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NCPD Nursing Continuing Professional Development

Examining a Fatigue Management Model in Older Individuals

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Abstract

Purpose: The aim of this study was to examine a fatigue model for older individuals based on the theory of unpleasant symptoms.
Research Design: The research design used was a secondary data analysis of the "Patient-Reported Outcomes Measurement Information System Profiles–Health Utilities Index" data set.
Methods: Multiple regression analysis and path analyses were used to examine hypothesized model paths.
Results: A number of comorbidities, pain, sleep, depression, anxiety, education, and sensory impairment were significant predictors of fatigue. Higher fatigue scores predicted lower physical, social, and cognitive performances, as well as worse perceived health and quality of life (QOL). In addition, the identified fatigue outcomes mediated the relationship between fatigue and QOL.
Conclusions: Future research should be directed toward exploring other risk factors of fatigue and examining feedback loops depicted in the theory of unpleasant symptoms.
Clinical Relevance to the Practice of Rehabilitation Nursing: Rehabilitation nurses should closely monitor and manage the identified fatigue-influencing factors to improve older individuals' performance, perceived health, and QOL.

Keywords: Fatigue; management model; older individuals; influencing factors.

Although all age groups can experience fatigue, it is particularly common in older individuals. Fatigue becomes more burdensome and debilitating in older adults over the age of 60 years compared to younger individuals and children. This is partly due to the coexistence of a number of chronic illnesses in this population with common underlying processes such as inflammation (Hardy & Studenski, 2010), making it one of the most prevalent symptoms reported in older individuals (van Seben et al., 2019). Studies have shown that fatigue in older individuals is associated with biophysiological, sociodemographic, and psychological factors (Torossian & Jacelon, 2021). Fatigue is also associated with a poorer prognosis and higher odds of mortality in this population (Hofer et al., 2018). Because of its prevalence and health-related consequences, fatigue has been a topic of interest for a vast number of researchers, who have contributed to the advancement of scientific knowledge around a number of risk factors of fatigue. However, a comprehensive fatigue management model that could serve as a guide for healthcare providers caring for older individuals experiencing fatigue is lacking.

The theory of unpleasant symptoms (TUS) is a middle-range theory developed by Lenz et al. (1997), with the aim of guiding research and practice in the management of an individual's experience of one or more symptoms. The theory depicts three levels of factors that influence the experience of a symptom. The first category of influencing factors is physiological variables, related to the biological processes that maintain or disrupt normal body function, including nutrition, existence of a pathology, energy levels, trauma, and so forth. Psychological influencers constitute the second category of influencing factors and are variables related to one's state of mind, mood, and affective reaction to a disease or illness, such as depression and anxiety. Lastly, situational influencers are variables related to an individual's physical and social environment, such as place of residence, educational background, social network, and support. In the TUS, the three levels of influencing factors are interrelated and impact the experience of symptoms (Lenz et al., 1997). The experienced symptom,

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in its turn, affects the individual's functional and cognitive performance (CP). Functional performance is operationalized as an individual's physical and social function, that is the extent to which one is able to carry out activities of daily living, fulfill work- and role-related tasks, and participate in social interactions. Cognitive performance is operationalized as one's ability to carry out cognitive tasks, such as problem-solving, thinking, reasoning, and concentrating. The TUS also highlights feedback loops (Figure 1), which are beyond the scope of this paper.

Examining a fatigue management model based on the TUS, inclusive of multiple risk factors and chronic diseases, is plausible, as the experience of fatigue is associated with common underlying physiological, psychological, and situational risk factors. Hence, the purpose of this research study was to examine a fatigue management model (Figure 2), which highlights the relationship between fatigue and all three influencing factors and the impact of fatigue on physical performance (PP), social performance (SP), and CP, in addition to perceived health and quality of life (QOL). Another purpose of this study was to examine the mediating role of fatigue outcomes in the relationship between fatigue and QOL.

Methods

A nonexperimental, quantitative, cross-sectional exploratory study design was used, which included secondary data analysis. In this study, the source of data was the Patient-Reported Outcomes Measurement Information System–Health Utilities Index (PROMIS-HUI, Version 1.1; Cella, 2017) data set. PROMIS-HUI is a publicly available data set consisting of 150 items reflecting sociodemographic data, comorbidities, PROMIS global form, and PROMIS profile measures on seven domains, consisting of emotional distress, fatigue, physical function, pain, sleep, social participation, and cognition, in addition to the HUI.

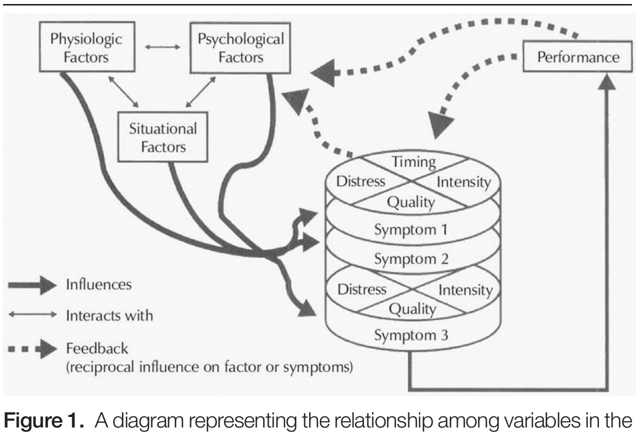

Figure 1. A diagram representing the relationship among variables in the theory of unpleasant symptoms. From "The middle-range theory of unpleasant symptoms: An update," by Lenz et al., 1997, *Advances in Nursing Science, 19*(3), 14–27 (https://doi.org/10.1097/00012272-199703000-00003). Copyright © 1997 Wolters Kluwer Health, Inc.

