Original Article

A Rasch Analysis of Assessments of Morning and Evening Fatigue in Oncology Patients Using the Lee Fatigue Scale

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Abstract

Context. To accurately investigate diurnal variations in fatigue, a measure needs to be psychometrically sound and demonstrate stable item function in relationship to time of day. Rasch analysis is a modern psychometric approach that can be used to evaluate these characteristics.

Objectives. To evaluate, using Rasch analysis, the psychometric properties of the Lee Fatigue Scale (LFS) in a sample of oncology patients.

Methods. The sample comprised 587 patients (mean age 57.3 ± 11.9 years, 80% women) undergoing chemotherapy for breast, gastrointestinal, gynecological, or lung cancer. Patients completed the 13-item LFS within 30 minutes of awakening (i.e., morning fatigue) and before going to bed (i.e., evening fatigue). Rasch analysis was used to assess validity and reliability.

Results. In initial analyses of differential item function, eight of the 13 items functioned differently depending on whether the LFS was completed in the morning or in the evening. Subsequent analyses were conducted separately for the morning and evening fatigue assessments. Nine of the morning fatigue items and 10 of the evening fatigue items demonstrated acceptable goodness-of-fit to the Rasch model. Principal components analyses indicated that both morning and evening assessments demonstrated unidimensionality. Person-separation indices indicated that both morning and evening fatigue scales were able to distinguish four distinct strata of fatigue severity.

Conclusion. Excluding four items from the morning fatigue scale and three items from the evening fatigue scale improved the psychometric properties of the LFS for assessing diurnal variations in fatigue severity in oncology patients.   J Pain Symptom Manage 2016;■:■−■. © 2016 American Academy of Hospice and Palliative Medicine. Published by Elsevier Inc. All rights reserved.

Introduction

Fatigue severity fluctuates throughout the day with higher levels reported in the evening.[1,2] Although studies of diurnal variations in fatigue are limited, research on differences in morning and evening fatigue severity may provide important information about risk factors and underlying mechanisms of fatigue. In our previous research that identified subgroups of individuals with distinct morning and evening fatigue trajectories,[3] both higher morning and evening fatigue trajectories were associated with younger age, as well as higher scores on depression,

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state and trait anxiety, and sleep disturbance. However, several characteristics were only associated with higher morning (i.e., poorer functional status) or evening (i.e., being female, caring for children at home) fatigue trajectories. In addition, in a study of patients with HIV/AIDS,[4] although depression was a unique predictor of higher levels of evening fatigue, anxiety was a predictor of higher levels of both morning and evening fatigue. These findings suggest that morning and evening fatigue are distinct but related symptoms that may have different etiologies and underlying mechanisms. To investigate these diurnal variations in fatigue severity, information is needed about whether the various items on a fatigue instrument function differently depending on the time of day when these assessments are done.

Rasch analysis, a modern psychometric approach based on item response theory, is a relatively new frontier in the evaluation of patient-reported outcome measures. Even well-established instruments such as the Center for Epidemiologic Studies—Depression Scale[5] and the Beck Depression Inventory-II[6,7] were re-evaluated using this approach because Rasch analysis provides unique insights into an instrument's psychometric properties and how individual items function by evaluating the relative endorsement or hierarchy of items within an instrument. Rasch models transform ordinal scores into linear, interval-level variables and show what item responses would be expected if interval scale measurement was achieved. Actual response patterns, identified in an instrument with a set of items intended to be summed together, are tested against what would be expected by the Rasch model.[8]

In two previous studies of women with HIV/AIDS,[9,10] we used Rasch analysis to evaluate the Lee Fatigue Scale (LFS) and its unidimensionality and internal scale validity were demonstrated for both the morning and evening assessments. However, the female-only sample was relatively small, and responses were made on a 10-cm visual analogue scale rather than on the more commonly used 0 to 10 numeric rating scale (NRS). Therefore, it is not clear whether these findings apply to men, to patients with other chronic illnesses, or to the newer NRS-rated items. Given the limitations of these two studies, the purpose of this study was to evaluate the psychometric properties of the LFS (NRS version) using Rasch analysis in a sample of male and female oncology patients receiving chemotherapy (CTX). Because the patients completed the LFS on awakening (i.e., morning fatigue) and before going to bed (i.e., evening fatigue), separate Rasch analyses were done to evaluate potential differences in the psychometric properties of the LFS when it is used to assess diurnal variations in fatigue severity.

Methods

Patients and Settings

This study is part of a longitudinal study of the symptom experience of oncology outpatients receiving CTX. Eligible patients were aged ≥18 years; had a diagnosis of breast, gastrointestinal, gynecological, or lung cancer; had received CTX within the preceding four weeks; were scheduled to receive at least two additional cycles of CTX; were able to read, write, and understand English; and gave written informed consent. Patients were recruited from two Comprehensive Cancer Centers, one Veteran's Affairs hospital, and four community-based oncology programs. A total of 975 patients were approached and 587 consented to participate (60.2% response rate). The major reason for refusal was being overwhelmed with their cancer treatment.

Instruments

A demographic questionnaire was used to obtain information on age, gender, ethnicity, marital status, living arrangements, education, employment status, and income. The Karnofsky Performance Status (KPS) scale is widely used to evaluate functional status in patients with cancer and has well-established validity and reliability.[11] Patients rated their functional status using the KPS scale which ranged from 30 (I feel severely disabled and need to be hospitalized) to 100 (I feel normal; I have no complaints or symptoms).[11,12] Patients' medical records were reviewed for disease and treatment information.

The Self-Administered Comorbidity Questionnaire is a short and easily understood instrument that was developed to measure comorbidity in clinical and health service research settings.[13] The questionnaire consists of 13 common medical conditions. Patients were asked to indicate if they had each condition; if they received treatment for it; and did it limit their activities. Total scores can range from 0 to 39. The Self-Administered Comorbidity Questionnaire has well-established validity and reliability and has been used in studies of patients with a variety of chronic conditions.[14,15]

The LFS consists of 18 items designed to assess fatigue (i.e., 13 items, see Table 1) and energy (i.e., five items).[16] Only the 13 fatigue items were used in this analysis. Each item was rated on a 0 to 10 NRS. A total fatigue score is calculated as the mean of the 13 fatigue items, with higher scores indicating greater fatigue severity. Patients were asked to rate each item based on how they felt "right now," within 30 minutes of awakening (i.e., morning fatigue) and before going to bed (i.e., evening fatigue). Cutoff scores of >3.2 and >5.6 indicate high levels of