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# The Revised Piper Fatigue Scale (PFS-R) for Italian cancer patients: a validation study

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ABSTRACT

**Background and aim.** Fatigue is one of the most frequently reported symptoms by cancer patients. In recent years, much effort has been directed to designing fatigue measures which are psychometrically appropriate as well as easily administered. Among these, the Revised Piper Fatigue Scale (PFS-R) is widely used in assessing fatigue in cancer patients and other populations. Despite its large utilization in different national contexts and with different populations, its structure appears to vary across cultures, suggesting the need for its validation before use. The main aim of the present work was to verify the validity (i.e., dimensional structure and construct validity) and reliability (i.e., internal consistency) of an Italian translation of the PFS-R to reassure Italian oncology practitioners about its appropriate usage in practice and research.

**Methods and study design.** One-hundred ten Italian oncological inpatients were administered an Italian translation of the PFS-R together with a form for the collection of personal identification and clinical data and other fatigue and quality of life measures (POMS and EORTC QLQ-C30) already validated for Italy.

**Results.** Principal component exploratory factor analysis revealed a four-factor structure quite similar to (although not overlapping) the original described by Piper and colleagues; all four factors proved to be reliable and to correlate with one another and with previous validated measures of fatigue and quality of life. Preliminary descriptive statistics were also provided for data comparisons.

**Conclusions.** Despite the discussed limitations, PFS-R seems a valid and reliable multidimensional fatigue measure also adequate in Italian oncological settings. **Free full text available at www.tumorionline.it**

## Introduction

Fatigue is one of the most frequently reported symptoms by cancer patients and tends to accompany the individual during the entire disease course, i.e., throughout treatment and also later, in the terminal or survival phase of the illness[1-8]. This pervasiveness of fatigue in the cancer experience has suggested to coin the term "cancer-related fatigue" (CRF), as recommended by healthcare providers for its systematic and accurate assessment[1,9]. Nevertheless, the distinction between a physiological reaction to fatiguing situations and a clinically relevant symptom (or syndrome) is often not so clear[9-10] and this lack of clarity can provoke under- or overestimation of the phenomenon.

In fact, fatigue is a subjective experience that occasionally affects everybody. In healthy individuals it is a regulatory response to physical or psychological stress that contributes to maintaining a healthy balance between rest and activity[11]. By contrast, for people with specific diseases including cancer, fatigue often becomes a distressing symptom and a great source of concern.

The NCCN[1] defines CRF as "a distressing, persistent, subjective sense of physical, emotional and/or cognitive tiredness or exhaustion related to cancer or cancer treat-

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ment that is not proportional to recent activity and interferes with usual functioning" (p. FT-1) (see also: Rodriguez[10]; Servaes *et al.*[11]; Wu & McSweeney[12]).

The Revised Piper Fatigue Scale (PFS-R[13]) is a multidimensional self-report instrument useful in fatigue assessment[12,14] originating from a prior longer version of the scale[15]. Although it is frequently used for non-cancer populations[16-20], it was originally validated in a sample of breast cancer survivors[13] and is commonly applied in oncological practice as well as research. The scale consists of 22 items supplemented by 5 additional open-ended questions related to the temporal dimension of fatigue, its perceived cause, effect, relief, and additional symptoms not included in the scoring. A principal component factor analysis groups the 22 items into 4 reliable and correlated dimensions: behavioral severity (6 items), relating to the severity and degree of disruption in activity of daily living; affective meaning (5 items), relating to the emotional meaning attributed to fatigue; sensory (5 items), relating to the physical symptoms; and cognitive and mood (6 items), relating to mental and mood states[13]. Scaling is based on a 0-10 range; total and subscale mean scores are derived from summing individual items and dividing by the number of items in the subscale/total scale to maintain the 0-10 scaling.

