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Qualities of Fatigue and Associated Chronic Conditions Among Older Adults

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Abstract

Context—While fatigue is a common and distressing symptom, a well-specified definition of fatigue is lacking. One of the least well-defined aspects of fatigue is its quality, which might reflect the underlying pathophysiology.

Objectives—To identify qualities of fatigue and assess whether they are associated with distinct chronic conditions.

Methods—We identified five fatigue qualities in the literature, two mental and three physical, and selected representative items from those available in our data from a prospective cohort of 495 community-dwelling primary care patients aged 65 years or older. We then examined the prevalence of each quality, the correlations among qualities, and the association of fatigue qualities with health and functional status, including chronic conditions.

Results—Fatigue was very common among older primary care patients, with 70% reporting any fatigue and 43% reporting feeling tired most of the time, and was associated with worse health and functional status. Physical fatigue qualities were more common than mental qualities. Correlations among fatigue qualities were 0.09–0.27 and did not support the mental versus physical classification. Different fatigue qualities were not well explained by older adults' underlying chronic conditions. Rather the cumulative number of fatigue qualities was associated with worse health and function.

Conclusion—These first steps in exploring fatigue qualities suggest that different fatigue qualities could represent disparate manifestations of a common underlying etiology, while not ruling out distinct underlying pathophysiologies.

Keywords

Fatigue; older adults; chronic conditions

Introduction

Fatigue is common among older adults (1), is distressing, and is associated with functional decline and mortality (2–5). Despite this, the underlying causes and treatment of fatigue are not well understood. While clinicians and patients easily recognize fatigue when they see or

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experience it, the lack of a well-specified definition of fatigue is a major barrier to further research on the etiology, diagnosis, and treatment of this important symptom (6,7). A first step in developing a definition of fatigue is agreeing upon a set of domains required to describe the clinical phenomenon of fatigue. Although the numerous scales that have been developed to measure fatigue assess a wide variety of domains or aspects of fatigue, there is minimal consistency across measures in the specific domains addressed. Given that fatigue is first and foremost a symptom, the traditional dimensions of symptoms taught in medical history-taking may be a good starting point. These dimensions (location, chronology, precipitating and palliating factors, quality, severity, and associated symptoms (8)) have provided a framework for the assessment and management of pain (9,10), another subjective and difficult to study symptom. Diagnostic criteria for fatigue-related diseases, such as chronic fatigue syndrome (11), already take in to account many of these dimensions. One of the least explored and most difficult to define dimensions of fatigue is quality.

The quality of a symptom is its character or nature; for example, qualities of pain include aching, cramping, dull, sharp or burning. The quality of pain can be used to identify the underlying pathophysiology and to guide treatment. For example, burning or shooting pain is often neuropathic, and may be treated with anticonvulsants or tricyclic antidepressants, whereas aching pain is likely to be nociceptive and to respond to standard analgesics (10). The number or types of fatigue qualities have not been well defined. Some measurement scales for fatigue consider it a unidimensional construct, while others have specified different qualities of fatigue, such as physical (e.g., lack of energy, sleepiness) and mental (e.g., apathy and inability to concentrate) (12–18).

Defining qualities of fatigue is important because different qualities of fatigue may represent distinct underlying pathophysiologies. Alternatively, different qualities may represent diverse manifestations of a common underlying problem or set of problems. Our goal in this research was to identify qualities of fatigue and assess whether they were associated with distinct patterns of clinical characteristics. To identify fatigue qualities, we reviewed the literature and evaluated the existing fatigue scales (6,12–20). Based on this evidence, we developed a model of fatigue qualities with two groups of qualities: mental, comprising cognitive and emotional qualities, and physical, comprising sleepiness, lack of energy, and weakness (Figure 1). To assess the potential relationship between fatigue qualities and underlying pathophysiology, we examined the correlations among the various qualities of fatigue and the association of clinical characteristics with specific qualities of fatigue. If fatigue qualities reflect distinct underlying pathophysiologies, we would expect low correlations among fatigue types and distinctive patterns of clinical characteristics associated with each quality.

