with FM, and 5 % had 11 or greater tender points at the first evaluation but fewer than 11 tender points at the second evaluation. The results of three participants' index visit tender point examinations were missing so their FM case status from their subsequent visits (which was stable over time in all three cases) was imputed for their index visit. FM case status was retained for analysis.

All sources of information were reviewed to ensure that potential participants met CFS case criteria: the self-report questionnaire about CFS case criteria; the medical, laboratory, and psychiatric evaluations; and review of past records. After the screening process, the study was explained to eligible subjects and they were invited to participate. The study was reviewed and approved by the IRB at the authors' institution; all participants indicated informed consent by signing a consent form. A total of 169 patients met the above criteria and were asked to participate in the study; of those, 100 consented. Seven participants met criteria for idiopathic chronic fatigue [1] and were excluded from this study, for a final sample of 93 participants. Participants received an honorarium for each evaluation they completed. Further details regarding the sample and their longitudinal course over time have been described previously [25].

Measures

The participants completed self-report questionnaires that yielded measures of functional status and cognitive symptoms.

Functional status—The SF-36 [19], described above, was used to evaluate functional status. The physical functioning and bodily pain scores were retained for analysis: These scores are relevant to both CFS and FM, and have been shown to be sensitive to change in clinical status over time in previous studies [22, 23, 25, 26].

Cognitive complaints—The Multiple Ability Self-Report Questionnaire (MASQ) [21] assesses the degree of difficulty in performing 38 specific cognitive tasks. The MASQ is scored for five scales: (a) language, (b) visuo-perceptual ability, (c) verbal memory, (d) visual memory, and (e) attention/concentration. The average item value on a 1 ("never" experiences difficulties) to 5 ("always" experiences difficulties) for each scale was retained; greater self-reported cognitive impairment is indicated by higher scores. MASQ scores have been demonstrated to have modest concurrent validity with the results of the neuropsychological tests that assessed complementary domains of cognitive function [21].

Data analysis

Participants were classified as meeting only CFS case criteria or both CFS and FM case criteria (CFS and CFS/FM, respectively) at the index evaluation. These samples were compared using *t* or Fisher's exact tests for parametric and nonparametric comparisons with small cell sizes, respectively. These comparisons were conducted for sociodemographic variables, self-reported cognitive symptoms, and functional status variables. Hierarchical linear models (HLM) were used to test change in cognitive symptoms over time with fixed effects for time (elapsed days since the index visit), random effects for the intercept, and evaluation visit as a repeated measure. HLM also was used to identify cognitive complaints

that were associated with functional status (with separate analyses for the dependent variables of physical functioning and bodily pain), with fixed effects for time (elapsed days since the index visit) and MASQ subscales, random effects for the intercept, and evaluation visit as a repeated measure. These analyses were conducted separately for participants meeting only CFS case criteria and for participants meeting both CFS and FM case criteria.

Results

Sample characteristics

Table 1 shows the results of the comparisons of participants with CFS ($n = 50$) and with CFS/FM ($n = 43$) with regard to sociodemographic characteristics. Overall, the participants averaged about 44 years of age with no significant difference between the CFS and CFS/FM samples. Most participants were female; the CFS/FM sample contained proportionally more women (95 %) than did the CFS sample (75 %). As reported previously, these participants were mostly non-Hispanic white (93 %), unemployed (63 %), who had complete 2 years of education beyond high school on average [25].

Group differences in functional status, cognitive symptoms, and change in cognitive symptoms over time

Table 1 also shows the means and SD for physical functioning, bodily pain, and cognitive complaints from participants' index research evaluation, and comparisons of the CFS versus CFS/FM subgroups. Participants with CFS/ FM reported significantly worse physical functioning and more bodily pain than participants with CFS only, consistent with our hypothesis. It should be noted that both groups' average values of these SF-36 subscales were in the clinically impaired range (i.e., <80).