Recruitment

Participants in this study were recruited from an online Internet survey company, "Opinions 4 Good" (Op4G). This readily available platform includes a panel of 152,000 respondents of different demographic backgrounds (Op4G, 2020). For PROMIS-HUI, respondents were selected such that they were representative of the 2010 U.S. census, despite analysis that later showed that the selected sample was sicker than the general U.S. population (Hays et al., 2016). Eligibility criteria included being 18 years of age or older, English-speaking, part of the U.S. general population, and enrolled in the Op4G panel. To recruit participants, an e-mail was sent by the online survey company to members of the panel, notifying them of a new survey opportunity. Interested participants filled out a consent form, followed by a survey consisting of nearly 150 items. Participants were compensated with an incentive provided by Op4G, which did not exceed 10 USD. In this study, only participants over the age of 60 years were included. The institutional review board at the University of Massachusetts Amherst determined that this project does not involve an intervention or interaction with individuals or does not use identifiable private information. Thus, institutional review board application was not required.

Study Measures

As previously mentioned, physiological variables are those related to the biological processes that maintain or disrupt normal body function, whereas psychological variables are related to one's state of mind, mood, and affective reaction to a disease or illness. Lastly, situational influencers pertain to an individual's physical and social environment, such as place of residence, educational background, social network, and support.

Physiological Influencing Factors

These included age (Bevilacqua et al., 2018; Salter et al., 2019), number of comorbidities (Horne et al., 2019; W. Q. Lin et al., 2015), pain (Crowe et al., 2017; Teshale, 2019), sleep (Barak et al., 2020; Loh et al., 2018), and gender (Bevilacqua et al., 2018; Salter et al., 2019).

Gender, unlike all other physiological factors, is a categorical variable, which included males (1) and females (2). Age was based on a self-report of the number of years lived, whereas number of comorbidities was based on the presence (1) or the absence (0) of the listed chronic diseases (sum of present chronic conditions), including hypertension, rheumatoid arthritis, asthma, migraines, diabetes,

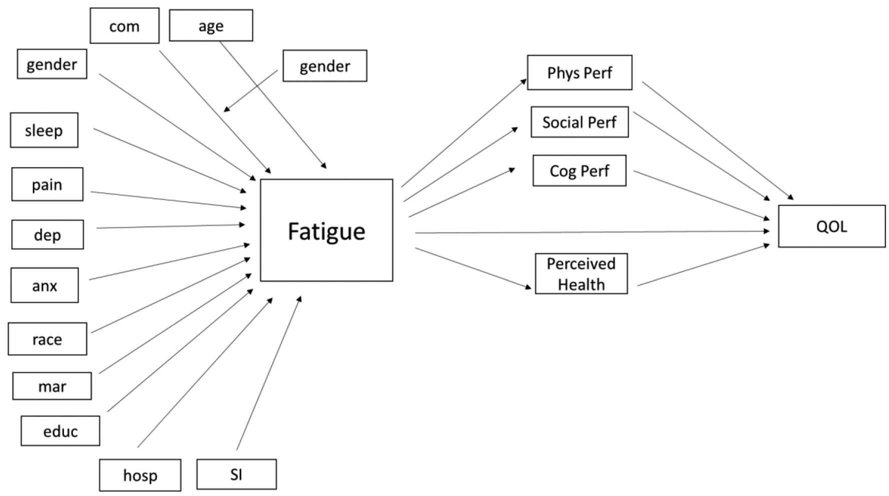

Figure 2. Diagram representing the proposed fatigue management model. Com = comorbidities; dep = depression; anx = anxiety; mar = marital status; educ = education; hosp = hospitalization; SI = sensory impairment; Phys = physical; Cog = cognitive; Perf = performance; QOL = quality of life.

angina, cancer, lung, heart, liver, and/or kidney disease. Pain was measured using the PROMIS short form v1.0–pain intensity 3a (three items) and the PROMIS item bank v1.1–pain interference (nine items). Sleep was measured as the sum of scores of sleep disturbance and sleep-related impairment items selected from their respective item banks (16 items in total), the validities of which have been supported in different chronic conditions (Yu et al., 2012). Higher scores on both instruments reflect worse pain and higher sleep disturbance/impairment.

Psychological Influencing Factors

Psychological risk factors of fatigue included depression and anxiety (Barak et al., 2020; Crane et al., 2016; Kim & Son, 2020; Salter et al., 2019). Eight items from the PROMIS item bank v.1.0 emotional distress–depression and PROMIS emotional distress v.1.0 emotional distress–anxiety were used to measure depression and anxiety, respectively. The depression item bank, from which the items of the depression scale in this study were chosen, has shown adequate internal consistency ($\alpha = .988$; Nolte et al., 2019).

Situational Influencing Factors

Situational factors associated with fatigue included education (Jing et al., 2015; Kessing et al., 2016; W. Q. Lin et al., 2015; Muszalik et al., 2016), marital status (Jing et al., 2015; W. Q. Lin et al., 2015), race (Chou, 2013; Franklin & Harrell, 2013; F. Lin et al., 2013), hospitalizations (Bhalla et al., 2014), and sensory impairment (SI), including hearing (Alhanbali et al., 2017; Hornsby & Kipp, 2016) and vision (Berthold Lindstedt et al., 2019). Unlike other chronic conditions that independently impact the individual's experience of symptoms, the repercussions or the burden of hearing problems are dependent upon social interactions. For this reason, despite being linked to physiological factors, SI was categorized as a situational factor in this study.

Race, marital status, educational level, and number of hospitalizations were nominal-level variables. Race was operationalized as White, Black, and others. Education was categorized as "no high school," "high school, GED, or technical/associate's degree," and "college degree." The number of hospitalizations was operationalized as self-reports of the frequency of hospital stays in the last 12 months and was dichotomized into ≤ 2 or >2 hospitalizations per year, based on the average rate of hospitalization per community-dwelling older adult (Gjesten et al., 2018). Lastly, SI was based on the score of four items reflecting vision impairment (two items) and hearing impairment (two items). Scores for SI ranged between 0 and 4, with higher scores reflecting a higher level of SI.

Fatigue

This was the main outcome of interest in this study and was measured based on the scores of eight items on fatigue impact and eight items on fatigue experience selected from the PROMIS item bank v.1.0–fatigue (16 items total). The reliability and construct validity of PROMIS–fatigue short forms have been supported in individuals with heart failure, chronic obstructive pulmonary disease, back pain, and others (Cella et al., 2016; Flynn et al., 2015).