Methods

Overview

Subjects for this cross-sectional study were recruited from two primary care clinics (a Medicare Health Maintenance Organization and a Veterans Affairs clinic) during April-October of 1996. The purpose of the original prospective cohort study was to determine the feasibility and effectiveness of physical performance measures as predictors of health and functional outcomes in the primary care setting. The present study used data from the baseline assessment. The study was approved by the Institutional Review Boards of the relevant institutions. Study methods, described in detail elsewhere (21,22), are summarized below.

Subjects

Eligible community-dwelling adults aged 65 years or older from two primary care clinics serving a common geographic region in a major U.S. metropolitan area were recruited. Clinic

patients were eligible if they were cognitively intact (Mini-Mental State Examination [MMSE] (23) score ≥ 24) or mildly impaired (MMSE 16–23) with a caregiver, were able to walk four meters, and had a gait speed between 0.2 and 1.3 meters per second (m/s). Participants who used assistive devices were included.

Quality of Fatigue

Using the model of fatigue qualities shown in Figure 1, we selected representative items from the data set (Table 1). Because “tiredness” was the most common synonym presented for fatigue in existing scales (2,12,13,24–26), we also present data on participant responses to the question “Do you feel tired most of the time?” as a general measure of fatigue. When multiple items were available to represent a fatigue quality, we selected the most representative item, defined as the item most highly correlated with the sum of the candidate items (27). As shown in Table 1, we identified three candidate items for the emotional, cognitive, and sleepiness qualities, two items for lack of energy, and one item for weakness. Feeling tired much of the time was the item most highly correlated with the sum of the other items and was also the most prevalent item. The items selected as most representative are highlighted in bold in Table 1 and presented in Figure 1. All subsequent analyses are based on these five items and the general fatigue item.

Measures

Participant assessments included demographic characteristics, cognition (23), and self-reported physician-diagnosed chronic conditions (28). Depressive symptoms were assessed with the Geriatric Depression Scale (29). Self-rated health was assessed with the 5-level ordinal global health item from the Medical Outcomes Study (SF-36) (25). Functional status was assessed with the 100-point physical function index (PFI) of the SF-36 (25) and a 16-item basic and instrumental activities of daily living (ADL) scale from the National Health Interview Survey (NHIS), which counts the number of tasks performed without difficulty (30). Physical performance was measured with the 12-point Short Physical Performance Battery (SPPB) (31,32), and usual gait speed was assessed over a four-meter course. Inter-rater and test-retest reliability for the measures used in this study were found to be excellent, with intra-class correlations (ICC) generally over 0.9 (22).

Statistical Analysis

We present the candidate items for each fatigue quality, their prevalences, and their correlation with the sum of the other candidate items with each quality and overall. We present the prevalence of each quality of fatigue and evaluate the correlation between qualities using Spearman coefficients. To assess the interrelationships among the fatigue qualities and the general item, we performed maximum likelihood factor analyses of the five items with and without tiredness. To determine how many factors to retain, we used an eigenvalue > 1 and examination of scree plots of the eigenvalues. Because our items had binary responses, we used a tetrachoric correlation matrix in the factor analyses (33). The characteristics of participants reporting each individual fatigue quality and of participants reporting 1, 2, or ≥ 3 fatigue qualities were compared using Chi-square tests for dichotomous variables and the Kruskal-Wallis test for continuous variables. Because of the exploratory nature of these analyses, we did not correct the *P*-values for multiple comparisons. We determined the independent association between individual fatigue qualities and each chronic condition category by using multiple logistic regression to calculate odds ratios and 95% confidence intervals, which are presented graphically. To determine if the strength of the associations between the fatigue qualities and each condition differed among qualities, we used the TEST statement in PROC LOGISTIC. If an overall difference was noted, we used post hoc tests to identify the specific

differences among the qualities. All tests were two-tailed with $\alpha=0.05$, and SAS[®] version 9.2 (SAS Institute, Cary, North Carolina) was used for all analyses.