However, our prediction that the CFS and CFS/FM groups would not differ in terms of cognitive complaints was not uniformly supported. Consistent with this hypothesis, the groups did not differ significantly in terms of their language, attention/concentration, and visuospatial memory complaints. However, both visuo-perceptual ability and verbal memory were more impaired among participants with CFS/FM than among those with CFS alone. Both groups' MASQ scores on all subscales averaged several SD above healthy individuals' average MASQ scores [21, 27, 28], suggesting perceptions of significant cognitive impairment in all domains. CFS/FM average scores were comparable to published averages for FM-only samples [27, 28].¹

HLM analyses found no significant change in any MASQ score over time (F s ranged from 0.004 for language to 1.32 for verbal memory, all ns), so only participants' average scores from the index visit are presented in Table 1.

¹We used the average item value for each MASQ scale, consistent with the original MASQ article [21]. Other studies [26–28] have reported total scores across items for each scale. Average item values for each scale can be compared to total scores for each scale by multiplying the average item value by eight for all scales except visuo-perceptual ability, which is multiplied by 6.

Association of cognitive symptoms with functional status over time

The final hypothesis was that cognitive symptoms would be associated with patients' functional status over time. Time-varying fixed effects of elapsed days (based on the number of days since the participant's index research evaluation) and the five MASQ variables were used to predict the SF-36 dependent variables of bodily pain and physical functioning in separate HLM analyses; these analyses were conducted for participants meeting only CFS case criteria and for participants meeting both CFS and FM case criteria. The results are presented in Table 2. (Random effects for slope were tested but did not result in better models, i.e., in Bayesian Information Criteria decreases of -10 [29]; thus, the analyses with elapsed days as fixed effects are reported.)

In terms of the dependent variable of physical functioning, for participants with CFS, less difficulty with visuo-perceptual abilities was associated with better physical functioning. For participants with CFS/FM, fewer language complaints were significantly associated with better physical functioning. Insignificant effects were found for the other MASQ scales.

In terms of the dependent variable of bodily pain, for participants with CFS, more elapsed days, and less difficulty with visuo-perceptual abilities and verbal memory were associated with less bodily pain. For participants with CFS/FM, less difficulty with verbal memory was significantly associated with less bodily pain. Insignificant effects were found for the other MASQ scales.

Discussion

This study of 93 patients with CFS, 43 of whom also met the 1990 criteria for FM [12], examined self-reported cognitive complaints and functional status over an 18-month period. Our prediction that physical functioning and bodily pain would be worse among patients with both CFS and FM than among those with CFS alone was supported, and both groups' scores were in the clinically impaired range. The literature review did not lead us to predict differences in self-reported cognitive symptoms between patients with CFS alone and patients with CFS and FM, and no significant differences were found for language, attention–concentration, and visuospatial memory difficulties. However, more visuo-perceptual problems and verbal memory difficulties were reported among patients with both CFS and FM than among those with CFS alone. Of note, participants' self-reported cognitive symptoms did not change over time, and were comparable to published FM-only values [27, 28], and were significantly worse than healthy persons' published values [21, 27]. These findings of more severe self-reported difficulties in several areas of cognitive function among those with FM in addition to CFS, and that these scores were in the clinically impaired range, may lend support to the recent addition of cognitive difficulties to the FM case criteria [11].

The final hypothesis that attention-concentration and memory—two cognitive functions specifically identified in both the CFS [1] and newest FM [11] case definitions— would be associated with worse functional status over time was partially supported. For both CFS and CFS/FM groups, verbal memory difficulties were associated with bodily pain, consistent with our predictions and the inclusion of memory difficulties in the CFS and FM case

criteria [1, 11]. However, attention-concentration problems were not associated with either functional status measure for either participant group. The attention-concentration difficulties experienced by patients with CFS and FM may be more subtle—for example, entailing divided attention and other more complex attentional processes—than those assessed by the MASQ, which asks about mind wandering, keeping one's train of thought, and so forth. Beyond our predictions regarding memory and attention-concentration, we found that additional cognitive complaints were associated with functional status: Fewer language complaints were associated with better physical functioning for CFS/ FM participants, and fewer problems with visuo-perceptual abilities were associated with better physical functioning and less bodily pain for participants who met criteria for CFS but not FM. The MASQ's visuo-perceptual scale includes items related to getting lost, estimating distances, and map reading. A proportion of patients with CFS become housebound, which has been attributed to symptom severity [30]; the results of the present study suggest that patients' perceived visuo-perceptual cognitive symptoms involved in successfully negotiating travel away from home might be related to functional limitations. Taken together, these results were largely consistent with our hypotheses with the exception that attention-concentration complaints, which are highlighted in the CFS case definition, were not significantly associated with either measure of functional status.

