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Functional status of persons with chronic fatigue syndrome in the Wichita, Kansas, population

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Abstract

Background: Scant research has adequately addressed the impact of chronic fatigue syndrome on patients' daily activities and quality of life. Enumerating specific problems related to quality of life in chronic fatigue syndrome patients can help us to better understand and manage this illness. This study addresses issues of functional status in persons with chronic fatigue syndrome and other fatiguing illnesses in a population based sample, which can be generalized to all persons with chronic fatigue.

Methods: We conducted a random telephone survey in Wichita, Kansas to identify persons with chronic fatigue syndrome and other fatiguing illnesses. Respondents reporting severe fatigue of at least 1 month's duration and randomly selected non-fatigued respondents were asked to participate in a detailed telephone interview. Participants were asked about symptoms, medical and psychiatric illnesses, and about physical, social, and recreational functioning. Those meeting the 1994 chronic fatigue syndrome case definition, as determined on the basis of their telephone responses, were invited for clinical evaluation to confirm a diagnosis of chronic fatigue syndrome. For this analysis, we evaluated unemployment due to fatigue, number of hours per week spent on work, chores, and other activities (currently and prior to the onset of fatigue), and energy level.

Results: There was no difference between persons with chronic fatigue syndrome and persons with a chronic fatigue syndrome-like illness that could be explained by a medical or psychiatric condition for any of the outcomes we measured except for unemployment due to fatigue (15% vs. 40%, $P < .01$). Persons with chronic fatigue syndrome and other fatiguing illnesses had substantially less energy and spent less time on hobbies, schooling, or volunteer work than did non-fatigued controls ($P < .01$).

Conclusions: Persons with chronic fatigue syndrome are as impaired as persons whose fatigue could be explained by a medical or psychiatric condition, and they have less energy than non-fatigued controls.

Background

Chronic fatigue syndrome (CFS) is defined by severe fatigue of at least 6 month's duration that interferes substantially with occupational, educational, social, or personal activities, is not alleviated by rest, and is accompanied by at least four of eight specific symptoms (unusually severe post-exertional fatigue, significantly impaired memory or concentration, unrefreshing sleep, sore throat, tender lymph nodes, muscle pain, joint pain, headaches) [1]. Despite the disabling nature of CFS, scant research has adequately addressed the impact of this syndrome on patients' daily activities and quality of life. Enumerating specific problems related to quality of life in CFS patients can help us to better understand and manage this illness [2].

The quality-of-life approach to studying chronic illnesses concerns how illness impacts daily physical, psychological, and social functioning. This approach is important because many chronically ill patients focus on improving function and well-being rather than on obtaining a "cure" [3]. CFS patients have substantial functional impairment compared with both healthy controls and other chronically ill populations [3–7]. Previous research has found CFS patients to be more severely impaired than persons with untreated hyperthyroidism [8], end-stage renal disease [9], heart disease [10], or multiple sclerosis [7]. Unfortunately, these studies included CFS patients identified by self and physician referral, and the results cannot be generalized to the population of persons suffering from CFS.

This report evaluates the functional status of persons with CFS and other fatiguing illnesses identified in a random sample of the Wichita, Kansas, population. Using information gathered through interviews with fatigued and non-fatigued respondents, we addressed whether: 1) persons with CFS are different from non-fatigued persons or from people with other unexplained fatiguing illnesses with respect to energy level and physical, social, and recreational functioning and in what manner; 2) do persons with and without medical or psychiatric conditions differ in regard to these areas of functioning?

Methods

This study adhered to human experimentation guidelines of the U.S. Department of Health and Human Services. All participants were volunteers who gave informed consent.

The Centers for Disease Control and Prevention Human Subjects Committee approved study protocols.

Study Design

Details of the population-based study to estimate the prevalence and incidence of CFS in the adult population of Wichita, Kansas, have been published [11]. In brief, we used a computer-assisted telephone interviewing system to screen ~90 000 persons. Respondents with severe fatigue for at least 1 month ($n = 3\,528$) and randomly selected non-fatigued ($n = 3\,634$) respondents ranging in age from 18 to 69 years completed detailed telephone interviews concerning fatigue, other symptoms, and medical history.