Results

The study population, which included the 495 participants who had baseline data on all fatigue qualities, had an average age of 74 years and was 44% female and 80% white (Table 2, column 1). The relatively low proportion of women was a result of the predominantly male population recruited from one of our two sites (VA primary care). Seventy percent of the participants (348/495) reported at least one fatigue quality. The most prevalent fatigue quality was low energy, reported by 42% of participants, while the least common was emotional fatigue, reported by 8% (Table 3, column 1). The physical fatigue qualities (sleepiness, low energy, and weakness) were all more common than the mental fatigue qualities (emotional and cognitive). Correlations between the physical fatigue qualities ranged from 0.13 to 0.20, while the correlation between the mental qualities was 0.27. Correlations between the mental and physical qualities were similar in magnitude, ranging from 0.09 to 0.27. Correlations of each subtype with tiredness tended to be greater, ranging from 0.12 for emotional fatigue to 0.45 for low energy.

In factor analysis of the five qualities both with and without tiredness, only a single factor was retained. For the five-item analysis, factor loadings ranged from 0.31 for sleepiness to 0.77 for trouble concentrating. When tiredness was included in the analysis, the factor loadings ranged from 0.39 for sleepiness to 0.81 for tiredness.

Participants who reported any quality of fatigue were more likely to be female and to report fair or poor self-rated health (Table 2). Presence of any fatigue was also associated with more chronic conditions, greater depressive symptoms, and worse functional status and physical performance; it was not associated with age.

The characteristics associated with reporting fatigue were similar across qualities, with variation in the strength but not in the direction of the associations (Table 4). Most qualities were associated with fair or poor self-rated health, more chronic conditions, greater depressive symptoms, and worse functional status and physical performance. The only gender differences in fatigue quality were a greater prevalence of sleepiness and tiredness in women compared to men. Whites were more likely to report low energy and tiredness than non-whites. The only fatigue quality associated with cognitive status was cognitive fatigue.

In order to examine the pattern of associations between fatigue qualities and chronic disease, we compared the relative odds of having each category of chronic disease across fatigue qualities (Figure 2). Most of the associations with specific diseases are similar across fatigue qualities. While cognitive fatigue had a stronger association with cardiovascular conditions and emotional fatigue had a stronger association with diabetes compared to the other qualities, these differences were not statistically significant. There was a significant difference overall among qualities in their association with pulmonary conditions; post hoc analyses of these associations with pulmonary disease indicated that there was no difference between emotional and cognitive fatigue ($\chi^2=0.06$, $df=1$, $P=0.81$), and no difference among the physical qualities ($\chi^2=1.28$, $df=2$, $P=0.53$), but that there was a significant difference between the mental and physical groups ($\chi^2=7.43$, $df=1$, $P=0.006$). There was also a significant difference overall among qualities in their association with general conditions, which included psychiatric problems, sleep disorders, and chronic pain. However, post hoc pairwise comparisons between qualities' associations with general conditions revealed a significant difference only between low energy and weakness ($\chi^2=5.28$, $df=1$, $P=0.022$).

Among the 348 participants who reported any fatigue, 161 (46%) reported one quality, 104 (30%) two qualities, and 83 (24%) three or more qualities. Comparing these three groups, participants reporting more fatigue qualities had more chronic conditions (means 2.0, 2.6, 2.8; $P<0.001$), worse cognition (mean MMSE 27.8, 27.7, 26.8; $P=0.008$), greater depressive symptoms (mean GDS 1.5, 3.6, 5.6; $P<0.001$), worse functional status (mean SF-36 PFI 67, 53, 41; $P<0.001$), and worse physical performance (mean SPPB 8.6, 7.7, 7.1; $P<0.001$). In general, the prevalence of chronic conditions increased as the number of fatigue qualities increased; this association was statistically significant for cardiovascular (18%, 27%, 36%; $P=0.007$), musculoskeletal (68%, 81%, 80%; $P=0.04$), and general conditions (14%, 31%, 35%; $P<0.001$).

