The measurement of fibromyalgia severity: converting scores between the FIQR, the PSD and the FASmod

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Abstract

Objective

The revised Fibromyalgia Impact Questionnaire (FIQR) is a widely used fibromyalgia severity assessment tool that was introduced in 2009 prior to the publication of the American College of Rheumatology (ACR) preliminary fibromyalgia criteria in 2010 and its revision in 2016. In 2020, the modified Fibromyalgia Assessment Scale (FASmod) was published. The Polysymptomatic Distress scale (PSD) of the fibromyalgia criteria and FASmod include assessments of pain location severity and can be used for diagnosis as well as in non-fibromyalgia patients. The aim of this study is to provide equations for the conversion of the FIQR scores to PSD and FASmod as an aid to understanding and sharing fibromyalgia severity information.

Methods

3089 patients with fibromyalgia, diagnosed according to the ACR 2010/2011 criteria and belonging to the Italian Fibromyalgia Registry completed FIQR, FASmod and PSD questionnaires. Pearson's correlation coefficient was used to test the correlations between indices. The least square regression approach was used to produce predictive equations for each scale based on the remaining scales.

Results

FIQR was correlated with PSD (r=0.714) and FASmod (r=0.801); PSD and FASmod showed the highest correlation (r=0.897), expected since they assess the same constructs. Predictive equations showing a linear model were effective in producing mean cohort values, but individual predictions deviated substantially, precluding prediction in the individual patient.

Conclusion

Conversion equations that allow for interconversion of multiple scales fibromyalgia severity assessment scales are produced. These can be useful in obtaining mean values for cohorts but are not accurate enough for use in individual patients.

Key words

fibromyalgia, disease severity, Polysymptomatic Distress scale, conversion equations

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Introduction

Many scales that are not designed primarily for fibromyalgia can be used in the assessment of fibromyalgia because persons with fibromyalgia experience pain, disability, and psychological stress just as persons with other conditions do (1). However, it is also desirable, if possible, to measure symptoms that are essential to the fibromyalgia diathesis and thus to measure fibromyalgia severity. In addition, as fibromyalgia symptoms are part of a continuum which extend to those who meet fibromyalgia criteria as well as to those who have less severe illness, severity should be measurable in all patients.

A number of scales have been developed to assess fibromyalgia severity. The Fibromyalgia Impact Questionnaire (FIQ) and its 2009 revision and renaming to the *revised* Fibromyalgia Impact Questionnaire (FIQR) is the most important and widely used assessment tool (2). It was developed before the revision of fibromyalgia criteria that introduced diagnosis based on symptom severity (3-5). Among the problems inherent in using the FIQR are that its scores are not interpretable using the now common metric of the Polysymptomatic Distress scale (PSD), which is a part of the American College of Rheumatology (ACR) criteria and criteria revisions. Researchers with investments in the FIQR need a way to use it that is compatible with the PSD scale and fibromyalgia criteria. In addition to the PSD, a slightly modified and shortened version of the PSD is now available as the modified Fibromyalgia Assessment Scale (FASmod) (6, 7).

The 21 item FIQR differs from the PSD and FASmod in one very important way: it contains no measure of pain locations or extent; and it contains measurements of function and general health status. The PSD and FASmod use pain location extent as the primary concept in measuring severity, but do not include health and disability measures. Therefore, it is uncertain if the FIQR and other scales are measuring the same constructs.

In addition, in daily clinical practice, examination times are usually tight and it is difficult to perform an all-inclusive clinimetric evaluation in the individual patient.

With these assumptions in view, this study aims to provide conversions scales to convert FIQR scores to PSD and FASmod, and *vice versa*, and to investigate agreement between scales at mean levels and at individual patient levels.