Fatigue Outcomes

Hypothesized outcomes included PP, SP, CP, perceived health, and QOL. Although not highlighted in the TUS, perceived health (Silva et al., 2011) and QOL (Schmidt et al., 2018; Tolstrup Larsen et al., 2018) have been shown to be consequences of fatigue and were thus included in the model. Physical performance was operationalized as the total sum of scores on 18 items selected from PROMIS v2.0 item bank–physical function, the psychometric properties of which have been supported (Crins et al., 2018; Oude Voshaar et al., 2015). Cognitive performance was measured by eight items on cognitive function and eight items on cognitive function–abilities. The questions were chosen from the PROMIS item bank–cognitive function v2.0 and PROMIS item bank–cognitive function–abilities v2.0, respectively. The reliability of the PROMIS cognition short form, which includes some of these items, has been supported (Fieo et al., 2016; Saffer et al., 2015). Social performance was operationalized as the sum of scores on eight items selected from PROMIS, the ability to participate in social roles and activities v.2.0 item bank and eight items from PROMIS satisfaction with social roles and activities v2.0 item bank. Both item banks have shown to have good internal consistency in individuals with rheumatoid arthritis (Bartlett et al., 2015). Perceived health was based on the score of two items that assessed subjective ratings of physical and mental health. Each of these items was based on a 5-point Likert scale, resulting in a summative score that ranged from 0 to 10. Lastly, QOL was based on one item only, a response ranging from "poor" to "excellent."

Cronbach's alpha for all continuous variables was also calculated, and findings showed that instruments used in this sample were reliable. That is, all Cronbach's alpha coefficients were greater than .7. Results pertaining to internal consistency reliability are presented in Table 1.

Data Analysis

A number of statistical analysis techniques were used to examine the hypothesized pathways. To examine the relationship between fatigue and the three categories of influencing factors, bivariate analyses were conducted. Significant physiological, psychological, and situational influencing factors were then entered simultaneously into multiple linear regression as independent variables, and fatigue was entered as the dependent variable.

For the second part of the model (fatigue outcomes), path analysis was used to examine the consequences of fatigue and the mediating effects of fatigue outcomes on the relationship between fatigue and QOL. The four paths examined are depicted below:

1. Age, gender, number of comorbidities, pain, sleep, depression, anxiety, marital status, education, SI, race, hospitalization ➔ fatigue
2. Fatigue ➔ PP, SP, CP, perceived health
3. Fatigue, PP, SP, CP, perceived health ➔ QOL
4. Age, gender, number of comorbidities, pain, sleep, depression, anxiety, marital status, education, SI, race, hospitalization ➔ PP, SP, CP, perceived health, QOL

Table 1 Internal Consistency Reliability (Cronbach's α) Measures of Study Variables

Instrument	Cronbach's α	No. of Items
Fatigue	.95	16
Pain	.96	12
Sleep	.94	16
Depression	.95	8
Anxiety	.94	8
Sensory impairment	.79	4
Physical performance	.97	18
Social performance	.95	16
Cognitive performance	.92	16
Perceived health	.80	2
Quality of life	N/A	1

The PROMIS-HUI data set was examined for missing data points. Descriptive analyses showed that missing data were not systematic and did not represent a threat to the internal validity of study findings. Thus, participants with missing data were excluded. Statistical assumptions were checked, and a "robust" option was used wherever needed. All statistical procedures in this study were carried out using Stata IC (2019, Version 16), and significance was set at $\alpha = .05$.

Results

Data for 20 participants were deleted due to inaccurate data entry (unrealistic numbers). Of the remaining sample of $n = 2{,}980$, those below the age of 60 years and two participants who had missing data points for QOL were excluded. The final sample size was $n = 725$.

Sample Characteristics

The average age was 70.18 years, with an age range of 60–88 years. Of the total sample size ($n = 725$), the majority of participants were White ($n = 440$, 60.69%), and the rest were either Black, Hispanic, Asian, or of other ethnic backgrounds. About half of the participants were female ($n = 400$, 55.17%); the majority of participants had either a technical/associate degree or a college degree ($n = 304$, 41.76%) and were married ($n = 453$, 62.48%). Participants had an average of two to three comorbidities, and the majority ($n = 481$, 66.34%) had not been admitted to the hospital in the past 12 months (Table 2).

In terms of the descriptive statistics of the study variables, participants had mild pain with a mean of 27.38

Table 2 Sociodemographic Characteristics of Study Sample (*n* = 725)

Variable	Mean (*SD*)
Age	70.18 (7.92)
No. of comorbidities	2.90 (2.12)
Frequency of hospitalization (last 12 months)	0.84 (4.41)
	Frequency (%)
Gender	
Male	325 (44.83)
Female	400 (55.17)
Race	
White	440 (60.69)
Black	183 (25.24)
Asian	93 (12.83)
American Indian/Hawaiian/Pacific Islander/ other	9 (1.25)
Education	
Less than high school	237 (32.55)
High school or GED	187 (25.69)
Technical degree/associate's degree	144 (19.78)
College degree (BA/BS)	160 (21.98)
Marital status	
Never married	74 (10.21)
Married	453 (62.48)
In a committed relationship	32 (4.41)
Separated	7 (0.97)
Divorced	88 (12.14)
Widowed	71 (9.79)

(PROMIS range: 12–60) and moderate levels of sleep problems (*M* = 39.09; PROMIS range: 16–80) and fatigue (*M* = 38.32; PROMIS range: 16–80). Regarding the psychological variables, participants reported low levels of depression and anxiety on average. Most participants had no visual or hearing impairments (Table 3). In what relates to fatigue outcomes, most participants in this study had above average physical, social, and CP levels and "good" perceived health and QOL on a spectrum ranging from "poor" to "excellent."

Influencing Factors of Fatigue

Bivariate analyses showed that all variables, except for marital status, were significantly associated with fatigue.