Discussion

Reports of a variety of fatigue qualities were common among this cohort of older primary care patients. The correlations among the fatigue qualities were small to moderate (34), consistent with the hypothesis that they reflect distinct underlying pathophysiologies. However, the patterns of association with chronic disease were similar across fatigue qualities. The cumulative number rather than the type of fatigue qualities reported was correlated with degree of morbidity. Taken together, these first steps in exploring fatigue qualities suggest that different fatigue qualities could represent disparate manifestations of a common underlying etiology, while not ruling out distinct underlying pathophysiologies.

Fatigue was very common among older primary care patients, with 70% reporting any fatigue and 43% reporting feeling tired most of the time. Cross-sectionally, fatigue was associated with worse health and functional status. Physical fatigue qualities were more common than mental qualities. Correlations among the fatigue qualities did not support the mental versus physical classification. The majority of older adults reporting fatigue report multiple qualities, and measures of health and function worsened as the number of qualities reported increased.

If fatigue qualities reflected distinct underlying pathophysiologies, we might have hypothesized that musculoskeletal disorders might be most strongly associated with weakness or cardiopulmonary disease most strongly associated with low energy. While musculoskeletal disease was associated with a high relative risk of weakness, the increase in risk was similar for sleepiness and tiredness. Pulmonary conditions were associated with increased risk of low energy, although the risk increase was greater for tiredness. Cardiac disease was associated with the greatest increase in risk of cognitive fatigue. Our results instead suggest that the various qualities of fatigue may all represent disparate manifestations of a common underlying process, such as increased inflammation or disordered homeostasis. Another possibility is that a common underlying subjective sensation of fatigue is described in varying ways by different older adults, influenced not only by individual characteristics but also potentially by cultural differences. Our results do not rule out the possibility, however, that different qualities reflect distinct pathophysiologies that do not correlate with chronic conditions.

Our study population represents an older primary care population with a high burden of chronic disease. Compared with palliative care populations (35,36), they have higher functional status and fewer depressive symptoms. Relationships among fatigue qualities may be different in palliative care. In addition, our participants were mostly white, which may limit the generalizability of these findings, although the percentage of whites in our study is similar to that among older adults in the United States (81%) (37). Although our data was collected in 1996, fatigue remains a common problem among older adults (4,38,39).

Our study has several additional limitations. First, our assessments of fatigue subtypes were drawn from preexisting health status measures, and may not optimally capture each subtype.

Second, although these are the qualities of fatigue most often mentioned in the literature (6, 12–20), there may be others qualities that that we have not captured, such as lack of endurance. Third, our measures simply assessed general symptoms, rather than symptoms related to a specific level or type of activity. Fourth, our ability to assess the correlations among qualities was limited by the dichotomous nature of our fatigue measures. Finally, we did not have data available on subclinical disease (40), inflammatory markers (40–42), or other potential physiologic correlates of fatigue (43,44), and so we cannot draw any conclusions about the underlying pathophysiology of distinct fatigue qualities.

In conclusion, older adults report a variety of symptoms that might represent distinct qualities of fatigue, but these qualities are not well explained by underlying chronic conditions. Rather the cumulative number of fatigue qualities is associated with worse health and function. These results suggest that fatigue qualities represent disparate manifestations of a common pathophysiology rather than multiple underlying pathophysiologies.

