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# Association between psychological constructs and physical and emotional distress in individuals with fibromyalgia

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## ABSTRACT

**Objective.** Psychological factors and physical and emotional distress are frequently identified in fibromyalgia (FM). Previous reports have explored the relationship between some of these variables and functional disability and emotional distress in the disease; however, additional links with other potential psychological factors are unknown. This study aimed to assess the association between psychological variables and functional disability and emotional distress in individuals with FM.

**Methods.** This prospective, cross-sectional cohort study included 251 FM patients aged over 18 years. Demographic and clinical characteristics and outcome measures were recorded for each participant. Multiple linear regression analysis was performed to identify associations between the psychological factors.

**Results.** The findings suggest significant associations between psychological variables and physical impact and emotional distress (anxiety and depression) (all  $p$ -values  $<0.0001$ ). Positive and negative affect, mindfulness, and perceived injustice were strongly associated with the physical and emotional impact (all  $p$ -values  $<0.05$ ) in the sample.

**Conclusion.** The study provides useful insights into the domains of physical and emotional distress. The findings should be incorporated into personalised treatments aimed at reducing functional disability and improving quality of life in patients with fibromyalgia.

## Introduction

Fibromyalgia (FM) is one of the most common clinical rheumatological conditions, characterised by widespread musculoskeletal pain of unknown aetiology and an uncertain pathophysiology (1). Over the last three decades, at least five sets of classifications, case diagnostic criteria and screening instru-

ments have been developed for use in clinical settings. At present, however, no universally accepted case criteria or clinically established diagnostic biomarkers are available for FM. Therefore, FM represents a challenge for clinicians and researchers all over the world. The most commonly used clinical definition was proposed in the 1990 American College of Rheumatology (ACR) criteria (2). However, it presents certain deficiencies and in 2016 a new revised version was published (3). Although the most frequent symptom of FM is chronic pain, the condition also includes an array of complaints such as fatigue, sleep disturbances, irritable bowel syndrome, paresthesias, mood disorders and problems of concentration and memory (4, 5). It is also associated with a high rate of functional disability (6). According to population-based studies, the estimated prevalence of chronic widespread pain is between 7% and 11%, and between 1% and 4% for FM. Patients often suffers notable distress and impairment of their health-related quality of life, resulting in a considerable burden of illness (7). Advances in three disciplines have led to changes in FM models. First, epidemiological studies have shown that FM is at the end of a continuous spectrum of chronic musculoskeletal pain (3); second, neurophysiological studies have demonstrated alterations in the processing of sensory information and an underlying neuroendocrine dysfunction, and also alterations in nociceptive mechanisms of pain (8); and third, clinical psychology studies have compared the psychological variables and other approaches in FM patients and in patients with rheumatoid arthritis (9). Over the past 25 years, our understanding of the functional and psychosocial problems commonly associated with FM has gradually advanced. It is currently possible to evaluate different

multidimensional aspects of FM and even to categorise the states of disease severity using outcome measures that can be easily applied in daily clinical practice (10). FM is a chronic pain syndrome that presents with neurophysiological alterations, along with mood impairments and a high rate of comorbidity with anxiety/depression and somatoform disorders. Like all painful states, FM is considered a complex and subjective experience in which affective and cognitive aspects are crucial in the prognosis (11). Personality traits like alexithymia also play an important role in clinical manifestations, especially in social and psychological dimensions, quality of life and perceived disability (12). Today, maladaptive cognitive and emotional factors are associated with several brain regions involved in chronic pain processing, and targeting these factors in these patients may normalise specific brain alterations (13). As regards the study of psychological variables in FM, previous work has focused on acceptance, mindfulness, positive and negative affect, catastrophising, surrender, psychological inflexibility and perceived injustice, without reaching conclusive results (14-16). In the present study, we intend to give a comprehensive explanation of the relationship between psychological variables and functional disability and distress in a cohort of FM patients, and also to explore the value of psychological variables for predicting functional disability and emotional distress in individuals with this condition.