The PFS-R has already been validated in France[21], the Netherlands[22], and Brazil[20], and its translation has also been documented for the Swedish[23], Greek[24], Chinese[25], and Turkish[26] languages. However, the dimensional structure of the scale appears not to be constant across cultures[13,20-22]; consequently, inspection of its psychometric properties (dimensionality, validity, reliability) before its usage in a new national context seems desirable.

The first aim of the present work has been to make a valid and reliable fatigue measure available to Italian cancer patients and Italian clinicians and researchers. To pursue this objective, the PFS-R dimensional structure, together with its reliability, has been tested in a sample of Italian cancer patients. The construct validity of the entire scale and its dimensions has been verified by correlating them with other fatigue and quality of life (QoL) measures already validated for Italy and widely applied in cancer populations. Preliminary data (e.g., means, standard deviations, frequencies) are also presented for Italian cancer patients. A supplementary interest of the present study concerns the international debate on the cross-national and cross-cultural validity of psychological measures[14,27].

## Material and methods

### *Participants*

One-hundred and ten consecutive cancer patients participated in the study. The eligibility criteria were the following: (1) being hospitalized in the same cancer hospital in north-east Italy, (2) being older than 18 years, (3) being diagnosed or being treated for cancer, (4) having an ECOG performance status between 0 and 2[28], (5) having no handicaps, psychiatric syndromes or temporary inability to compile forms, and (6) having a good understanding of the Italian language. Selection of potential participants was done by consulting clinical files, whereas the actual involvement in the research was subordinated to the signing of a written permission.

In the sample, 33 (30%) participants were men and the median age was 58 years (range, 26-80). As for disease data, the most representative types of cancer were breast cancer (17.3%), ovarian cancer (10.9%), and colorectal cancer (8.2%).

### *Materials and procedure*

The PFS-R, together with a form for the collection of personal identification and clinical data, the Subscales F, T, D, and C of the Profile of Mood States (POMS[29]), the European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire Core 30 (EORTC QLQ-C30[30]), and the informed consent form to participate in the trial were administered by a trained psychologist during hospitalization.

Before data collection, the PFS-R was translated into Italian* following the back-translation procedure[31,32] and the comprehensibility of the Italian version was verified in a nonclinical sample of 10 units.

The POMS[29] is a widely used tool in assessing mood states which has already been validated for Italy[33]. It consists of 5 negative mood scales (Tension-Anxiety, Fatigue-Inertia, Confusion-Bewilderment, Depression-Dejection, Anger-Hostility) and 1 positive scale (Vigor-Activity). In the present research the Fatigue-Inertia (F), Tension-Anxiety (T), Depression-Dejection (D), and Confusion-Bewilderment (C) scales were administered.

The European Organisation for Research and Treatment of Cancer (EORTC) QLQ-C30 is a 30-item cancer-specific questionnaire for assessing the health-related QoL of cancer patients[30] validated for Italy by Apolone *et al.*[34] It encompasses 5 functional scales (physical, role, cognitive, emotional, and social), 3 symptom scales (fatigue, pain, nausea and vomiting), a global health and QoL scale, and single items for the assessment of additional symptoms commonly reported by cancer patients (i.e., dyspnea, appetite loss, disturbed sleep, constipation, and diarrhea), as well as the perceived financial impact of the disease and its treatment[30]. In the present study, EORTC QLQ-C30 was administered excluding the 6 single items for the assessment of additional symptoms and the nausea and vomiting symptom scales.

The decision to drop several subscales (i.e., those less pertinent to the dimensions investigated by the PFS-R)

* The Italian version of the Scale is available by contacting the first author at the e-mail address listed.

from both the POMS and the EORTC QLQ-C30 rested upon the necessity not to tire participants too much.