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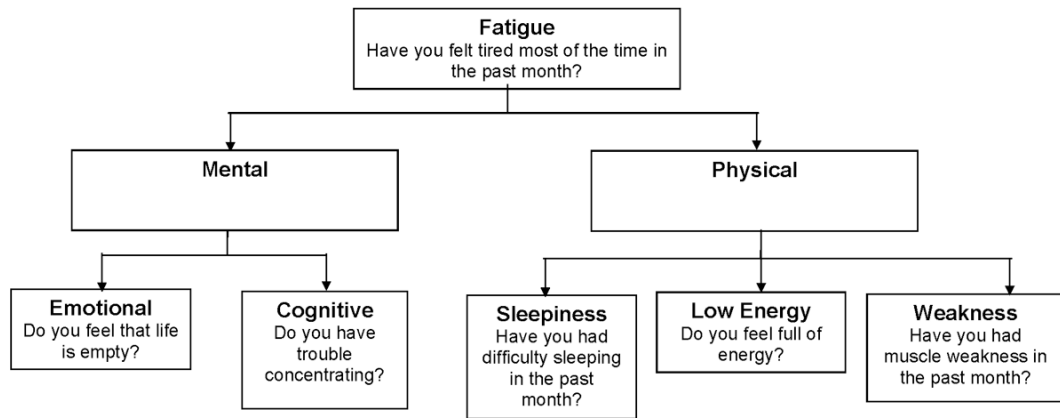


Figure 1. Model of fatigue qualities. Survey items used to assess each quality are presented under each quality.