## Methods

### *Participants and procedures*

A multicentre, prospective, cross-sectional cohort study was carried out in 251 consecutive individuals (mean age at the time of enrollment:  $52.4 \pm 8.03$  years) who met the 1990 ACR criteria for FM (2). All participants were referred from primary health care facilities in Aragon, Spain, and assessed by an expert rheumatologist at the outpatient rheumatology clinic of Miguel Servet University Hospital, Zaragoza, from January 1999 through March 2010. All participants were of Caucasian descent and from the same geographical area.

Inclusion criteria for participating in the study were: 1) FM diagnosis according to the 1990 ACR criteria; 2) age over 18 years; 3) ability to speak and understand Spanish; and 4) provision of informed consent. Exclusion criteria were as follows: 1) previous or current diagnosis of serious medical illnesses (major depression disorder, schizophrenia, borderline personality disorder, alcoholism or drug addiction) or serious Axis I/Axis II diagnoses of psychiatric disorder; 2) refusal to cooperate or to sign the informed consent document; 3) failure to complete the questionnaires. Sociodemographic data, comorbid health conditions and other clinical characteristics were also recorded for each participant. No data were collected on the pharmacological and non-pharmacological treatments used for participants' chronic pain. All participants were initially contacted by telephone and the nature of the study was explained to them. If they decided to participate, they were then called for an appointment by a trainee postgraduate psychologist, who carried out the clinical interview and completed the face-to-face protocols. In the personal interview, the characteristics of the questionnaires and the study aims were explained, and participants were assured that their data would be processed in full confidentiality. Once signed informed consent was obtained, the tests and interviews were administered over a period of approximately one and a half hours per person. All participants who met eligibility criteria gave written informed consent prior to their participation. The study protocol was approved by the local Institutional Review Board at the Zaragoza University School of Medicine.

### *Measures*

#### *- Fibromyalgia Impact Questionnaire (FIQ)*

The Spanish consensus version of the FIQ was used. This questionnaire assesses disability and the physical impact of the disease. It consists of 10 items, and the first (consisting of nine sub-items) focuses on the ability of patients to perform certain physical tasks. Each item is classified on a 4-point Likert scale (0-3). The next two items require the patient to

indicate the number of days in the previous week that s/he felt well and how many days in the last week s/he was unable to work because of the illness. The remaining seven (from 4 to 10) refer to the ability to work, pain, general fatigue, morning fatigue, rigidity, anxiety and depression, all measured from 0 to 10 using visual analogue scales. Higher scores indicate a higher degree of impact of the disease, and a score of 70 is considered severe. The FIQ has demonstrated good psychometric properties in the Spanish population and an internal consistency of 0.93 (17).

#### *- The Hospital Anxiety and Depression Scale (HADS)*

The HADS is a self-reported scale used to screen for the presence of anxiety and depression in people with medical illnesses. It comprises 14 items scored on 4-point Likert scales, and includes two subscales: anxiety (seven items) and depression (seven items) which are scored independently. Again, the higher the score, the greater the level of anxiety and/or depression. The HADS has been validated in the Spanish population with good internal consistency (0.83 for anxiety and 0.82 for depression) (18).

#### *- Chronic Pain Acceptance Questionnaire (CPAQ)*

Acceptance was measured with the original CPAQ using the validated Spanish version. The CPAQ measures pain acceptance as a prognosis of well-being in patients with chronic pain. It comprises two subscales: a) engagement in activities of daily life, and b) the acceptance of pain; it consists of a inventory of self-administered 20 items rated on a score of 0 (never true) to 6 (always true). The results of the two subscales are added directly and the total score ranges between 0 and 120, with higher scores indicating a higher level of pain acceptance and/or engagement in daily life activities. The CPAQ has good internal consistency, with a Cronbach's alpha of 0.78 (19).