*Statistical analyses*

To test the dimensional composition of the PFS-R (Italian version), a principal component exploratory factor analysis (PCA) was conducted. The construct validity of both the entire scale and its subscales was tested by Pearson's product moment correlations with the theoretically pertinent subscales of the POMS and EORTC QLQ-C30; these 2 questionnaires were chosen because both had been validated in Italy, published in the international scientific literature, and frequently used for studying fatigue and QoL in cancer patients. The internal consistency of the entire PFS-R and of the identified subscales was obtained calculating Cronbach's alpha. Descriptive statistics (mean, standard deviation, minimum, maximum, and frequencies) were provided for the entire PFS-R and the identified subscales for this Italian sample.

In the PFS-R, less than 10% missing data were substituted by the median score of the item answered by all the other participants.

The Statistical Package for the Social Sciences (SPSS) version 17.0 was used to perform the analyses and $P < 0.05$ was taken as the level of statistical significance.

## Results

*Dimensional structure*

The 22 items of the PFS-R were subjected to PCA. Before the analysis, the suitability of the data for factoring was assessed. The correlation matrix was found to have many coefficients of 0.30 and above. The Kaiser-Meyer-Oklin value was 0.89, and the Bartlett's test of sphericity reached statistical significance ($\chi^2$ [231] = 1808.30, $P < 0.001$), supporting the factorability of the correlation matrix[35,36]. PCA revealed the presence of 4 factors with eigenvalues exceeding 1. Oblimin rotation was performed to facilitate the interpretation of these 4 factors. As shown in Table 1, the rotated solution indicated the presence of a simple structure, with all factors showing a number of strong loadings, and all variables loading substantially on 1 component (at 0.40 or above) except Item 7, which was theoretically attributed to Factor 3 (see also Piper *et al.*[13]). The 4-factor solution explained a total of 73.68% of the variance, with Factor 1 contributing 50.53%, Factor 2 contributing 10.91%, Factor 3 contributing 7.25%, and Factor 4 contributing 4.96%. The 4 factors were significantly and positively correlated, as shown in Table 2.

A more detailed inspection of Table 1 suggests that (a) the first factor overlaps perfectly with the first factor named Behavioral Severity by Piper *et al.*[13]; (b) the second factor is saturated by fewer items than in Piper *et al.*[13] and deals only with Cognitive Severity; (c) the third factor substantially coincides with the Affective Meaning by Piper *et al.*[13] even though in this Italian sample it consists of 2 added items; and (d) the fourth factor is very similar to, although not overlapping, the Sensory Factor by Piper *et al.*[13] and thus we named it Sensory/Emotional Severity.

*Construct validity*

The construct validity of the entire PFS-R and its 4 dimensions was verified by correlating their scores with

**Table 1 - Factor loadings of the 22 PFS-R items**

| | Factors | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| 2. Feeling fatigue interfering with the ability to complete work/school activities | .92 | | | |
| 5. Feeling fatigue interfering with the ability to engage in enjoyable activities | .87 | | | |
| 6. Describing the degree of fatigue intensity/severity | .84 | | | |
| 1. Feeling fatigue causing distress | .78 | | | |
| 3. Feeling fatigue interfering with the ability to visit or socialize | .68 | | | |
| 4. Feeling fatigue interfering with the ability to engage in sexual activity | .65 | | | |
| 21. Feeling able/unable to remember | | .96 | | |
| 22. Feeling able/unable to think clearly | | .91 | | |
| 20. Feeling able/unable to concentrate | | .78 | | |
| 13. Feeling awake/sleepy | | .56 | | |
| 10. Describing fatigue as positive/negative | | | .94 | |
| 9. Describing fatigue as protective/destructive | | | .89 | |
| 11. Describing fatigue as normal/abnormal | | | .81 | |
| 8. Describing fatigue as agreeable/disagreeable | | | .66 | |
| 17. Feeling patient/impatient | | | .57 | |
| 18. Feeling relaxed/tense | | | .53 | |
| 7. Describing fatigue as pleasant/unpleasant | .47 | | .52 | |
| 14. Feeling lively/listless | | | | - .66 |
| 15. Feeling refreshed/tired | | | | - .64 |
| 16. Feeling energetic/unenergetic | | | | - .60 |
| 12. Feeling strong/weak | | | | - .46 |
| 19. Feeling exhilarated/depressed | | | | - .46 |