Table 3 Descriptive Statistics of Study Variables (*n* = 725)

Variable	Mean (*SD*)	Range [Possible Range]
Pain	27.38 (12.34)	12–58 [12–60]
Sleep	38.29 (13.40)	18–74 [16–80]
Fatigue	38.79 (14.13)	16–76 [16–80]
Depression	16.78 (8.15)	8–40 [8–40]
Anxiety	17.57 (7.75)	8–40 [8–40]
Sensory impairment	0.80 (1.25)	0–4 [0–4]
Physical performance	69.92 (18.02)	26–90 [18–90]
Social performance	56.15 (15.27)	16–80 [16–80]
Cognitive performance	60.29 (13.02)	20–80 [16–80]
Perceived health	6.14 (2.16)	2–10 [2–10]
Quality of life	3.00 (1.15)	1–5 [1–5]

Hence, all significant variables were simultaneously entered into multiple linear regression using the "robust" option to account for heteroscedasticity of some variables (discussed above). The results of the regression are presented in Table 4.

Findings from the simultaneous entry of all significant risk factors of fatigue into multiple linear regression showed that three of the examined physiological factors, both psychological factors, and two of the situational factors were significant predictors of fatigue. The number of comorbidities ($B = 0.49$, $p = .003$), pain ($B = 0.37$, $p < .001$), sleep ($B = 0.35$, $p < .001$), depression ($B = 0.20$, $p = .015$), anxiety ($B = 0.20$, $p = .020$), having a high school degree/GED/technical or associate's degree compared to a college degree ($B = 1.93$, $p < .007$), and more than one SI ($B = 2.04$, $p = .015$) were significant predictors of fatigue, whereas all other variables rendered insignificant after simultaneous entry. Overall, the effect size of this model was moderate. Variables entered into the regression accounted for 69% of the variance of fatigue scores.

Fatigue Outcomes

As mentioned earlier, a path analysis consisting of four paths was conducted to examine the research question.

Table 4 Multiple Regression Equation of Outcome Variable Fatigue (*n* = 725)

	Unstandardized β (*SE*)	β	*T*	*p*
Age	−0.04 (0.05)	−.02	−0.82	.414
Gender (1 = male, 2 = female)	0.08 (0.64)	.00	0.12	.905
No. of comorbidities	0.49 (0.16)	.07	2.95	.003
Pain	0.37 (0.05)	.32	7.57	< .001
Sleep	0.35 (0.04)	.33	8.20	< .001
Depression	0.20 (0.08)	.11	2.44	.015
Anxiety	0.20 (0.08)	.11	2.34	.020
Race (White)	1		.	.
Black	−1.52 (1.07)	−.05	−1.43	.154
Other	−0.82 (1.11)	−.02	−0.74	.457
Education (reference: college degree)				
No high school	0.02 (1.39)	.00	0.01	.991
High school/GED/technical/ associate's	1.93 (0.72)	.07	2.69	.007
hospitalization (in last 12 months) 0: ≤2/year 1: ≥3/year	1.26 (1.25)	.02	1.01	.314
Sensory impairment 0: no sensory impairment 1: one or more sensory impairment	2.04 (0.83)	.07	2.45	.015
Constant	8.30 (3.21)		2.59	.010
$F(13, 711) = 149.69$, $p < .001$				
$R^2 = .69$				

Findings from the path analysis regarding the direct effect of fatigue on the selected outcomes showed that fatigue was a significant predictor of poorer physical (B = −0.18, p < .001), social (B = −0.51, p < .001), and CP (B = −0.24, p < .001), as well as poorer perceived health (B = −0.03, p < .001). Higher scores of these outcome variables, with the exception of CP, were shown to be significant predictors of a better QOL. Surprisingly, a better CP was a predictor of a poorer QOL (B = −0.01, p = .014). In addition, fatigue was not directly associated with QOL (B = 0.00, p > .05). The effects of all performance-based outcome variables on QOL were generally weak, but that of perceived health was moderate.

To support the examination of whether fatigue outcomes mediate the relationship between fatigue and QOL, the investigators calculated the indirect effect of fatigue on QOL. The results showed that the indirect path was significant (B = −0.01, p < .001), suggesting the presence of a mediating effect. Individual paths for mediators were not examined, because all mediators were significantly correlated, and examining them separately would not have been very informative. Results from path analyses are presented below (Figure 3).

Further analyses were conducted to investigate the relationship between fatigue outcomes and QOL, especially the unexpected negative association between CP and QOL. Social performance, CP, and perceived health were divided according to their domains, which, in turn, were entered into a regression equation. That is, SP was divided into "social ability" and "social satisfaction," CP was divided into "cognitive function" and "cognitive function-abilities," whereas perceived health was divided into "perceived physical health" and "perceived mental health." Physical performance was entered as one domain (per PROMIS item banks).

Findings from this regression analysis suggested that neither cognitive ability (B = −0.00, p = .430) nor cognitive function (B = 0.00, p = .974) predicted QOL, with beta coefficients of zero in both cases. Better social satisfaction (B = 0.01, p = .003), but not social ability (B = −0.00, p = .918), significantly predicted better QOL (Table 5). The relationship between PP and QOL was weak but significant (B = 0.01, p < .01), which was also the case for mental health and QOL (B = 0.21, p < .001). However, the association between perceived physical health and QOL was moderate (B = 0.60, p < .001).

Discussion

The aim of this study was to examine a fatigue management model as a first step to guide the care of older individuals experiencing fatigue through the early detection and management of risk factors of fatigue. Findings suggested that the number of comorbidities, sleep, pain (physiological), depression, anxiety (psychological), education, and SI (situational) are significant predictors of fatigue. The latter, in its turn, influences PP, SP, CP, and perceived health, which mediate the relationship between fatigue and QOL.