#### *- Mindful Attention Awareness Scale (MAAS)*

Mindfulness was analysed through the original MAAS questionnaire validated

in Spanish. It is composed of a self-reported 15-item scale, which measures the construct of awareness, centered on the present, and without judging the situations experienced. There is only one factor, and the items are scored from 1 (almost always) to 6 (almost never) and are added together. The score ranges from 15 (minimum mindfulness) to 90 (maximum). In an attempt to control socially desirable responses, participants are asked to respond honestly on the basis of their experience and not according to any pre-conceptions about what they think they should answer. Cognition, emotions, physical, interpersonal and general domains are evaluated. The validated Spanish version of the MAAS has high internal consistency, with a Cronbach's alpha of 0.85 (20).

#### - Positive and Negative Affect Scale (PANAS)

A validated Spanish version of the PANAS was used in this study. The PANAS is a brief measure of positive (e.g. "enthusiastic"), and negative (e.g. "distressed") affect. It consists of two mood scales with 10 items each, for the evaluation of positive affect and negative affect. The scores for each item on a 5-point Likert scale range from 1 (very slightly or not at all) to 5 (very much/extremely). Positive affect is obtained by adding the odd items, and the negative affect by adding the even items, and the scores of both affects are obtained by adding the numbers assigned to the 10 items on each of the two scales. Higher scores indicate higher levels of positive/negative affect. The Spanish PANAS questionnaire has shown good psychometric properties with Cronbach's alphas of 0.86 to 0.90 for positive affect and 0.84 to 0.87 for negative affect (21).

#### - Pain Catastrophising Scale (PCS)

Catastrophising was assessed with the PCS in its validated Spanish version. The PCS comprises 13 self-administered items divided into three subscales that assess rumination (four items), magnification (three) and helplessness (six). Items are rated in relation to their frequency of respondents' feelings and thoughts related to pain, and are valued

on a 5-point Likert scale from 0 (never) to 4 (all the time). The three subscales are added together and the total score ranges from 0 to 52, with higher scores corresponding to a greater frequency and intensity of negative thoughts and feelings regarding pain. The Spanish version of the PCS has demonstrated good psychometric properties in FM patients, with a Cronbach's alpha for the total scale of 0.87 (22).

#### - Pain Self Perception Scale (PSPS)

Surrender was measured with the PSPS in the validated Spanish version. This self-administered questionnaire consists of 24 items (statements) that measure the self-processing of the thoughts and feelings that may be experienced during an episode of intense pain. Answers are measured using a 5-point Likert scale, between 0 (minimum intensity) and 4 (maximum intensity). The global scale is the only factor, and there are no subfactors. The questionnaire scores range from 0 to 96. This questionnaire has excellent internal consistency, with a Cronbach's alpha coefficient of 0.98 (23).

#### - Psychological Inflexibility in Pain Scale (PIPS)

Psychological inflexibility was assessed using the Spanish PIPS. This self-administered 12-item questionnaire contains two main domains: avoidance (eight items) and cognitive fusion (four); both measure the inability to maintain values in the presence of unpleasant thoughts, emotions, and physical symptoms. The statements are scored on a 7-point Likert scale ranging from 1 (never true) to 7 (always true). The total score for the scale adds together the 12 items and thus ranges between 12 and 84, with higher scores indicating greater psychological inflexibility in the face of pain. Its psychometric properties are considered adequate. PIPS has good internal consistency, measured by Cronbach alphas of 0.75 (cognitive fusion), 0.90 (avoidance) and 0.89 (total scale) (24).

#### - Injustice Experience Questionnaire (IEQ)

Perceived injustice was measured using the validated Spanish version of

the IEQ, which reliably measures how a traumatic situation affects people's lives. This questionnaire contains 12 items, with two subscales of severity/irreparability (six items) and fault/injustice (six) on a 5-point Likert scale, from 0 (none at all) to 4 (all the time). The total score ranges between 0 and 48. The psychometric properties of the IEQ were considered adequate for use in this study, and the coefficient Cronbach alpha for the total IEQ was 0.92 (25).