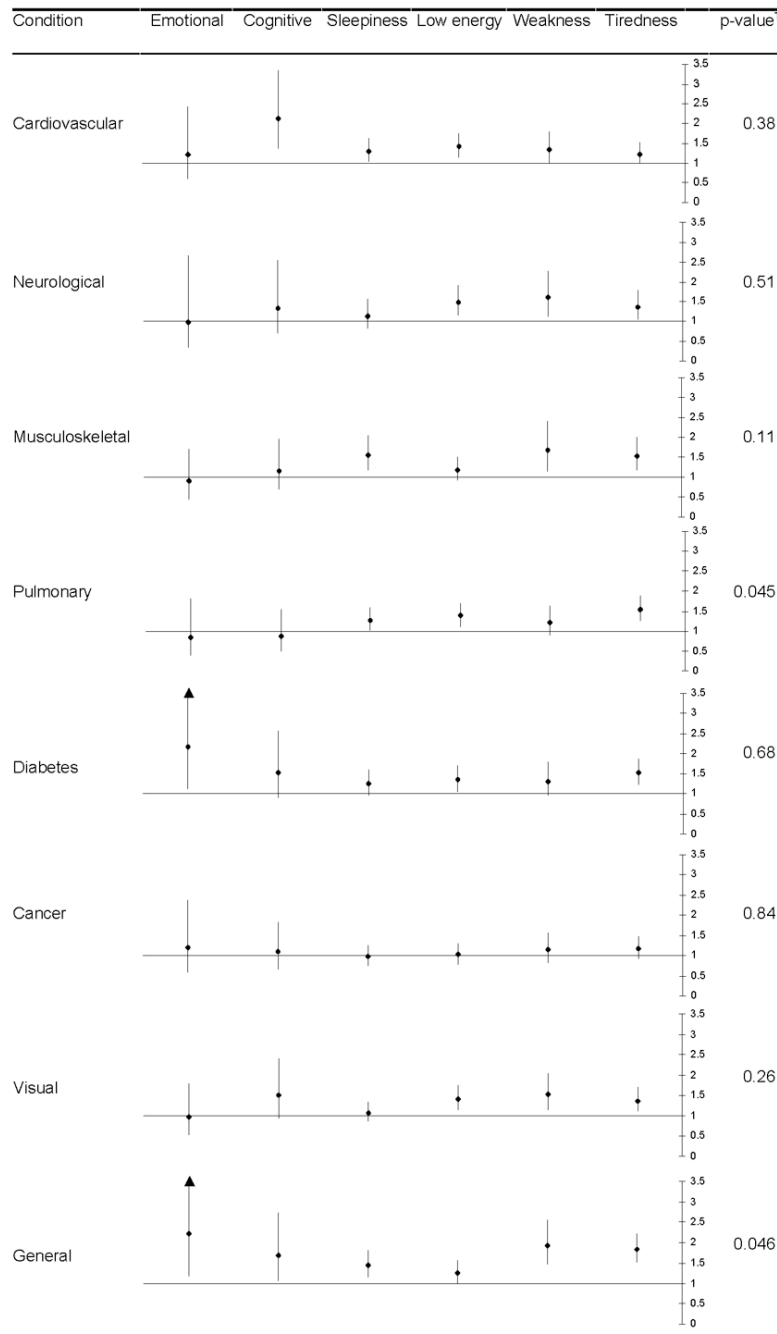


Figure 2. Association of individual chronic disease categories with fatigue qualities. Odds ratios and 95% confidence intervals representing the independent association of each fatigue type with a chronic condition are presented. Chronic condition categories include: cardiovascular (angina, heart failure, or heart attack), neurological (stroke or Parkinson’s disease), pulmonary (lung disease, emphysema, asthma, or bronchitis), musculoskeletal (arthritis, osteoporosis, broken bone, amputation, or joint replacement), diabetes, cancer, visual (cataracts or glaucoma), and general (depression, anxiety, emotional problem, sleep problem, or chronic pain). *P*-values represent a Chi-square test of an overall difference among qualities in the strength of their associations with each condition.

Table 1

Candidate Questions for Each Fatigue Quality

Fatigue Quality	Candidate Questions ^a	Answer Indicating Fatigue	Prevalence	Correlation with Quality Total	Correlation with Overall Total
General	Do you feel tired much of the time?	Yes	212 (43)	n/a	0.49
Emotional	Do you feel that life is empty?	Yes	38 (8)	0.36	0.35
	Do you often get bored?	Yes	114 (23)	0.33	0.34
	Do you find life very exciting?	No	143 (29)	0.33	0.35
Cognitive	Do you have confused thinking?	Yes	74 (15)	0.38	0.37
	Do you have memory loss?	Yes	176 (36)	0.38	0.30
	Do you have trouble concentrating?	Yes	65 (13)	0.42	0.44
Sleepiness	Do you have a sleep problem?	Yes	30 (6)	0.13	0.12
	Do you have difficulty sleeping?	Yes	200 (40)	0.20	0.28
	Do you enjoy getting up in the morning?	No	78 (16)	0.15	0.36
Weakness	Do you have muscle weakness?	Yes	142 (29)	n/a	0.32
Lack of Energy	Do you feel full of energy?	No	206 (42)	0.33	0.48
	Is it hard for you to get started on new projects?	Yes	153 (31)	0.33	0.39

^aThe item selected as most representative of the quality is bolded.

Table 2Participant Characteristics by Fatigue Presence^a

Characteristic	Total <i>n</i> =495	Fatigue		<i>P</i> -value
		No <i>n</i> =147	Any <i>n</i> =348	
Age, years	74.0±5.7	73.9±6.1	74.1±5.6	0.63
Female	217 (44)	51 (34)	166 (48)	0.008
White	395 (80)	110 (75)	285 (82)	0.07
Number of chronic condition types ^b	2.2±1.3	1.7±1.2	2.4±1.2	<0.001
Cardiovascular	112 (23)	25 (17)	87 (25)	0.05
Neurological	53 (11)	9 (6)	44 (13)	0.03
Musculoskeletal	351 (71)	91 (62)	260 (75)	0.004
Pulmonary	118 (24)	20 (14)	98 (28)	<0.001
Diabetes	87 (18)	14 (10)	73 (21)	0.002
Cancer	114 (23)	32 (22)	82 (24)	0.66
Visual	263 (53)	65 (44)	198 (57)	0.01
General	103 (21)	19 (13)	84 (24)	0.005
Cognitive function (MMSE ^c)	27.5±2.3	27.3±2.5	27.5±2.3	0.32
Depressive symptoms (GDS ^d)	2.3±2.8	0.5±0.8	3.1±2.9	<0.001
Fair or poor self-rated health	110 (22)	10 (7)	100 (29)	<0.001
SF-36 PFI ^e	63±30	81±22	57±29	<0.001
NHIS ADL ^f	14.2±2.2	15.4±1.0	13.7±2.3	<0.001
SPPB ^g	8.4±2.6	9.2±2.1	8.0±2.8	<0.001
Gait speed, meters/second	0.88±0.24	0.95±0.22	0.84±0.24	<0.001

^aValues represent *n* (%) for dichotomous variables and mean ± standard deviation for continuous variables.