Methods

Patient recruitment

The data of this study were retrospectively extracted from a large database of patients with fibromyalgia belonging to the Italian Fibromyalgia Registry (IFR) (8). The patients included in the IFR were recruited from November 2018 to December 2021 in 19 Italian rheumatology centres. For the purposes of this study were included adult patients, with a diagnosis of fibromyalgia for at least three months according to the ACR 2010/2011 criteria (3). Patients who did not meet the ACR criteria at the time of evaluation (PSD <12), although they had previously met the criteria, were also included. Patients belonging to IFR were recruited in a naturalistic manner from daily practice. The study protocol did not require any peculiar medical intervention. In each centre the diagnosis was made by an experienced rheumatologist with at least 10 years of experience. All of the patients underwent a diagnostic work-up including a complete physical examination and the laboratory tests specified in the revised European League Against Rheumatism (EULAR) recommendations for the management of fibromyalgia (9). Patients with comorbid conditions interfering with the metric assessment of fibromyalgia (*i.e.* inflammatory arthropathies, connective tissue diseases, or significant psychiatric conditions, including severe depression) were excluded. Patients who had incomplete data within the IFR were also excluded.

All the participants gave their written informed consent to the study. The protocol, patient information sheet and consent form were approved by the Ethics Committee of the Università Politecnica delle Marche, Ancona, Italy (Comitato Unico Regionale – ASUR

Marche, no. 1970/AV2), and the review boards of all of the study centres.

Questionnaires

FIQR. The FIQR consists of 21 numerical rating scales (range 0–10, with 10 being the 'worst' for each scale). FIQR studies three main health domains: function, overall impact and symptoms. The questions refer to the previous seven days. The final score (range 0–100) with greater values indicating a worse severity (2).

FASmod

The FASmod is a revised version of the FAS realised in 2019. FASmod is made of two parts investigating the symptoms of the last seven days. The first part is represented by two 11-point numeric rating scale studying fatigue and unrefreshing sleep, while the second part is a front/back manikin with represented 19 body areas analysing the presence of widespread pain. The final score, ranging from 0 to 39, is the algebraic sum of the two scales and the score of pain obtained on the manikin (6, 7).

PSD

The PSD is based on the variables used in the ACR FM 2010/2011 diagnostic criteria, and is the algebraic sum of widespread pain index (WPI, range 0–19) and symptom severity scale (SSS, range 0–12). In addition to diagnostic purposes, the PSD (range 0–31) allows assessment of the severity of the disease because higher scores suggest a more severe and pervading disease (3-5).

Statistical analyses

In these analyses we followed the methods and suggestions of Hawley (10). We studied 3089 fibromyalgia patients who had complete data for FIQR, FASmod and PSD scales. The correlation between the scales was first studied with Pearson's correlation coefficients. From the full sample we created to 50% subsets of randomly selected patients by sex. The subsets were labelled "primary" and "validation." Using least square regression on the primary data set, we created six equations to predict FIQR, PSD and FAS from each of the questionnaires. We analysed the predicted results in the validation data set according to the method of Hawley (8). Graphs were obtained from scatter plots and lowess regression. We also studied the effect of sex on predictions in least square regression. There was no effect of sex at the 0.05 level, and we did not include sex in any of the final models.

Table I. Correlation of fibromyalgia scales and simple regression (y = mx + c) equations describing the relationship between scale pairs with 95% CI for x and c from primary sample (N=1545).

Variable	PSD (r^2)	FASmod (r^2)	FIQR (r^2)
PSD	1.000	0.897 (0.885)	0.714 (0.510)
FASmod	0.897 (0.885)	1.000	0.801 (0.642)
FIQR	0.714 (0.510)	0.801 (0.642)	1.000
WPI	0.912 (0.832)	0.861 (0.741)	0.558 (0.311)
SSS	0.786 (0.618)	0.641 (0.411)	0.702 (0.493)

y	mx	c	95% CI for x	95% CI for c
PSD	0.221 FIQR	5.872	0.210 to 0.232	5.179 to 6.565
PSD	0.733 FAS	0.331	0.715 to 0.751	-0.154 to 0.817
FASmod	0.303 FIQR	7.446	0.292 to 0.315	6.719 to 8.172
FASmod	1.010 PSD	4.632	1.073 to 1.127	4.083 to 5.181
FIQR	2.309 PSD	15.924	2.196 to 2.422	13.622 to 18.225
FIQR	2.114 FAS	5.845	2.035 to 2.193	3.710 to 7.981

CI: confidence intervals; PSD: Polysymptomatic Distress scale; FASmod: modified Fibromyalgia Assessment Scale; FIQR: revised Fibromyalgia Impact Questionnaire.