Respondents were queried as to a variety of medical and psychiatric illnesses and stratified on the basis of the absence or presence of conditions that could explain their symptoms and thus exclude a diagnosis of CFS [1]. Reported exclusionary medical conditions included cancer within 5 years of the interview (except basal skin cancer), emphysema, chronic hepatitis, rheumatoid arthritis, acquired immunodeficiency syndrome, systemic lupus erythematosus, Sjögren's syndrome, multiple sclerosis, organ transplantation, pregnancy or major surgery within the past year, and any previous medical condition for which a resolution had not been documented. Stroke, heart attack, heart failure, and a heart condition limiting the ability to walk were exclusionary if they occurred within 2 years of the interview.

Exclusionary psychiatric conditions included those that would prevent a subject from accurately reporting symptoms (e.g., schizophrenia and bipolar disorder) and those with fatigue as a reasonably anticipated symptom (e.g., bulimia or anorexia nervosa, major depressive disorder with melancholia, and alcohol or substance abuse within the 5 years prior to the onset of fatigue).

On the basis of responses to the detailed telephone interview, respondents were classified as having "No Fatigue" if they did not report fatigue of at least 1 month's duration. Respondents reporting fatigue lasting at least 1 month were considered fatigued and stratified into three groups: 1) "Prolonged Fatigue" (ie, those whose fatigue lasted between 1 and 6 months); 2) "Chronic Fatigue" (ie, those who reported fatigue of at least 6 month's duration but with insufficient symptoms or fatigue severity to meet

Table 1: Questionnaire items used to measure functional status

Measure	Question
Unemployment due to fatigue	Are you unemployed because of your current fatiguing illness?
Current hours per week spent on: Work Household chores Other activities	During the past 4 weeks, on average, how many hours per week did you spend... ...on work duties including working from home and travel related to work? ...on household chores, such as cleaning, grocery shopping, and caring for your family? ...on activities such as hobbies, schooling, or volunteer work?
Prior to fatigue onset, hours per week spent on: Work Household chores Other activities	Before your fatigue began, on average, how many hours per week did you spend... ...on work duties including working from home and travel related to work? ...on household chores, such as cleaning, grocery shopping, and caring for your family? ...on activities such as hobbies, schooling, or volunteer work?
Energy level	During the past 4 weeks, where would you place yourself in terms of energy, wellness, and ability to complete your everyday activities on a scale from 1 to 100? 1 is the worst you could feel and 100 is the best you could feel.

the case definition of CFS); 3) "CFS-like" (ie, respondents whose reported symptoms and fatigue severity met the case definition of CFS).

CFS-like respondents who reported medical or psychiatric conditions that could have explained their fatigue (n = 511) were classified as having "Explained Syndromic Fatigue." The remaining 456 CFS-like respondents, who did not report an exclusionary condition, were invited to participate in a clinical evaluation to confirm a diagnosis of CFS, as recommended in the 1994 International CFS Research Case Definition [1]. Those who agreed to be clinically evaluated received a comprehensive physical examination, psychiatric evaluation, and routine laboratory tests. Because placement in the CFS-like classification group was based on telephone responses, those who declined clinical evaluation retained the classification of CFS-like, as did those who no longer reported sufficient symptoms or fatigue severity during their clinical evaluation. Those who had an exclusionary condition identified upon clinical evaluation were placed in the Explained Syndromic Fatigue category. Last, participants who received a clinical evaluation and reported sufficient symptoms and fatigue severity were classified as having CFS if we were unable to find a medical or psychiatric condition that might explain their fatigue.

Assessment of Functional Status

We measured functional status by using data from the detailed telephone interview (Table 1). Participants were asked how many hours per week they currently spent on work, household chores, and other activities, such as hobbies, schooling, or volunteer work. We created a variable to represent the total hours of meaningful activity per week, which was the sum of the three individual activity

variables for each respondent. Fatigued subjects were also asked how many hours they had spent on these activities prior to the onset of fatigue and if they were currently unemployed due to their fatiguing illness. In addition, all subjects were asked, "During the past 4 weeks, where would you place yourself in terms of energy, wellness, and ability to complete your everyday activities on a scale from 1 to 100, with 1 being the worst you could feel and 100 being the best you could feel?"

Assignment of Fatigue Groups

We classified subjects into one of six fatigue categories, as outlined above (No Fatigue, Prolonged Fatigue, Chronic Fatigue, Explained Syndromic Fatigue, CFS-like, or CFS). We further stratified the first three groups by whether an exclusionary condition was or was not reported. Three subjects who were evaluated clinically were excluded from this analysis because the results of their psychiatric evaluations were inconclusive, and thus we were unable to classify them.