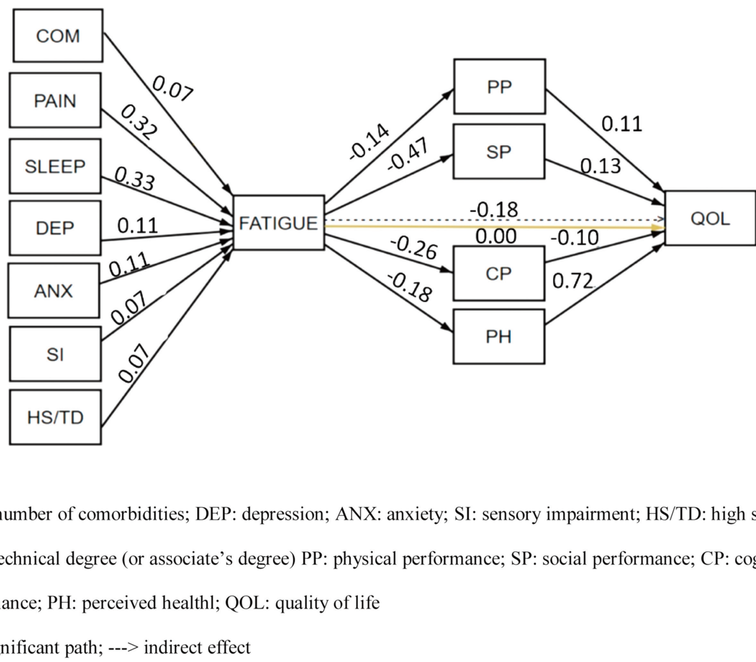

Figure 3. Fatigue management model based on the theory of unpleasant symptoms. COM = number of comorbidities; DEP = depression; ANX = anxiety; SI = sensory impairment; HS/TD = high school (or GED)/technical degree (or associate's degree); PP = physical performance; SP = social performance; CP = cognitive performance; PH = perceived health; QOL = quality of life. → indicates insignificant path; —> indicates indirect effect.

Table 5 Regression Analyses of Quality of Life and Its Predictors Using Individual Domains as Independent Variables (n = 725)

	B	Unstandardized β (SE)	t	p
Fatigue	0.00	0.00 (0.00)	.12	.905
Physical performance	0.11	0.01 (0.00)	2.77	.006
Social ability	−0.00	−0.00 (0.01)	−.10	.918
Social satisfaction	0.09	0.01 (0.00)	2.99	.003
Cognitive ability	−0.02	−0.00 (0.00)	−.79	.430
Cognitive function	0.00	0.00 (0.01)	.03	.974
Physical health	0.59	0.06 (0.04)	15.98	.000
Mental health	0.23	0.21 (0.03)	6.57	.000
Constant	—	0.31	−.56	0.575
$F(8, 716)$, $p < .001$				
$R^2 = .73$				

Although the association between fatigue and QOL was supported in other studies (Abrahams et al., 2018; Fan et al., 2020), this was not the case in this study. This might be due to the inclusion of mediators, such as PP, SP, CP, and perceived health. The significant association between QOL and PP, SP, and CP, respectively, in this study was almost negligible. Statistical significance in this case might be due to a large sample size alone, rather than an actual clinical significance, which is further supported by the fact that CP was insignificant in the post hoc analysis described above. Thus, it can be concluded that the relationship between all three performance outcomes (physical, social, and cognitive) and QOL is mediated by perceived health, the inclusion of which makes the association between these outcomes and QOL very weak.

Findings of this study are of value to older individuals experiencing fatigue, their family members, rehabilitation nurses, and researchers interested in improving the management of fatigue and the improvement of QOL of older individuals. These findings highlight the importance of screening older individuals for the identified risk factors of fatigue and implementing multicomponent interventions that address different risk factors. Several interventions have been developed to address the different risk factors of fatigue. For example, cognitive behavioral therapy, mindfulness, and sleep hygiene training (MacLeod et al., 1980; Wennberg et al., 2013) have been shown to be effective interventions for improving sleep. Furthermore, the application of cold and/or hot packs and relaxation breathing techniques have been shown to effectively minimize pain (Fouladbakhsh et al., 2011). However, such interventions and others address one outcome only and thus are not holistic. Findings of this study suggest the need for multifactorial interventions, as fatigue is linked to interrelated risk factors that contribute to the experience of fatigue. A study presented promising findings regarding yoga therapy in the management of depression, pain, and sleep, with high participant adherence rates (Cartwright et al., 2020). Hence, rehabilitation nurses should implement similar interventions that address all or most risk factors of fatigue. This would not only manage fatigue but also improve PP, SP, CP, perceived health, and QOL.

In addition, given the prevalence of hearing, vision, and dual SI in older individuals (Elliott et al., 2015; Roets-Merken et al., 2014), consistent vision and hearing screening protocols for older individuals should be implemented in the community and nursing homes. In a recent study, researchers reported that less than half of the nursing home staff used hearing and vision screening tools to detect SI in residents (Andrusjak et al., 2021). They also identified a lack of routine assessments for SI and a lack of access to vision and hearing assistive devices (Andrusjak et al., 2021). A number of easy-to-administer SI screening tools are available for nursing home staff and nurses. The Severe Dual Sensory Loss screening tool (Roets-Merken et al., 2014) is one of many inexpensive and easy-to-administer SI screening tools and has been shown to be reliable and valid in detecting SI in older adults.

Future research recommendations include examining a number of associations that were not examined in this study and exploring new fatigue-related risk factors. Cognitive performance was negatively (although negligibly) correlated with QOL, which warrants further investigation on the moderating role of neurodegenerative diseases, such as dementia, in the association between CP and QOL. In addition, the feedback loops depicted in the TUS were not investigated in this study. That is, examining the extent to which fatigue influences its predictors (sleep, pain, and depression) and the extent to which PP, CP, and SP influence fatigue and its predictors would illustrate a better picture of the interplay between these variables.

Study findings should be viewed in lieu of this study's limitations. First, this was a secondary data analysis, which renders the researcher unaware of the circumstances in which participants responded to questionnaires. Second, a number of variables, including social support, physical activity, medications, and income, which have been shown to influence fatigue levels, were not included in the data set. Third, QOL, one of the main outcomes in this study, was operationalized as the score to a single item, which does not accurately represent the multifaceted aspects of QOL. Fourth, there were no data on neurodegenerative diseases, such as mild cognitive impairment or Alzheimer's disease, which have been shown to influence the association between CP and QOL (Chuang et al., 2016; Hsiao et al., 2016; Stites et al., 2017). Lastly, path analysis does not infer causality, the establishment of which calls for randomized controlled trials.