These results add to the literature in several ways. There have been few previous comparisons of functional status, longitudinal course, and cognitive difficulties among patients with CFS, and among patients with FM in addition to CFS. The present study suggests that patients with both conditions are more disabled, have more cognitive complaints, and recover more slowly over time. Other novel results concern the associations of cognitive difficulties with functional status. These associations may have other implications for these patients' lives, which could be examined in future research. For example, do language difficulties, such as difficulties following conversations, finding words, and expressing oneself, mean that patients may not be able to fully engage in treatment, such as following directions for a complex rehabilitation program? Such problems could result in poorer physical functioning, as was found among the participants with both CFS and FM in this sample.

The study was not without weaknesses, which included the lack of a participant group with FM only, which could help unravel the relative contributions of fatigue and/or pain to the perception of cognitive difficulties. The MASQ has been validated by comparing self-reported difficulties with the results of objective neuropsychological tests [21]: Patients with CFS [31] and FM [17] demonstrate cognitive impairments, and the alignment between subjective and objective measures of cognitive problems has been acceptable in patients with FM [17], but has not been robust in patients with CFS [32]. Future research could complement self-report data by the inclusion of neuropsychological testing.

Acknowledgments

Funding This study was funded by the National Institute of Allergy and Infectious Disease (U19AI38429, Project 4 (Project PI, K. Schmaling)).

References

1. Fukuda K, Strauss SE, Hickie I, Sharpe MC, Dobbins JG, Komaroff A, et al. (1994). The chronic fatigue syndrome: A comprehensive approach to its definition and study. *Annals of Internal Medicine*, 121, 953–959. [PubMed: 7978722]
2. Cockshell SJ, & Mathias JL (2013). Cognitive deficits in chronic fatigue syndrome and their relationship to psychological status, symptomatology, and everyday functioning. *Neuropsychology*, 27, 230–242. [PubMed: 23527651]
3. Friedberg F, Dechene L, McKenzie MJ, I. I., & Fontanetta R (2000). Symptom patterns in long-duration chronic fatigue syndrome. *Journal of Psychosomatic Research*, 48, 59–68. [PubMed: 10750631]
4. Hickie I, Lloyd A, Hadzi-Pavlovic D, Parker G, Bird K, & Wakefield D (1995). Can the chronic fatigue syndrome be defined by distinct clinical features? *Psychological Medicine*, 25, 925–935. [PubMed: 8588011]
5. Aaron LA, Burke MM, & Buchwald D (2000). Overlapping conditions among patients with chronic fatigue syndrome, fibromyalgia, and temporomandibular disorder. *Archives of Internal Medicine*, 160, 221–227. [PubMed: 10647761]
6. Brown MM, & Jason LA (2007). Functioning in individuals with chronic fatigue syndrome: Increased impairment with cooccurring multiple chemical sensitivity and fibromyalgia. *Dynamic Medicine*, 6, 6. [PubMed: 17540028]
7. Ciccone DS, & Natelson BH (2003). Comorbid illness in women with chronic fatigue syndrome: A test of the single syndrome hypothesis. *Psychosomatic Medicine*, 65, 268–275. [PubMed: 12651994]
8. Gotts ZM, Ellis JG, Deary V, Barclay N, & Newton JL (2015). The association between daytime napping and cognitive functioning in chronic fatigue syndrome. *PLoS ONE*, 10, 1–12.
9. Schmaling K, Lewis DH, Fiedelak JI, Mahurin R, & Buchwald DS (2003). Single-photon emission computerized tomography and neurocognitive function in patients with chronic fatigue syndrome. *Psychosomatic Medicine*, 65, 129–136. [PubMed: 12554824]
10. Ickmans K, Meeus M, Kos D, Clarys P, Meersdom G, Lambrecht L, et al. (2013). Cognitive performance is of clinical importance, but is unrelated to pain severity in women with chronic fatigue syndrome. *Clinical Rheumatology*, 32, 1475–1485. [PubMed: 23737111]
11. Wolfe F, Clauw DJ, Fitzcharles MA, Goldenberg DL, Katz RS, Mease P, et al. (2010). The American College of Rheumatology preliminary diagnostic criteria for fibromyalgia and measurement of symptom severity. *Arthritis Care & Research*, 62, 600–610. [PubMed: 20461783]
12. Wolfe F, Smythe HA, Yunus MB, Bennett RM, Bombardier C, Goldenberg DL, et al. (1990). The American College of Rheumatology 1990 criteria for the classification of fibromyalgia. *Arthritis and Rheumatism*, 33, 160–172. [PubMed: 2306288]
13. Aaron LA, Herrell R, Ashton S, Belcourt M, Schmaling K, Goldberg J, et al. (2001). Comorbid clinical conditions in chronic fatigue: A co-twin control study. *Journal of General Internal Medicine*, 16, 24–31. [PubMed: 11251747]
14. Goldenberg DL, Simms RW, Geiger A, & Komaroff AL (1990). High frequency of fibromyalgia in patients with chronic fatigue seen in a primary care practice. *Arthritis and Rheumatism*, 33, 381–387. [PubMed: 2317224]
15. Jason LA, Taylor RR, & Kennedy CL (2000). Chronic fatigue syndrome, fibromyalgia, and multiple chemical sensitivities in a community-based sample of persons with chronic fatigue syndrome-like symptoms. *Psychosomatic Medicine*, 62, 655–663. [PubMed: 11020095]
16. Yunus MB (2013). Fibromyalgia: A central sensitivity syndrome In Goldman MB, Troisi R, & Rexrode KM (Eds.), *Women and health* (2nd ed., pp. 1331–1340). New York: Academic Press.
17. Tesio V, Torta DM, Colonna F, Leombruni P, Ghiggia A, Fusaro E, et al. (2015). Are fibromyalgia patients cognitively impaired? Objective and subjective neuropsychological evidence. *Arthritis Care & Research*, 67, 143–150. [PubMed: 25047247]
18. Leavitt F, Katz RS, Mills M, & Heard AR (2002). Cognitive and dissociative manifestations in fibromyalgia. *Journal of Clinical Rheumatology*, 8, 77–84. [PubMed: 17041327]