Statistical Analyses

Statistical analyses were done using SAS version 8.01 (SAS Institute, Cary, NC). Dichotomous variables were compared using Pearson's chi-square test, while the Wilcoxon rank sum and Kruskal-Wallis tests were used to compare continuous variables. The Wilcoxon signed ranks test was used to compare current and prior responses for reported hours spent on activities per week. The Cochran-Armitage test was used to test for trend. All statistical tests were two-tailed, and significance was determined at an α -level of .05.

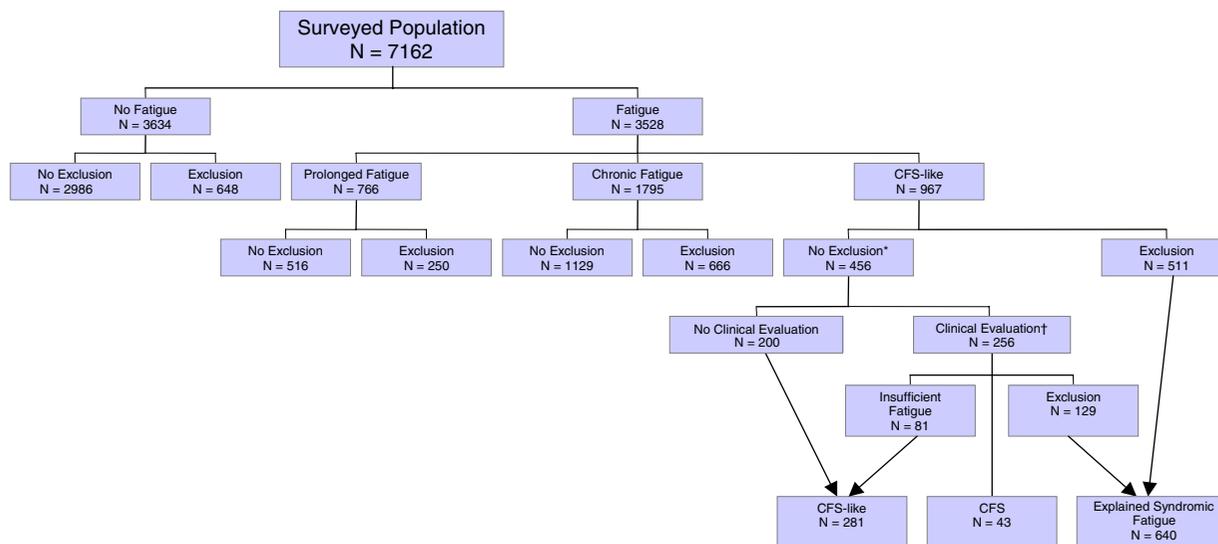


Figure 1
Study population as classified into fatigued and non-fatigued groups. *all CFS-like respondents who did not report an exclusionary condition were invited to participate in a clinical evaluation; †3 participants had inconclusive psychiatric assessments and could not be classified; *Fatigue* = severe fatigue of ≥ 1 month. *Exclusion* = subject reported a medical or psychiatric condition that would exclude a diagnosis of CFS. *Prolonged Fatigue* = severe fatigue ≥ 1 month but < 6 months. *Chronic fatigue* = severe fatigue ≥ 6 months, but without sufficient symptoms or fatigue severity to meet the 1994 CFS research case definition I. *CFS-like* = appears to meet the CFS case definition [1]. *Insufficient Fatigue* = no longer reported sufficient symptoms or fatigue severity when evaluated clinically. *Explained Syndromic Fatigue* = appears to meet the CFS case definition, except that an exclusionary condition was either reported or discovered upon clinical evaluation.

Results

Fatigue Groups

Figure 1 summarizes the composition of the fatigued and non-fatigued groups. The study population was mostly white (88%) and female (65%) and had a median age of 42 years. Demographic characteristics were similar across fatigue categories, with the exception of female sex and employment (data not shown). The percentage of women was lowest among the non-fatigued group without medical or psychiatric conditions (56%) and progressively increased with each level of fatigue, the CFS group having the highest percent of females (93%, test for trend $P <$

.01). There was also a significant trend for employment. Employment was highest among the non-fatigued group (78%) and decreased with each level of fatigue, with only 54% of those with CFS being employed (test for trend $P <$.01). Unemployment due to fatigue is discussed below.