#### Statistical analysis

All statistical analyses were performed using SPSS v. 21.0 (IBM Corp., Armonk, NY, USA). Firstly, a descriptive study was carried out to establish the sample characteristics and to test the psychological variables for statistical normality. Means and standard deviations of each variable were calculated at baseline. The Chi-square test was used to determine the relationship between qualitative and categorical variables. The Student t-test or analysis of variance (ANOVA) was used, if the quantitative variable met the assumption of normality. Normality was established through the Kolmogorov-Smirnov test, and the non-parametric Mann-Whitney U-test or Kruskal-Wallis test were used in case of non-normality. Pearson's correlation analysis was used to examine relationships between quantitative variables. The psychological variables that showed significant correlation with disability and distress were then selected for the subsequent multiple stepwise regression analysis. Two-sided significance tests with  $p$ -values  $<0.05$  were considered statistically significant.

## Results

### Participants' characteristics

Descriptive analysis, clinical characteristics and comorbid health conditions of the sample are presented in Table I. Of the 251 patients enrolled, 241 were women (96.02%) and 10 men (3.98%). The entire sample was analysed and the descriptive data were reported for the global and subscale scores of each questionnaire. Anxiety and depression assessed using the HADS were considered as dependent variables. The mean age of the participants at enrollment

**Table I.** Baseline demographic and clinical characteristics of the sample (n=251).

Variable	n (%)*
Gender	
Male	10 (3.9)
Female	241 (96.1)
Age at enrollment (years)	52.4 ± 8.03
Current smoker	70 (27.9)
Ex-smoker (≥1 year)	50 (19.9)
Non-smoker	131 (52.2)
Marital status	
Married/living with partner	185 (73.7)
Single	23 (9.2)
Separated/divorced	32 (12.8)
Widow/er	11 (4.3)
Place of residence	
Zaragoza	221 (88.1)
Huesca	20 (7.9)
Teruel	10 (3.9)
Living arrangements	
Lives alone	28 (11.2)
Lives with partner/spouse	80 (31.8)
Lives with partner/spouse and children	119 (47.4)
Lives with other family	10 (3.9)
Other	14 (5.6)
Education	
No qualifications	8 (3.2)
Finished primary school	116 (46.2)
Finished secondary school	95 (37.8)
University graduate	32 (12.8)
Employment	
Homemaker	32 (12.7)
Unemployed	38 (15.1)
Employed	63 (25.1)
Sick leave	31 (12.3)
Retired	34 (13.5)
Disabled	53 (21.1)
Illness duration at diagnosis (years)	10.2 ± 9.3
Illness duration at time of inclusion (years)	18.3 ± 11.1
Comorbid conditions	
Chronic neck pain	238 (94.8)
Low back pain	230 (91.6)
Vision problems (dry eyes)	223 (88.8)
Anxiety	205 (81.7)
Headaches/migraine	193 (76.9)
Irritable Bowel Syndrome	187 (74.5)
Depression	175 (69.7)
Menopause	169 (67.3)
Osteoarthritis	153 (60.9)
Rheumatoid arthritis	61 (24.3)

\*All data, except for age at enrollment and illness duration (shown as mean ± SD), are presented as numbers (percentages) of subjects.

was 52.4±8.03 years [95% CI: 51.34-53.45]. In all, 82.9% of the patients lived in Zaragoza and 11.2% in Teruel (capital or province). As for living arrangements, 73.71% were married or with a partner and almost half (47.41%)

**Table II.** Descriptive statistics of the instruments and their subscales used to measure the psychological variables among participants.