19. Ware JE, Jr, Snow KK, Kosinski M, & Gandek B (1993). SF-36 Health survey: Manual and interpretation guide. Boston: The Health Institute, New England Medical Center.
20. Komaroff AL, Fagiolo L, Doolittle TH, Gandek B, Gleit MA, Guerriera RT, et al. (1996). Health status in patients with chronic fatigue syndrome and in general population and disease comparison groups. *American Journal of Medicine*, 101, 281–290. [PubMed: 8873490]
21. Seidenberg M, Haltiner A, Taylor M, Hermann B, & Wyler A (1994). Development and validation of a multiple ability self-report questionnaire. *Journal of Clinical and Experimental Neuropsychology*, 16, 93–104. [PubMed: 8150893]
22. Boomershine CS (2012). A comprehensive evaluation of standardized assessment tools in the diagnosis of fibromyalgia and in the assessment of fibromyalgia severity. *Pain Research and Treatment*, 2012, 653714. [PubMed: 22110942]
23. Williams DA, & Arnold LM (2011). Measures of fibromyalgia. *Arthritis Care & Research*, 63, S86–S97. [PubMed: 22588773]
24. Robins L, & Helzer J (1985). Diagnostic interview schedule (DIS): Version III-A. St. Louis, MO: Department of Psychiatry, Washington University School of Medicine.
25. Schmaling KB, Fiedelak JI, Katon WJ, Bader JO, & Buchwald DS (2003). Prospective study of the prognosis of unexplained chronic fatigue in a clinic-based cohort. *Psychosomatic Medicine*, 65, 1047–1054. [PubMed: 14645784]
26. Branco JC, Zachrisson O, Perrot S, & Mainguy Y (2010). A European multicentre double-blind placebo-controlled monotherapy clinical trial of milnacipran in treatment of fibromyalgia. *Journal of Rheumatology*, 37, 851–859. [PubMed: 20156949]
27. Williams DA, Clauw DJ, & Glass JM (2011). Perceived cognitive dysfunction in fibromyalgia syndrome. *Journal of Musculoskeletal Pain*, 19(1), 66–75.
28. Kratz AL, Schilling S, Goesling J, & Williams DA (2015). Development and initial validation of a brief self-report measure of cognitive dysfunction in fibromyalgia. *Journal of Pain*, 16(6), 527–536. [PubMed: 25746197]
29. Raftery AE (1996). Bayesian model selection in social research In Marsden PV (Ed.), *Sociological Methodology* (Vol. 26, pp. 111–163). Oxford: Blackwell.
30. Wiborg JF, van der Werf S, Prins JB, & Bleijenberg G (2010). Being homebound with chronic fatigue syndrome: A multidimensional comparison with outpatients. *Psychiatry Research*, 177(120), 246–249. [PubMed: 20207012]
31. Cockshell SJ, & Mathias LJ (2010). Cognitive functioning in chronic fatigue syndrome: A meta-analysis. *Psychological Medicine*, 40, 1253–1267. [PubMed: 20047703]
32. Cockshell SJ, & Mathias LJ (2014). Cognitive functioning in people with chronic fatigue syndrome: A comparison between subjective and objective measures. *Neuropsychology*, 28, 394–405. [PubMed: 24364389]