Current Activity

Figure 2 shows the median reported number of weekly hours spent on work, chores, and other activities and the total reported hours of meaningful activity for each fatigue category. Fatigue groups without exclusionary conditions, including the No Fatigue group, were similar with

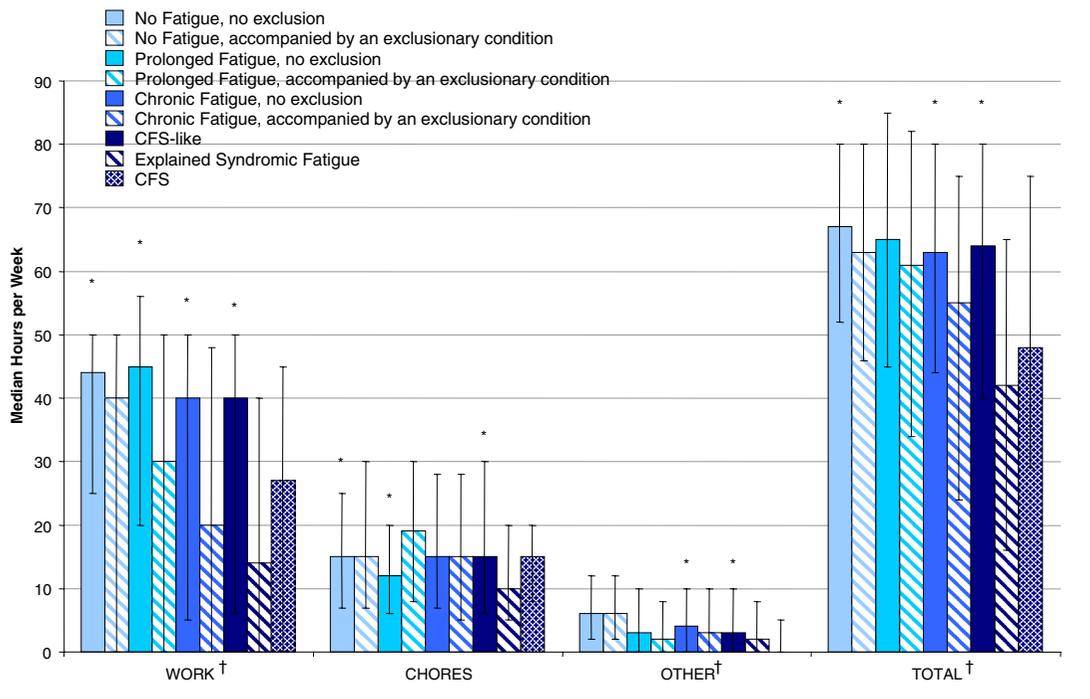


Figure 2
Median number of activity hours per week for fatigue groups. *significantly different ($P < .05$) from corresponding fatigue group with exclusionary conditions; CFS and CFS-like groups are compared with the Explained Syndromic Fatigue group. † significantly different ($P < .05$) across the fatigue groups without exclusionary conditions. Bars represent 25th to 75th percentile.

respect to the reported number of hours spent on chores. However, they were significantly different with respect to the reported number of hours spent on work and other activities, and the total meaningful activity decreased significantly across the fatigue groups without exclusionary conditions (Kruskal-Wallis P -values $< .01$).

With regard to other activities, the Prolonged Fatigue (no exclusions), Chronic Fatigue (no exclusions), and CFS-like groups were statistically similar (Kruskal-Wallis $P = .30$). The No Fatigue group without exclusions reported spending significantly more time on other activities than did the three middle groups without exclusions (Wilcoxon rank sum $P < .01$), and the CFS group reported significantly less time spent on other activities (Wilcoxon

rank sum $P = .01$). With respect to the reported number of hours spent on work and the reported total number of meaningful activity hours per week, the No Fatigue and Prolonged Fatigue groups without exclusions were statistically similar (Wilcoxon rank sums $P = .37$ and $.19$, respectively) and the Chronic Fatigue (no exclusions), CFS-like and CFS groups were statistically similar (Kruskal-Wallis $P = .22$ and $.06$, respectively). The more severely fatigued groups without exclusions reported spending significantly less time working and fewer total hours on meaningful activity than the No Fatigue and Prolonged Fatigue groups without exclusions (Wilcoxon rank sums both $P < .01$).

However, when unemployed subjects were excluded from these analyses, differences in work hours and total hours were no longer significant: all groups without exclusionary conditions, including the No Fatigue group, reported spending a median of 40 to 45 hours working ($P = .49$) and a median of 65–70 hours on total meaningful activity ($P = .70$) (data not shown). Therefore, it appears that the differences in reported hours of work and total hours between fatigued and non-fatigued subjects were most likely due to differences in the number of unemployed subjects in each group.