Measures	median, min.-max.	mean ± SD	95% CI
PCS	24, 0-52	24.2 ± 13.6	[22.5-25.9]
Rumination	8, 0-17	8.4 ± 4.7	[7.8-9.0]
Magnification	4, 0-12	4.5 ± 3.2	[4.1-4.9]
Helplessness	11, 0-24	11.2 ± 6.9	[10.4-12.1]
CPAQ	45, 0-110	47.6 ± 23.4	[44.7-50.5]
Activity engagement	24, 0-66	26.3 ± 15.0	[24.4-28.2]
Pain willingness	19, 0-54	21.2 ± 11.4	[19.8-22.6]
PSPS	46, 0-96	48.4 ± 32.5	[44.3-52.5]
MAAS	57, 18-90	56.6 ± 17.5	[54.4-58.8]
IEQ	31, 0-48	30.1 ± 12.1	[28.6-61.6]
PIPS	60, 12-84	57.0 ± 18.2	[54.8-59.3]
Avoidance	37, 8-56	36.0 ± 14.0	[34.3-37.8]
Cognitive fusion	22, 4-28	21.0 ± 5.7	[20.2-21.7]
Global HADS	19, 0-40	18.4 ± 8.7	[17.3-19.5]
Anxiety	11, 0-21	10.7 ± 4.9	[10.1-11.3]
Depression	7, 0-20	7.7 ± 4.6	[7.1-8.2]
FIQ	60, 17-87	58.0 ± 15.0	[56.1-59.9]
PANAS +	25, 10-66	25.1 ± 8.4	[24.0-26.2]
PANAS -	24, 10-47	24.0 ± 8.9	[22.9-25.1]

PCS: pain catastrophising scale; CPAQ: chronic pain acceptance questionnaire; PSPS: pain self-perception scale; MAAS: mindful attention awareness scale; IEQ: injustice experience questionnaire; PIPS: psychological inflexibility of pain scale; HADS: hospital anxiety and depression scale; FIQ: fibromyalgia impact questionnaire; PANAS: positive and negative affect scale. The number of valid subjects completing the questionnaires is 248-251.

lived in their own home with their partner and/or children. The majority had finished primary and secondary education (84%). As regards employment, 25.1% were working, 21.12% were permanently disabled and 12.35% were on sick leave. The mean length of time from onset of symptoms until the time of inclusion was 18.3±11.1 years. The most prevalent comorbidities associated with FM were of rheumatological origin (Table I).

The descriptive statistics of the instruments used to measure the psychological variables evaluated in our study are shown in Table II.

*Correlations analyses*

The most statistically significant correlations between the psychological variables and functional disability, stress, anxiety and depression are shown. As shown in Table III, surrender ( $r=0.720$ ,  $p=0.000004$ ), and negative affect ( $r=0.723$ ,  $p=0.000007$ ) presented most positive associations with emotional impact or distress (assessed by overall HADS). Depression was most negatively associated with positive affect ( $r=-0.705$ ,  $p=0.000008$ ). The results showed that all the psychological variables presented significant positive

and negative correlations (all  $p$ -values <0.0001).

*Regression analyses*

In the linear regression analysis, the dependent variables were the physical and emotional impact and the independent variables were psychological variables in the sample. The physical and emotional impact on patients with FM presented significant correlations with all the psychological variables analysed. These results were used as the basis for two regression analyses, which included the physical and emotional impact as criterion variables, and the psychological variables mentioned as explanatory variables. Acceptance, positive affect, injustice, negative affect and mindfulness were part of the final explanatory model, explaining 51% of the variance of the physical impact of FM (Table IV). Mindfulness, catastrophising and negative affect remained in the final model, explaining 59% of the variance in anxiety (Table V). Surrender, acceptance, mindfulness and injustice, as well as positive affect and negative affect, entered the explanatory model explaining 70% of the variance in depression (Table V). At the level of emotional impact or

**Table III.** Pearson's correlation analysis between psychological variables and physical status, distress, and anxiety and depression.