Table 1

Comparison of CFS and CFS/FM participant characteristics at the index evaluation

	CFS (<i>n</i> = 50)	CFS/FM (<i>n</i> = 43)	CFS versus CFS/FM <i>t</i> or Fisher's exact test
Age	44.30 (9.06)	43.88 (10.68)	<i>t</i> (91) = −.20, ns
Female	74 %	95 %	<i>p</i> = .009
SF-36 physical function	49.59 (23.09)	34.40 (23.08)	<i>t</i> (87) = −3.10 *
SF-36 bodily pain	38.09 (21.20)	28.50 (20.58)	<i>t</i> (87) = −2.33 *
MASQ language	2.45 (0.62)	2.57 (0.63)	<i>t</i> (91) = 0.90
MASQ visuo-perceptual ability	2.39 (0.63)	2.76 (0.81)	<i>t</i> (91) = 2.48 *
MASQ verbal memory	2.77 (0.59)	3.07 (0.62)	<i>t</i> (91) = 2.37 *
MASQ visuospatial memory	2.20 (0.59)	2.41 (0.66)	<i>t</i> (91) = 1.70
MASQ attention–concentration	2.67 (0.47)	2.77 (0.47)	<i>t</i> (91) = 1.02

*
p < .05

Table 2

Hierarchical linear models of the predictors of SF-36 physical functioning (left side of table) and of SF-36 bodily pain (right side of table)

Parameter	Predictors of physical functioning				Predictors of bodily pain			
	CFS		CFS/FM		CFS		CFS/FM	
	Estimate	<i>t</i>	Estimate	<i>t</i>	Estimate	<i>t</i>	Estimate	<i>t</i>
Intercept	70.62 (11.15)	6.34 *	67.91 (10.71)	6.34 *	84.87 (11.23)	7.56 *	60.01 (9.95)	6.03 *
<i>Fixed effects</i>								
Time (elapsed days)	0.00 (0.00)	0.98	0.01 (0.01)	1.87	0.02 (0.01)	3.23 *	0.00 (0.00)	0.30
MASQ language	-5.20 (4.23)	-1.23	-8.20 (3.90)	-2.10 *	5.62 (4.62)	1.22	-1.08 (3.88)	-0.28
MASQ visuo-perceptual ability	-6.33 (2.06)	-2.07 *	0.72 (3.04)	0.24	-8.15 (3.33)	-2.45 *	1.83 (3.04)	0.60
MASQ verbal memory	-2.07 (3.16)	-0.65	-1.35 (3.76)	-0.36	-10.10 (3.52)	-2.87 *	-11.60 (3.96)	-2.93 *
MASQ visuospatial memory	1.63 (4.01)	0.41	-7.24 (4.22)	-1.71	1.59 (4.35)	0.37	-1.55 (4.38)	-0.36
MASQ attention-concentration	3.76 (4.70)	0.98	2.62 (3.76)	0.70	-4.96 (5.32)	-0.93	1.96 (4.01)	0.49

SE are in parentheses

*
 $p < .05$