Key Practice Points

- Rehabilitation nurses and other healthcare providers should screen older individuals for three levels of influencing factors of fatigue.
- Nurses should consider the theory of unpleasant symptoms in planning interventions to address patients' fatigue.
- Nurses should examine the effectiveness of the examined model in clinical practice and propose modifications as needed.

The strengths of this study lie in its large sample size, the recruitment of study subjects from multiple states; the inclusion of older individuals with different chronic conditions representative of the 2010 U.S. census; the use of reliable, valid PROMIS measures; and the simultaneous examination of multiple risk factors of fatigue. Another strength of this study is the examination of outcomes of fatigue as mediators in the relationship between fatigue and QOL using the TUS, which helps plan multifactorial interventions to improve QOL. Furthermore, all the relationships depicted in the TUS, except for feedback loops, were examined in this study, which provides a better understanding of the interplay between different variables associated with fatigue, as opposed to the examination of fatigue in relation to either its risk factors or consequences.

Conclusion

Findings in this study supported the association between fatigue and pain, sleep, SI, education, and depression among older individuals. This association highlights the importance of routine screening for these risk factors in older individuals and the implementation of multifactorial interventions for timely and effective fatigue management. Doing so would improve CP, PP, and SP, as well as QOL. Findings suggested that CP, SP, PP, and perceived health mediate the relationship between fatigue and QOL. Future research should be directed toward examining the characteristics of the relationship between fatigue and the above-mentioned outcomes, exploring other risk factors of fatigue, examining feedback loops depicted in the TUS, and identifying factors (such as neurodegenerative diseases) that moderate the relationship between fatigue outcomes and QOL.

Conflict of Interest

The authors declare that there is no conflict of interest.

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References

Abrahams, H. J. G., Gielissen, M. F. M., Verhagen, C. A. H. H. V. M., & Knoop, H. (2018). The relationship of fatigue in breast cancer survivors with quality of life and factors to address in psychological interventions: A systematic review. *Clinical Psychology Review*, *63*, 1–11. 10.1016/j.cpr.2018.05.004

Alhanbali, S., Dawes, P., Lloyd, S., & Munro, K. J. (2017). Self-reported listening-related effort and fatigue in hearing-impaired adults. *Ear and Hearing*, *38*(1), e39–e48. 10.1097/AUD.0000000000000361

Andrusjak, W., Barbosa, A., & Mountain, G. (2021). Hearing and vision care provided to older people residing in care homes: A cross-sectional survey of care home staff. *BMC Geriatrics*, *21*(1), 1–13. 10.1186/s12877-020-01959-0

Barak, Y., Leitch, S., Greco, P., & Glue, P. P. (2020). Fatigue, sleep and depression: An exploratory interRAI study of older adults. *Psychiatry Research*, *284*, 112772. 10.1016/j.psychres.2020.112772

Bartlett, S. J., Orbai, A.-M., Duncan, T., DeLeon, E., Ruffing, V., Clegg-Smith, K., & Bingham, C. O. (2015). Reliability and validity of selected PROMIS measures in people with rheumatoid arthritis. *PLOS ONE*, *10*(9), e0138543. 10.1371/journal.pone.0138543

Berthold Lindstedt, M., Johansson, J., Ygge, J., & Borg, K. (2019). Vision-related symptoms after acquired brain injury and the association with mental fatigue, anxiety and depression. *Journal of Rehabilitation Medicine*, *51*(7), 499–505. 10.2340/16501977-2570

Bevilacqua, L. A., Dulak, D., Schofield, E., Starr, T. D., Nelson, C. J., Roth, A. J., Holland, J. C., & Alici, Y. (2018). Prevalence and predictors of depression, pain, and fatigue in older- versus younger-adult cancer survivors. *Psycho-Oncology*, *27*(3), 900–907. 10.1002/pon.4605

Bhalla, M. C., Wilber, S. T., Stiffler, K. A., Ondrejka, J. E., & Gerson, L. W. (2014). Weakness and fatigue in older ED patients in the United States. *The American Journal of Emergency Medicine*, *32*(11), 1395–1398. 10.1016/j.ajem.2014.08.027

Cartwright, T., Cahill, M., & Sadana, V. (2020). A mixed methods evaluation of an individualised yoga therapy intervention for rheumatoid arthritis: Pilot study. *Complementary Therapies in Medicine*, *50*, 1–7. 10.1016/j.ctim.2020.102339

Cella, D. (2017). *PROMIS Profiles-HUI data* [Data set]. Harvard Dataverse. 10.7910/DVN/P7UKWR

Cella, D., Lai, J.-S., Jensen, S. E., Christodoulou, C., Junghaenel, D. U., Reeve, B. B., & Stone, A. A. (2016). PROMIS fatigue item bank had clinical validity across diverse chronic conditions. *Journal of Clinical Epidemiology*, *73*, 128–134. 10.1016/j.jclinepi.2015.08.037

Chou, K. L. (2013). Chronic fatigue and affective disorders in older adults: Evidence from the 2007 British National Psychiatric Morbidity Survey. *Journal of Affective Disorders*, *145*(3), 331–335. 10.1016/j.jad.2012.08.012

Chuang, S. P., Wu, J. Y. W., Wang, C. S., & Pan, L. H. (2016). Cognitive function, depressive symptoms, function level, and quality of life in mild dementia and amnestic-mild cognitive impairment. *Journal of Medical Sciences*, *36*(1), 14–21. 10.4103/1011-4564.177171

Crane, P. B., Efird, J. T., & Abel, W. M. (2016). Fatigue in older adults post-myocardial infarction. *Frontiers in Public Health*, *4*, 55. 10.3389/fpubh.2016.00055

Crins, M. H. P., van der Wees, P. J., Klausch, T., van Dulmen, S. A., Roorda, L. D., & Terwee, C. B. (2018). Psychometric properties of the PROMIS Physical Function item bank in patients receiving physical therapy. *PLOS ONE*, *13*(2), e0192187. 10.1371/journal.pone.0192187