In comparisons of people with and without exclusionary conditions for each fatigue category, several differences were demonstrated. Among all groups, persons with exclusionary conditions reported spending significantly fewer hours per week working than those without exclusionary conditions in the same category ($P < .01$). The exception was the comparison between those with CFS and those with Explained Syndromic Fatigue, for which the difference was not significant. After unemployed subjects were dropped from the analyses, differences were no longer significant except for the No Fatigue ($P = .03$) and Prolonged Fatigue ($P = .04$) groups.

Subjects with Explained Syndromic Fatigue also reported spending fewer hours per week on chores than did those with CFS and those with CFS-like illness ($P = .01$). People with Chronic Fatigue accompanied by an exclusionary condition and those with Explained Syndromic Fatigue reported spending fewer hours on other activities than did people with Chronic Fatigue without such conditions ($P = .02$) and those with CFS-like illness ($P = .02$), respectively.

With regard to the total reported hours of meaningful activity per week, persons with exclusionary conditions in all fatigue categories reported significantly fewer hours ($P < .01$) except for those in the Prolonged Fatigue and CFS groups. However, when unemployed subjects were excluded, only difference in hours between the CFS-like and the Explained Syndromic Fatigue groups remained significant ($P = .01$).

Prior versus Current Activity

Figure 3 shows the change in reported hours per week for work, chores, other activities, and total meaningful activity from before onset of fatigue to time of interview. The change in hours of activity reported is striking. All fatigued groups with and without exclusions reported that they spent significantly less time on all activities after the onset of their fatiguing illness ($P \leq .01$), with the exception of the Prolonged Fatigue group without exclusionary conditions, which reported no change in the number of hours worked per week. The magnitude of the decrease in activity was greatest among the Explained Syndromic Fatigue

and CFS groups ($P < .01$); however, the decreases in these two groups did not differ from each other ($P = .16-.79$).

Energy Level

We asked subjects to express how they felt in terms of energy, wellness and ability to complete everyday activities on a composite scale from 1 to 100 (Figure 4). There was a clear downward trend in energy scores associated with severity of the fatigue category. The No Fatigue groups reported median energy scores between 80 and 85; Prolonged Fatigue, Chronic Fatigue, and CFS-like groups reported median energy scores of 50 ($P < .01$ compared with No Fatigue groups); CFS and Explained Syndromic Fatigue groups were also significantly lower, with median energy scores of 40 ($P < .01$ compared with the middle groups).

Unemployment due to Fatigue

There was a significant trend of increasing fatigue severity associated with increasing unemployment due to fatigue for subjects with and without exclusionary conditions ($P < .01$ for both), although differences were more pronounced among fatigue categories with exclusionary conditions (Figure 5). In all fatigue categories, more than twice as many people with accompanying exclusionary conditions reported that they were unemployed because of their fatigue compared with those in the same category without such exclusionary conditions ($P < .01$). In particular, approximately 40% of subjects with Explained Syndromic Fatigue reported being unemployed due to their fatiguing illness, compared with 15% of subjects with CFS ($P < .01$).

Discussion

This is the first population-based study examining the functional status of patients with CFS. We demonstrated that, with the exception of unemployment due to fatigue, persons with CFS and Explained Syndromic Fatigue (CFS-like illness accompanied by an exclusionary medical or psychiatric condition) were similarly impaired with respect to physical, social, and recreational functioning. This suggests that people with CFS are as severely impaired as people whose fatigue is associated with a known chronic disabling condition. This also supports the underlying assumption that these conditions cause significant impairment and should be considered exclusionary for a diagnosis of CFS.

While other studies have reported that persons with CFS are more severely impaired than chronically ill people, we do not believe that our results are contradictory. The previous studies compared CFS patients to those with multiple sclerosis [7] and muscular dystrophy [4], which can cause severe fatigue and exclude a diagnosis of CFS. However, the presence of fatigue was not an inclusion criterion