Measures	FIQ	Global HADS	Anxiety	Depression
PCS	0.586	0.665	0.604	0.605
PSPS	0.583	0.720	0.622	0.690
CPAQ	-0.579	-0.640	-0.500	-0.669
MAAS	-0.471	-0.620	-0.591	-0.534
PIPS	0.549	0.661	0.546	0.660
IEQ	0.586	0.678	0.566	0.671
PANAS +	-0.538	-0.663	-0.505	-0.705
PANAS -	0.580	0.723	0.691	0.621

PCS: pain catastrophising scale; CPAQ: chronic pain acceptance questionnaire; PSPS: pain self-perception scale; MAAS: mindful attention awareness scale; IEQ: injustice experience questionnaire; PIPS: psychological inflexibility of pain scale; HADS: hospital anxiety and depression scale; FIQ: fibromyalgia impact questionnaire; PANAS: positive and negative affect scale.

All values are shown as correlation coefficient (r); *p*-values <0.0001 in all the variables analysed.

**Table IV.** Multiple regression analysis (stepwise method) of psychological variables on physical impact as dependent variable in the sample.

Model	R	R <sup>2</sup>	R <sup>2</sup> adjusted	ESE	F-change	g11	g12	<i>p</i> -value
1	.593 <sup>a</sup>	.351	.349	12.216	130.565	1	241	.0001**
2	.667 <sup>b</sup>	.445	.441	11.320	40.679	1	240	.0001**
3	.693 <sup>c</sup>	.481	.474	10.975	16.315	1	239	.0001**
4	.706 <sup>d</sup>	.499	.490	10.807	8.500	1	238	.004*
5	.715 <sup>e</sup>	.511	.501	10.695	6.007	1	237	.015*

a, b, c, d and e are predictive variables, constant; a: acceptance; b: acceptance, negative affect; c: acceptance, negative affect, perceived injustice; d: acceptance, negative affect, perceived injustice, positive affect; e: acceptance, negative affect, perceived injustice, positive affect, mindfulness.

ESE: estimated standard error.

\**p*<.01; \*\**p*<.001.

**Table V.** Multiple regression analysis (stepwise method) of psychological variables on anxiety, depression and emotional distress (total HADS) as dependent variables in the sample.

Model	R	R <sup>2</sup>	R <sup>2</sup> adjusted	ESE	F-change	g11	g12	<i>p</i> -value
3	0.774 <sup>a</sup>	0.599	0.594	3.157	21.347	1	239	0.0001***
6	0.842 <sup>b</sup>	0.708	0.701	2.578	5.730	1	236	0.017*
6	0.870 <sup>c</sup>	0.758	0.752	4.383	4.810	1	236	0.029*

a, b, and c are predictive variables, constant.

HADS-anxiety (model 3 final): a-negative affect, mindfulness, and catastrophising; HADS-depression (model 6 final): b-positive affect, surrender, injustice, negative affect, acceptance, and mindfulness; HADS-total (model 6 final): c-negative affect, surrender, positive affect, mindfulness, injustice, and catastrophising; ESE: estimated standard error.

\**p*<0.05; \*\**p*<0.01; \*\*\**p*<0.001.

distress (overall scores of anxiety and depression), surrender, mindfulness, injustice, catastrophising, as well as positive and negative affect, all entered the explanatory model, explaining 75% of the variance in distress.

**Discussion**

The psychological variables analysed in this study showed significant correlations with the variables of physical impact or functional capacity, and also with the variables of anxiety, depression

and distress among the participants. Catastrophising, surrender, inflexibility and perceived injustice presented positive correlations with anxiety and depression. In contrast, the correlations with acceptance, mindfulness, and positive affect were negative, *i.e.* the greater the acceptance of the disease and the ability to focus on the here and now, the greater the positive affect and the lower the propensity to suffer anxiety and depression. The significant relationship found between catastrophising and