Crowe, M., Jordan, J., Gillon, D., McCall, C., Frampton, C., & Jamieson, H. (2017). The prevalence of pain and its relationship to falls, fatigue, and depression in a cohort of older people living in the community. *Journal of Advanced Nursing*, *73*(11), 2642–2651. 10.1111/jan.13328

Elliott, A. F., McGwin, G.Jr., Kline, L. B., & Owsley, C. (2015). Vision impairment among older adults residing in subsidized housing communities. *The Gerontologist*, *55*(Suppl. 1), S108–S117. 10.1093/geront/gnv028

Fan, X., Xing, C., Yang, L., Wang, J., & Feng, L. (2020). Fatigue, self-efficacy and psychiatric symptoms influence the quality of life in patients with myasthenia gravis in Tianjin, China. *Journal of Clinical Neuroscience: Official Journal of the Neurosurgical Society of Australasia*, *79*, 84–89. 10.1016/j.jocn.2020.06.023

Fieo, R., Ocepek-Welikson, K., Kleinman, M., Eimicke, J. P., Crane, P. K., Cella, D., & Teresi, J. A. (2016). Measurement equivalence of the Patient Reported Outcomes Measurement Information System® (PROMIS®) applied cognition—General concerns, short forms in ethnically diverse groups. *Psychological Test and Assessment Modeling*, *58*(2), 255–307.

Flynn, K. E., Dew, M. A., Lin, L., Fawzy, M., Graham, F. L., Hahn, E. A., Hays, R. D., Kormos, R. L., Liu, H., McNulty, M., & Weinfurt, K. P. (2015). Reliability and construct validity of PROMIS® measures for patients with heart failure who undergo heart transplant. *Quality of Life Research*, *24*(11), 2591–2599. 10.1007/s11136-015-1010-y

Fouladbakhsh, J. M., Szczesny, S., Jenuwine, E. S., & Vallerand, A. H. (2011). Nondrug therapies for pain management among rural older adults. *Pain Management Nursing*, *12*(2), 70–81. 10.1016/j.pmn.2010.08.005

Franklin, A. L., & Harrell, T. H. (2013). Impact of fatigue on psychological outcomes in adults living with rheumatoid arthritis. *Nursing Research*, *62*(3), 203–209. 10.1097/NNR.0b013e318283fcb3

Gjesten, M. T., Bronnick, K., & Testad, I. (2018). Characteristics and predictors for hospitalizations of home-dwelling older persons receiving community care: A cohort study from Norway. *BMC Geriatrics*, *18*(1), 1–9. 10.1186/s12877-018-0887-z

Hardy, S. E., & Studenski, S. A. (2010). Qualities of fatigue and associated chronic conditions among older adults. *Journal of Pain and Symptom Management*, *39*(6), 1033–1042. 10.1016/j.jpainsymman.2009.09.026

Hays, R. D., Revicki, D. A., Feeny, D., Fayers, P., Spritzer, K. L., & Cella, D. (2016). Using linear equating to map PROMIS(®) global health items and the PROMIS-29 V2.0 profile measure to the Health Utilities Index Mark 3. *PharmacoEconomics*, *34*(10), 1015–1022. 10.1007/s40273-016-0408-x

Hofer, F., Koinig, K. A., Nagl, L., Borjan, B., & Stauder, R. (2018). Fatigue at baseline is associated with geriatric impairments and represents an adverse prognostic factor in older patients with a hematological malignancy. *Annals of Hematology*, *97*(11), 2235–2243. 10.1007/s00277-018-3420-8

Horne, C. E., Johnson, S., & Crane, P. B. (2019). Comparing comorbidity measures and fatigue post myocardial infarction. *Applied Nursing Research*, *45*, 1–5. 10.1016/j.apnr.2018.11.004

Hornsby, B. W., & Kipp, A. (2016). Subjective ratings of fatigue and vigor in adults with hearing loss are driven by perceived hearing difficulties not degree of hearing loss. *Ear and Hearing*, *37*(1), e1–e10. 10.1097/AUD.0000000000000203

Hsiao, H. T., Li, S. Y., Yang, Y. P., Lin, L. L., Lin, S. I., & Wang, J. J. (2016). Cognitive function and quality of life in community-dwelling seniors with mild cognitive impairment in Taiwan. *Community Mental Health Journal*, *52*(4), 493–498. 10.1007/s10597-016-9993-6

Jing, M. J., Wang, J. J., Lin, W. Q., Lei, Y. X., & Wang, P. X. (2015). A community-based cross-sectional study of fatigue in middle-aged and elderly women. *Journal of Psychosomatic Research*, *79*(4), 288–294. 10.1016/j.jpsychores.2015.05.009

Kessing, D., Denollet, J., Widdershoven, J., & Kupper, N. (2016). Fatigue and self-care in patients with chronic heart failure. *European Journal of Cardiovascular Nursing*, *15*(5), 337–344. 10.1177/1474515115575834

Kim, H., & Son, H. (2020). A moderated-mediation model of the relationship between dietary satisfaction and fatigue in older adults with diabetes: The role of meal planning and depressive symptoms. *International Journal of Environmental Research and Public Health*, *17*(23), 8823. 10.3390/ijerph17238823

Lenz, E. R., Pugh, L. C., Milligan, R. A., Gift, A., & Suppe, F. (1997). The middle-range theory of unpleasant symptoms: An update. *Advances in Nursing Science*, *19*(3), 14–27. 10.1097/00012272-199703000-00003

Lin, F., Chen, D.-G., Vance, D. E., Ball, K. K., & Mapstone, M. (2013). Longitudinal relationships between subjective fatigue, cognitive function, and everyday functioning in old age. *International Psychogeriatrics*, *25*(2), 275–285. 10.1017/S1041610212001718

Lin, W. Q., Jing, M. J., Tang, J., Wang, J. J., Zhang, H. S., Yuan, L. X., & Wang, P. X. (2015). Factors associated with fatigue among men aged 45 and older: A cross-sectional study. *International Journal of Environmental Research and Public Health*, *12*(9), 10897–10909. 10.3390/ijerph120910897

Loh, K. P., Zittel, J., Kadambi, S., Pandya, C., Xu, H., Flannery, M., Magnuson, A., Bautista, J., McHugh, C., Mustian, K., Dale, W., Duberstein, P., & Mohile, S. G. (2018). Elucidating the associations between sleep disturbance and depression, fatigue, and pain in older adults with cancer. *Journal of Geriatric Oncology*, *9*(5), 464–468. 10.1016/j.jgo.2018.02.006

MacLeod, S., Musich, S., Kraemer, S., & Wicker, E. (1980). Geriatric nursing. *Geriatric Nursing*, *39*(5), 506–512.