^bChronic condition categories include: cardiovascular (angina, heart failure, or heart attack), neurological (stroke or Parkinson's disease), pulmonary (lung disease, emphysema, asthma, or bronchitis), musculoskeletal (arthritis, osteoporosis, broken bone, amputation, or joint replacement), diabetes, cancer, visual (cataracts or glaucoma), and general (depression, anxiety, emotional problem, sleep problem, or chronic pain).

^cMini-Mental State Exam, range 0–30 with higher scores representing better cognition.

^dGeriatric Depression Score, range 0–15 with higher scores representing more depressive symptoms.

^eMedical Outcomes Survey Physical Function Index, range 0–100 with higher scores representing better function.

^fNational Health Interview Survey Activities of Daily Living, range 0–16 with higher scores representing better function.

^gShort Physical Performance Battery, range 0–12 with higher scores representing better physical performance.

Table 3Spearman Correlations Between Different Qualities of Fatigue ($n=495$)^a

	<i>n</i> (%)	Fatigue Subtypes					
		Tiredness	Emotional Fatigue	Cognitive Fatigue	Sleepiness	Low Energy	Weakness
Tiredness	212 (43)	1.0	0.12	0.22	0.24	0.45	0.37
Emotional fatigue	38 (8)		1.0	0.27	0.09	0.20	0.14
Cognitive fatigue	65 (13)			1.0	0.09	0.27	0.19
Sleepiness	200 (40)				1.0	0.13	0.20
Low energy	206 (42)					1.0	0.16
Weakness	142 (29)						1.0

^aAll $P < 0.01$ except correlations between emotional fatigue and sleepiness ($P = 0.05$) and between cognitive fatigue and sleepiness ($P = 0.04$).

Table 4

Association of Participant Characteristics with Individual Fatigue Qualities^a

Characteristic	Emotional	Cognitive	Sleepiness	Low Energy	Weakness	Tiredness
Age, years						
Female			↑↑			↑
White				↑↑↑		↑
Number of chronic conditions ^b		↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑
Cognitive function (MMSE ^c)		↓↓↓				
Depressive symptoms (GDS ^d)	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑
Fair or poor self-rated health	↑↑↑	↑↑↑		↑↑↑	↑↑↑	↑↑↑
SF-36 PFI ^e	↓	↓↓↓	↓↓↓	↓↓↓	↓↓↓	↓↓↓
NHIS ADL ^f	↓↓↓	↓↓↓	↓↓↓	↓↓↓	↓↓↓	↓↓↓
SPPB ^g	↓	↓	↓	↓	↓	↓
Gait speed, meters/second	↓	↓↓↓	↓↓↓	↓↓↓	↓↓↓	↓↓↓

* Arrows represent the direction and significance of the association: up arrows positive association; down arrows negative association; one arrow $P < 0.05$; two arrows $P < 0.01$; three arrows $P < 0.001$.

^b Of eight categories: cardiovascular, neurological, pulmonary, musculoskeletal, diabetes, cancer, visual, and general.

^c Mini-Mental State Exam, range 0–30 with higher scores representing better cognition.

^d Geriatric Depression Score, range 0–15 with higher scores representing more depressive symptoms.

^e Medical Outcomes Survey Physical Function Index, range 0–100 with higher scores representing better function.

^f National Health Interview Survey Activities of Daily Living, range 0–16 with higher scores representing better function.

^g Short Physical Performance Battery, range 0–12 with higher scores representing better physical performance.