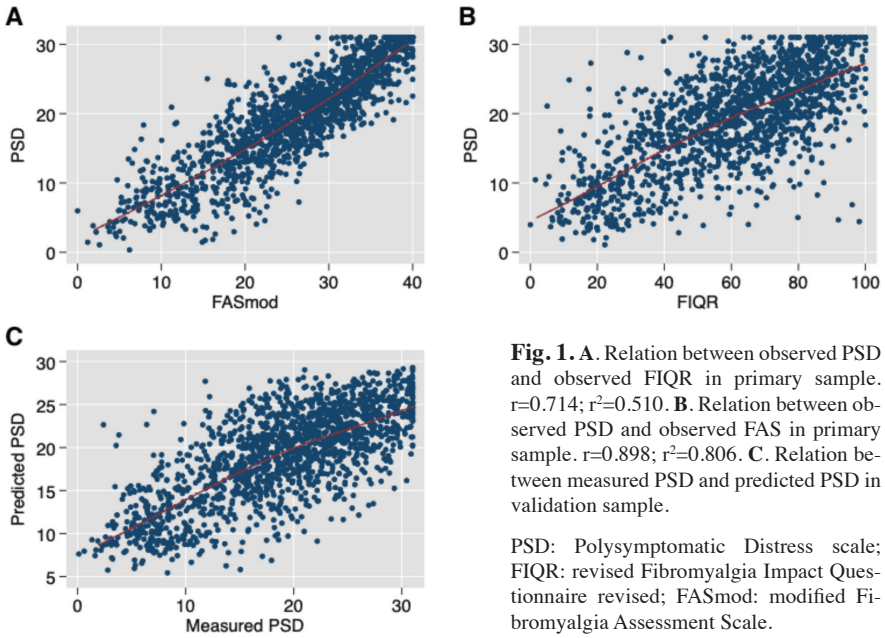

Fig. 1. A. Relation between observed PSD and observed FIQR in primary sample. r=0.714; r^2=0.510. **B**. Relation between observed PSD and observed FAS in primary sample. r=0.898; r^2=0.806. **C**. Relation between measured PSD and predicted PSD in validation sample.

PSD: Polysymptomatic Distress scale; FIQR: revised Fibromyalgia Impact Questionnaire revised; FASmod: modified Fibromyalgia Assessment Scale.

Results

Data from 3089 patients were randomly selected and divided into two sets for use as a primary sample (1545 patients) and a validation sample (1544 patients). The 93.1% of patients were women in the whole sample and also in primary and validation sample. The mean age of patients of the whole sample was 53.1±11.6 years, with a mean PSD 19.0±7.0, mean FASmod 25.5±8.6, and mean FIQR 59.4±22.8. In primary sample the mean age was 53.2±11.5 years, mean PSD 19.1±6.9, mean FASmod 25.7±8.5, and mean FIQR 60.1±22.3; in the validation sample the mean age was 52.8±11.7 years, mean PSD 18.9±7.1, mean FASmod 25.4±8.7, and mean FIQR 58.7±23.3.

The three assessment scales, as well as the two PSD components (WPI and SSS), were largely and positively correlated (Table I). PSD was most strong-

Table II. Extent of absolute differences between observed PSD scores and PSD scores predicted by PSD-FIQR equation.

% Differences	Frequency	%	Cumulative %
0-9	470	30.4	30.4
10-24	540	35.0	65.4
25-49	327	21.2	86.6
50-99	134	8.7	95.3
100+	73	4.7	100.0

% differences: ((observed PSD – predicted PSD)/observed PSD) x 100.
PSD: Polysymptomatic Distress scale; FIQR: revised Fibromyalgia Impact Questionnaire.

ly correlated with FASmod (r=0.897, r^2=0.885) and less correlated with FIQR (r=0.714, r^2=0.510). FASmod and FIQR were correlated at r=0.801, r^2=0.542). PSD, FAS and FIQR were correlated with WPI at r=0.912, 0.861 and 0.558. The reduced correlation between WPI and FIQR reflects the absence of a pain location extent assessment in the FIQR and their presence in PSD and FASmod.