Muszalik, M., Kołucka-Pluta, M., Kędziora-Kornatowska, K., & Robaczewska, J. (2016). Quality of life of women with breast cancer undergoing radiotherapy using the Functional Assessment of Chronic Illness Therapy–Fatigue Questionnaire. *Clinical Interventions in Aging*, *11*, 1489–1494. 10.2147/CIA.S113530

Nolte, S., Coon, C., Hudgens, S., & Verdam, M. G. E. (2019). Psychometric evaluation of the PROMIS® Depression Item Bank: An illustration of classical test theory methods. *Journal of Patient-Reported Outcomes*, *3*(1), 46. 10.1186/s41687-019-0127-0

Opinions 4 Good. (2020). *Health care panel*. https://op4g.com/our-panel/healthcare-panel

Oude Voshaar, M. A. H., Ten Klooster, P. M., Glas, C. A. W., Vonkeman, H. E., Taal, E., Krishnan, E., Bernelot Moens, H. J., Boers, M., Terwee, C. B., van Riel, P. L. C. M., & van de Laar, M. A. F. J. (2015). Validity and measurement precision of the PROMIS physical function item bank and a content validity-driven 20-item short form in rheumatoid arthritis compared with traditional measures. *Rheumatology (Oxford, England)*, *54*(12), 2221–2229. 10.1093/rheumatology/kev265

Roets-Merken, L. M., Zuidema, S. U., Vernooij-Dassen, M. J. F. J., & Kempen, G. I. J. M. (2014). Screening for hearing, visual and dual sensory impairment in older adults using behavioural cues: A validation study. *International Journal of Nursing Studies*, *51*(11), 1434–1440. 10.1016/j.ijnurstu.2014.02.006

Saffer, B. Y., Lanting, S. C., Koehle, M. S., Klonsky, E. D., & Iverson, G. L. (2015). Assessing cognitive impairment using PROMIS(®) applied cognition-abilities scales in a medical outpatient sample. *Psychiatry Research*, *226*(1), 169–172. 10.1016/j.psychres.2014.12.043

Salter, A., Fox, R. J., Tyry, T., Cutter, G., & Marrie, R. A. (2019). The association of fatigue and social participation in multiple sclerosis as assessed using two different instruments. *Multiple*

Sclerosis and Related Disorders, *31*, 165–172. 10.1016/j.msard.2019.04.014

Schmidt, H., Nordhausen, T., Boese, S., Vordermark, D., Wheelwright, S., Wienke, A., & Johnson, C. D. (2018). Factors influencing global health related quality of life in elderly cancer patients: Results of a secondary data analysis. *Geriatrics (Basel, Switzerland)*, *3*(1), 5. 10.3390/geriatrics3010005

Silva, J. P., Pereira, D. S., Coelho, F. M., Lustosa, L. P., Dias, J. M. D., & Pereira, L. S. M. (2011). Clinical, functional and inflammatory factors associated with muscle fatigue and self-perceived fatigue in elderly community-dwelling women. *Revista Brasileira de Fisioterapia*, *15*(3), 241–248.

Stites, S. D., Karlawish, J., Harkins, K., Rubright, J. D., & Wolk, D. (2017). Awareness of mild cognitive impairment and mild Alzheimer's disease dementia diagnoses associated with lower self-ratings of quality of life in older adults. *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences*, *72*(6), 974–985. 10.1093/geronb/gbx100

Teshale, S. M. (2019). Associations among decisional autonomy, fatigue, pain, and well-being in long-term physical disability. *Rehabilitation Psychology*, *64*(3), 288. 10.1037/rep0000279

Tolstrup Larsen, R., Tang, L. H., Brochmann, N., Meulengracht Flachs, E., Illemann Christensen, A., Hasselbalch, H. C., & Zwisler, A.-D. (2018). Associations between fatigue, physical activity, and QoL in patients with myeloproliferative neoplasms. *European Journal of Haematology*, *100*(6), 550–559. 10.1111/ejh.13048

Torossian, M., & Jacelon, C. S. (2021). Chronic illness and fatigue in older individuals: A systematic review. *Rehabilitation Nursing*, *46*(3), 125–136. 10.1097/RNJ.0000000000000278

van Seben, R., Reichardt, L. A., Aarden, J. J., van der Schaaf, M., van der Esch, M., Engelbert, R. H. H., Twisk, J. W. R., Bosch, J. A., Buurman, B. M., Kuper, I., de Jonghe, A., Leguit-Elberse, M., Kamper, A., Posthuma, N., Brendel, N., Wold, J., & Hospital-ADL Study Group (2019). The course of geriatric syndromes in acutely hospitalized older adults: The Hospital-ADL Study. *Journal of the American Medical Directors Association*, *20*(2), 152–158.e2. 10.1016/j.jamda.2018.08.003

Wennberg, A. M., Canham, S. L., Smith, M. T., & Spira, A. P. (2013). Optimizing sleep in older adults: Treating insomnia. *Maturitas*, *76*(3), 247–252. 10.1016/j.maturitas.2013.05.007

Yu, L., Buysse, D. J., Germain, A., Moul, D. E., Stover, A., Dodds, N. E., Johnston, K. L., & Pilkonis, P. A. (2012). Development of short forms from the PROMIS™ sleep disturbance and sleep-related impairment item banks. *Behavioral Sleep Medicine*, *10*(1), 6–24. 10.1080/15402002.2012.636266

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