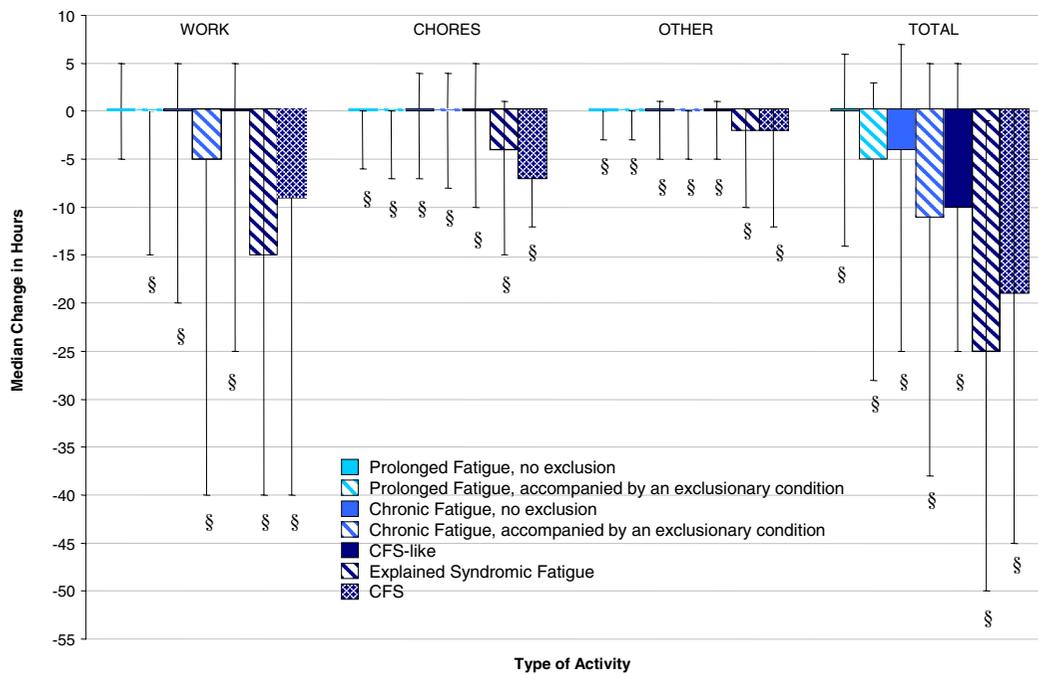


Figure 3
Changes from before onset of fatigue to time of interview in number of hours per week spent on activities by different fatigue groups. §Hours reported at time of interview were significantly different from hours prior to the onset of fatigue ($P < .01$). Bars represent 25th to 75th percentile.

in those studies. In fact, the patients enrolled in the muscular dystrophy study were ambulatory, did not have concurrent health problems, and were not seeking medical or mental health care. Similarly, the multiple sclerosis patients were being treated at a multiple sclerosis clinic, and many may not have been severely impaired at the time they were interviewed. In our study, fatigue was the entry criterion. We compared people with CFS identified in the Wichita population with persons in the same population who were experiencing severe chronic fatigue accompanied by an exclusionary condition. Thus, we evaluated the functional impairment of CFS subjects compared with that of people who did not just have an exclusionary condition but were actually impaired by one.

We also found that persons with CFS, indeed all fatigued subjects, rated themselves substantially lower in terms of energy, wellness and ability to complete everyday activities, and reported spending less time on activities other than work and chores than persons in the No Fatigue group. This is consistent with findings in other studies [3–5,7], which demonstrated that CFS patients had significant impairment compared with healthy controls. Of interest, we did not find any differences in the reported number of hours spent on work across any categories, including the No Fatigue group. This may reflect that work is considered an "essential" activity and that people may primarily sacrifice "non-essential" activities when they develop a fatiguing illness.