**Table 2 - Factor intercorrelations of the 4-factor model**

| | Behavioral severity | Cognitive severity | Affective meaning | Sensory/ emotional severity |
|---|---|---|---|---|
| Behavioral severity | - | .435 | .694 | .705 |
| Cognitive severity | | - | .433 | .560 |
| Affective meaning | | | - | .707 |
| Sensory/emotional severity | | | | - |

All estimated correlations are significantly above the $P$ <0.001 level.

the scores of the other, similarly constructed, administered tools.

As expected, the PFS-R as a global measure significantly correlated ($P$ <0.001) with POMS-F, with the Fatigue scale of EORTC QLQ-C30 and, inversely, with the global QoL measure expressed by the EORTC Global Health and QoL scale (Table 3).

Focusing on the 4 factors, Behavioral Severity correlated with the Role Functioning (RF) and Social Functioning (SF) scales of EORTC QLQ-C30; Cognitive Severity with the POMS-C and the Cognitive Functioning (CF) scale; Sensory/Emotional Severity with POMS-T, POMS-D, the Physical Functioning (PF), Emotional Functioning (EF) and Pain Symptom scales of EORTC QLQ-C30; and Affective Meaning correlated inversely with the EORTC QLQ-C30 Global Health and QoL scale (Table 3).

**Table 3 - Pearson's correlations of PFS-R and its subscales with POMS scales and EORTC QLQ-C30**

| | PFS-R (Total) | Behavioral severity | Cognitive severity | Affective meaning | Sensory/ emotional severity |
|---|---|---|---|---|---|
| POMS-F | .640 | | | | |
| POMS-C | | | .415 | | |
| POMS-T | | | | | .475 |
| POMS-D | | | | | .614 |
| EORTC PF | | | | | .491 |
| EORTC RF | | .664 | | | |
| EORTC CF | | | .634 | | |
| EORTC EF | | | | | .507 |
| EORTC SF | | .508 | | | |
| EORTC Fatigue | .610 | | | | |
| EORTC Pain | | | | | .430 |
| EORTC QL | - .723 | | | - .718 | |

All estimated correlations are significantly above the $P$ <0.001 level. POMS-F, Fatigue-Inertia scale; POMS-C, Confusion-Bewilderment scale; POMS-T, Tension-Anxiety scale; POMS-D, Depression-Dejection scale; EORTC PF, Physical functioning scale; EORTC RF, Role functioning scale; EORTC CF, Cognitive functioning scale; EORTC EF, Emotional functioning scale; EORTC SF, Social functioning scale; EORTC Fatigue, Fatigue symptom scale; EORTC Pain, Pain symptom scale; EORCT QL, Global health and QoL scale.

*Internal consistency*

Cronbach's alpha for the entire PFS-R (22 items) was 0.952, whereas for its 4 identified subscales (Behavioral Severity, Cognitive Severity, Affective Meaning, and Sensory/Emotional Severity) it was 0.919 (6 items), 0.884 (4 items), 0.912 (7 items), and 0.885 (5 items), respectively.

*Descriptive statistics*

Table 4 summarizes the descriptive statistics (mean, standard deviation, minimum, maximum) for the entire PFS-R and its 4 dimensions as calculated in the present sample of Italian cancer patients, whereas in Table 5 the frequencies are displayed as cumulative percentages.

## Discussion

The present work responds to the necessity to make a valid and reliable fatigue measure available to current oncology practice and research in Italy. Fatigue is one of the most frequently reported symptoms by cancer patients and seems to characterize all the disease phases, from treatment to survivorship[1,6,10-11]. Thus in recent years much effort has been directed to designing fatigue measures which are psychometrically appropriate as well as easily administered, and which were not available in Italy so far[14,37,38].