To enable conversion of FIQR to PSD and FAS, we used least square regression on the primary data set, as shown in Table I. Sex was not significant in any regression analysis and was therefore not included. Figure 1 shows the scatter plot and lowess regression of PSD on FIQR (Fig. 1A) and PSD on FASmod (Fig. 1B). The relationships between the scales were explained in each case through linear models. The more dispersed regression scatter plot of PSD and FIQR reflects the reduced correlation of PSD and FIQR compared with PSD and FAS. Of particular interest, there are many substantial outliers in the PSD FIQR plot that are not seen in the PSD FASmod plot.

To understand the relation between measured and predicted values, we used the conversion equation of PSD and FIQR (Table I) in the primary data set to obtain predicted PSD values and the observed values of PSD in the validation data set to obtain observed values (Fig. 1C). The correlation between the observed and predicted PSD scores was 0.705. Figure 1C shows a dispersed relationship between the observed and predicted variables. In Table II we studied the relation of absolute difference between the observed and predicted values of PSD shown in Figure 1C. Thirty-five percent of values differed by 10% to 24%, 21.2% differed by 25% to 49%, 8.5% differed by 50% to 99%, and 4.7% differed by 100% or more.

Discussion

The data of this study provide equations that can be used to predict PSD and FASmod scores from FIQR data. With such data FIQR scores are effectively transformed into measures such as PSD or FASmod. For example, a 2013 Brazilian study of 106 fibromyalgia patients reported a FIQR score of 61.2, which can now be converted to a PSD score of 19.4 (11). In an Iranian study, a FIQR of 49.8 can be converted to a PSD score of 16.9 (12). Data such as these allow older or non-PSD studies to be interpreted by the criteria-related PSD model.

The authors of the PSD and the authors of the FASmod have used these scales to evaluate fibromyalgia related severity in patients with musculoskeletal complaints regardless of whether they satisfy fibromyalgia criteria (13, 14). Patients without fibromyalgia (PSD scores <12) or those with improvement or remission can be evaluated by PSD/FASmod. Conversion from FIQR to PSD/FASmod may not always work well. While conversion provides acceptable mean scores for a cohort, individual scores are too "noisy" for use at the level of the individual patient (10). The correlation in the current study between actual and predicted PSD score was only 0.705. This translates into substantial inaccurate individual data points.

The FIQR scale provides a broad measure of fibromyalgia symptoms, health status and functional assessment in a single questionnaire aimed at the fibromyalgia patient. The omission of a major pain location extent assessment limits its compatibility with questionnaires such as the PSD and FASmod. The PSD which includes the WPI was introduced in 2010 after the revision of the FIQ in 2009 (2, 3). In addition, the FIQR questionnaire asks about the severity of "fibromyalgia," and therefore limits usefulness in patients with symptoms that do not meet fibromyalgia severity criteria as well as in those patients who are unaware that they are being considered for a fibromyalgia diagnosis. The FIQR authors proposed a 10-item score from the Symptom Impact Questionnaire (SIQR) symptoms (SIQR represents the FIQR symptom assessment to evaluate non-fibromyalgia disorders) and the use of a 28-location Pain Location Inventory (PLI) (15). These assessments have not been compiled into a single score and do not appear to have been widely used.

Short health status questionnaires that have been tested in fibromyalgia as well as in all other medical conditions are now widely available and may be more useful than disease specific questionnaires when standardised health status and disability status assessments are needed (1). However, the SIQR has shown good performance in assessing patients with chronic musculoskeletal pain, demonstrating greater correlation with the subscales of the SF-36 (used as an external criterion) than the PSD (16). Though some FIQR items are related to activities predominantly performed by women, no effect of sex was found on the conversion analysis.

In summary, we have provided conversion equations that allow for interconversion of multiple scales fibromyalgia severity assessment scales. These can be useful in obtaining mean values for cohorts but are not accurate enough for use in individual patients.

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