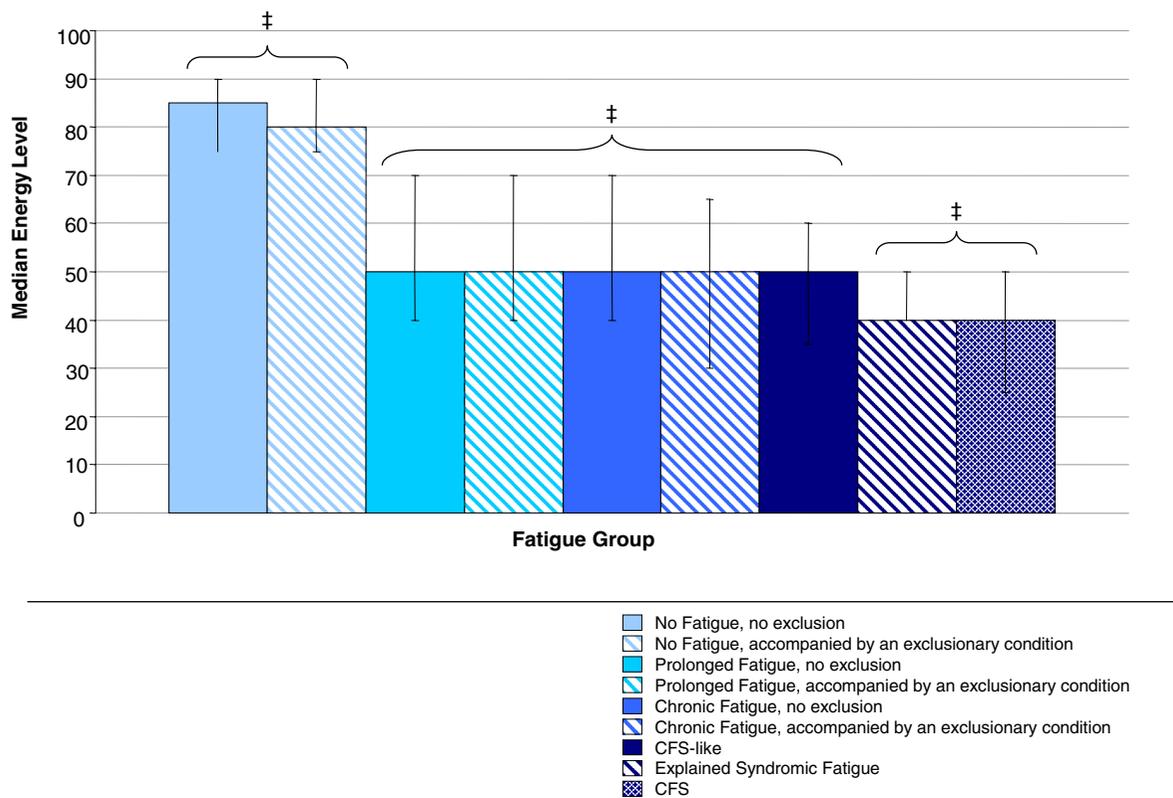


Figure 4
Energy level of fatigue groups on a scale from 1 to 100, 1 being the worst one could feel and 100 being the best.
 ≈ groups are statistically similar; ‡ significantly different from the adjacent group (P < .01); Bars represent 25th to 75th percentile.

Although the reported hours currently spent on chores were not different for fatigued and non-fatigued individuals, every fatigue group (with and without exclusionary conditions) reported spending more time on chores prior to the onset of fatigue, suggesting that chores may become less essential when people become fatigued.

We also observed that report of an exclusionary condition was associated with unemployment due to fatigue. Within each fatigue category, people reporting an accompanying exclusionary condition were more likely to be unemployed due to fatigue than were those who did not have such conditions. It may be more socially acceptable for persons with an identifiable illness to discontinue working, or persons with severe fatigue in the absence of an identifiable illness may find it more difficult to receive

unemployment and, thus, are not financially able to discontinue working.

This study has some limitations, most notably the potential for misclassification on several levels. First, most of the participants were not clinically evaluated, so we may have missed a number of people who either withheld report of or did not know they had an exclusionary condition. Conversely, subjects may have misunderstood the nature of an accompanying illness and misreported the presence of an exclusionary condition. In addition, of the 456 CFS-like subjects who were invited to have a clinical evaluation, 200 (44%) declined. Assuming that the same proportion of CFS cases would have occurred in those who did not come to clinic, we potentially missed 33 persons with CFS. In addition, those who chose not to