**Table 4 - Descriptive statistics for the PFS-R and its 4 subscales**

| | No. of items | Mean | Standard deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| PFS-R total | 22 | 4.56 | 2.22 | 0 | 10 |
| Behavioral severity | 6 | 5.17 | 2.84 | 0 | 10 |
| Cognitive severity | 4 | 2.62 | 2.40 | 0 | 10 |
| Affective meaning | 7 | 4.92 | 2.64 | 0 | 10 |
| Sensory/emotional severity | 5 | 4.92 | 2.41 | 0 | 10 |

**Table 5 - Cumulative percentages for the PFS-R and its 4 subscales**

| % | PFS-R (Total) | Behavioral severity | Cognitive severity | Affective meaning | Sensory/ emotional severity |
|---|---|---|---|---|---|
| 0 | 1.1 | 5.8 | 19.2 | 4.2 | 2.9 |
| 1 | 6.4 | 13.6 | 34.6 | 10.0 | 5.9 |
| 2 | 13.8 | 17.5 | 51.0 | 16.8 | 13.7 |
| 3 | 28.7 | 23.3 | 66.3 | 26.3 | 24.5 |
| 4 | 41.5 | 35.0 | 74.0 | 36.8 | 38.2 |
| 5 | 59.6 | 47.6 | 82.7 | 50.5 | 54.9 |
| 6 | 74.5 | 61.2 | 90.4 | 66.3 | 68.6 |
| 7 | 84.0 | 70.9 | 94.2 | 76.8 | 77.5 |
| 8 | 96.8 | 83.5 | 97.1 | 86.3 | 86.3 |
| 9 | 98.9 | 93.2 | 100 | 93.1 | 97.1 |
| 10 | 100 | 100 | 100 | 100 | 100 |

The Revised Piper Fatigue Scale has been widely used in assessing fatigue in cancer patients as well as in other populations[12,14]. It offers both a global fatigue score and 4 partial indices (behavioral severity, affective meaning, sensory, cognitive/mood) that are of particular utility in clinical practice.

Despite the extensive utilization of PFS-R in different national contexts and with different populations[13,16-26], its structure appears not to be invariable across them, suggesting the need for its inspection before application. After a rigorous translation procedure from English to Italian, we administered the PFS-R to a sample of Italian oncological inpatients, then we tested its validity (i.e., the dimensional structure and construct validity) and reliability.

Based upon an exploratory factor analysis, we proposed a 4-dimensional structure of the PFS-R for Italy that was quite similar to, although not completely overlapping, the original one. In particular, the main differences from the original structure by Piper[13] concern the cognitive/mood dimension, which in the Italian version has been restricted to cognition, and the sensory dimension, which in the Italian version has been integrated with emotional aspects to become sensory/emotional severity. The validity of these 4 reliable and correlate factors is reinforced by their correlation with other QoL and fatigue instruments (POMS and EORTC QLQ-C30) that had already been validated for our country. Although limited by the sample size, preliminary descriptive data about fatigue and its 4 identified dimensions were also provided.

The main limitations of the present research rest upon a sample size not large enough for further desirable analyses, such as confirmatory factor analysis and multi-group tests. Furthermore, because the first factor alone explains more than half of the variance, a comparison between the 4-dimensional and the uni-dimensional models would be interesting (see, for example, Lai *et al.*[39]). In further research, the discriminate validity and test-retest reliability should also be analyzed.

In spite of the mentioned limitations, the present report will reassure Italian oncology physicians (both healthcare providers and researchers) in using the PFS-R and provides them with a dimensional structure attained from a sample of Italian cancer patients together with preliminary descriptive statistics that can be used in data comparisons. More in general, the paper confirms the internal consistency and construct validity of the PFS-R. Finally, it gives some evidence for the expediency of cross-validity appraisal of psychological measures.

In conclusion, despite further research being relevant, according to our findings the Revised Piper Fatigue Scale can properly be used as a multidimensional fatigue measure also in Italian cancer patients.

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