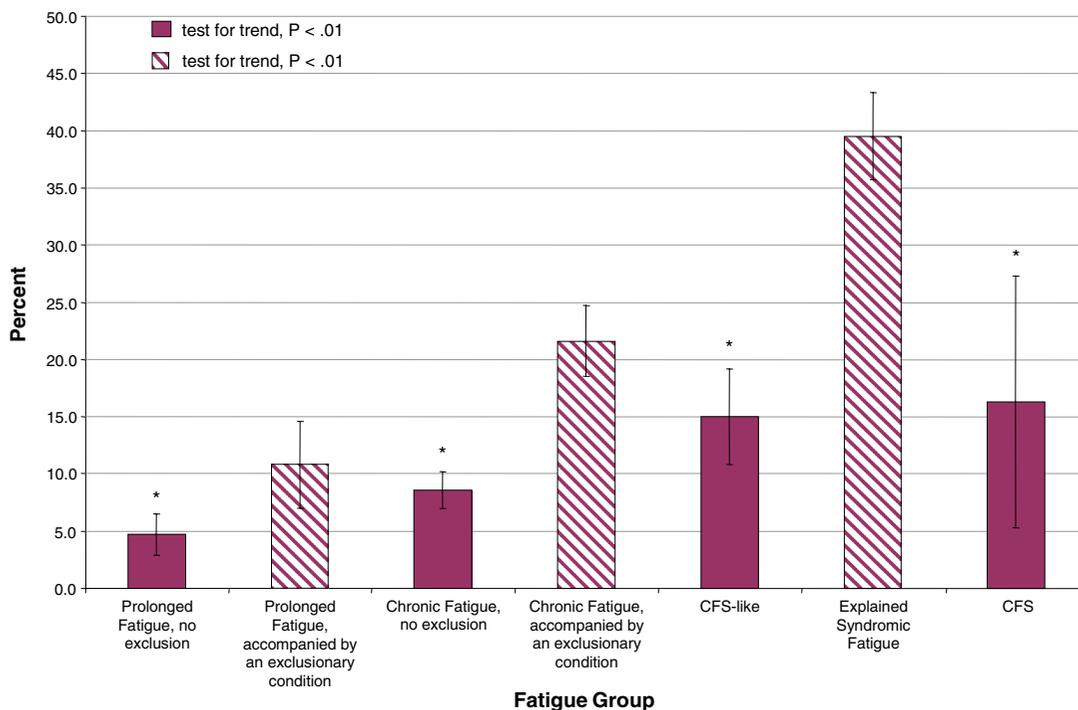


Figure 5
Percentage of subjects unemployed due to fatiguing illness *significantly different ($P < .05$) from corresponding fatigue group with exclusionary conditions, CFS and CFS-like are both compared with Explained Syndromic Fatigue. Bars represent 95% confidence intervals.

come to clinic may have been more impaired than those we evaluated, biasing our results toward the null.

Second, CFS is defined by self-reported symptoms – there are no signs or confirmatory laboratory abnormalities. There may be some misclassification of fatigue category based upon each respondent's self-report of fatigue severity. In addition, some of the outcome measures were subjective, requiring respondents to place themselves on a scale from 1 to 100 in terms of energy, wellness, and ability to complete everyday activities. Each individual's placement depended entirely on his or her perception of those three entities. The words "energy" and "wellness" may not mean precisely the same things to all people. In addition, some people's everyday activities are more demanding physically, emotionally, or mentally than

those of others, and whether someone feels they have the ability to complete everyday activities depends on how demanding those activities are. Last, the number of hours of activity reported relies on subject recall and does not indicate the quality of time spent.

Third, the analyses pertaining to the reported hours spent on various activities prior to the onset of fatigue are likely subject to the biases introduced by imperfect recall. In particular, there may be differential recall between the fatigue categories because of differences in the duration of illness. The prolonged fatigue group had been fatigued for less than six months, and presumably had better recall than the other groups. More than 3/4 of the CFS group had been fatigued for at least 2 years. However, while we can assume that recall error was linked to disease duration, we

have no reason to believe that the direction of recall error was similarly associated. People may have been just as likely to over-estimate hours of activity as to under-estimate, and while this may have decreased the precision of the estimates, we believe that the overall effect of recall bias was small.

This study also has unique strengths. Most important, we described CFS as it occurs in the community, without the confounders of referral biases that plague other CFS studies that have been based on convenience samples (usually medical settings). Only 16% of those in our sample who we classified as having CFS had reported ever being diagnosed with CFS by a doctor. We have performed a detailed analysis of the CFS cases in our sample, comparing those who had been previously diagnosed by a doctor to those who had not, the results of which are being prepared for publication (Solomon, submitted). In brief, results of that analysis suggest that persons with diagnosed CFS are quite different from those with undiagnosed CFS with respect to the number of symptoms reported, type of symptoms reported, and progression of illness. Whether these differences are due to differences in access to health care, health-seeking behavior, or physicians' perceptions of what CFS "should" look like, it seems clear that studies of persons with CFS using clinic-based samples may not be generalizable to the CFS population.

A second major strength of this study is its very large sample size, which allowed us to stratify our subjects into several fatigue categories and further subgroup them into those with and without exclusionary conditions. Most CFS studies combine subjects with exclusionary conditions into one group, obscuring the fact that not all people with such conditions have the same level of fatigue. Stratification by presence or absence of exclusionary conditions enabled us to evaluate the role of fatigue independent of exclusionary conditions.

Authors' contributions

LS performed the statistical analysis and wrote the manuscript; RN participated in the analysis and interpretation of the data and in critical revision of the manuscript, and provided statistical expertise; MR was instrumental in the conception and design of the study, and participated in the analysis and interpretation of the data, critical revision of the manuscript, and obtaining funding; DAP assisted in analysis and interpretation of the data and critical revision of the manuscript; WCR contributed to the conception and design of the study, acquisition of data and funding, analysis and interpretation of the data, and critical revision of the manuscript.

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