anxiety/depression symptoms indicates the construct's importance in this emotional state, and has also been reported previously by other authors both in FM patients and in other chronic pain conditions (15, 26-28). The negative effect of catastrophism on the experience of pain in our FM cohort corroborates the results of previous studies, both in relation to the pain intensity and in terms of the general impact of the problem on health and the emotional state (29-31). In agreement with previous reports of a significant association of this construct with emotional state and with positive and negative affect (13, 32-33) we found catastrophising to be positively correlated with anxiety and depression. In our study, catastrophising presented significant correlations with depression, but it did not enter the final explanatory model in the regression analysis. Therefore, while catastrophising was able to sufficiently explain or predict anxiety symptoms and their severity in these patients with FM, this was not the case for depressive symptoms. As expected, the results for surrender were similar to those for catastrophising: it was significantly associated with functional disability and the affective variables of anxiety and depression, and distress. Surrender can probably explain the variance in psychological distress and depression in FM, but it does not predict anxiety, and so its treatment schedule should include cognitive-behavioral therapy. Very few studies to date have analyzed this psychological variable in FM. In our study, higher rates of acceptance were associated with significantly lower levels of depression, anxiety, disability and distress. Our findings are in agreement with those of previous work and with the theoretical formulations of the role of acceptance and mindfulness in reducing anxiety and depression, both in FM and in other chronic pain conditions (34). According to these theories, painful sensations must be accepted and actively addressed; patients must adapt to pain and use coping and management strategies based on their own resources, within the processes of secondary evaluation (35). Our results for acceptance corroborate those of other reports (11, 33) and underline its importance in FM

patients. Patients' engagement in activities of daily life in spite of their pain, and their refusal to allow pain to limit their lives, can help to modify other constructs such as their perception of self-efficacy (that is, their ability to perform behaviors and achieve the desired results) and the perception of contingency with an internal locus of control (36). Our results stress that acceptance is a very important variable that would explain the physical functioning and depressive mood in FM patients. Mindfulness showed significant relationships with depression, anxiety, disability and distress. The more attention paid by the patient, the lower the state of depression and anxiety and the lower the functional disability. This variable entered all the explanatory models in our regression analyses. Mindfulness therapy is a third generation therapy that consists of increasing the awareness of the "here and now", self-regulating attention, and opening up to experiences without judging (37, 38). Brown and Ryan (39) reported that mindfulness can be measured in terms of its components of perception and attention and is fundamental for self-regulation and emotional experience. Mindfulness interventions in patients with pain achieve short-term improvements, enhance active coping, and promote physiological deactivation, and in the long-term, they minimise the risk of depression and reinforce coping resources (40). Other researchers have applied mindfulness in samples with chronic pain and also with FM patients (41). This variable makes an important contribution to the explanation of the physical and psychological health of FM patients. Psychological inflexibility presented associations with distress, depression, anxiety and disability, but it did not enter the final explanatory model of our regression analyses. Psychological flexibility is positively correlated with psychological wellbeing and mental health. It is composed of cognitive fusion (*i.e.* thoughts are mixed with real events) and avoidance. In our study, a correlation was found between psychological inflexibility and the functional disability associated with FM; however, it did not have any explanatory value in the

regression analysis, and so it made only a low contribution to physical and emotional functioning in this FM cohort. In patients with perceived injustice, the process of adaptation is complicated by their negative feelings and emotions; both patients and their families experience a lack of control (25). In this study we found associations with the affective variables of depression, anxiety, disability and distress; as Rodero *et al.* noted (25) a greater perception of injustice is matched by higher states of depression and anxiety, higher levels of disability, and increased distress. In our study, perceived injustice entered the explanatory model in the regression analyses and influenced functional disability and psychological distress in the study sample. Positive and negative affects are two other cognitive variables that presented associations with the above constructs and with the affective variables of depression, anxiety, disability and distress. Evidence has been reported of a relationship between chronic pain and positive and negative affect in patients with rheumatoid arthritis, in which the presence of positive affect reduced the relationship between the daily pain reported by the patient and negative affect. Managing emotional experiences requires learning the complete process of regulation and the ability to identify emotions, feel them, label them, normalise them and defines their function; this may be a protective factor for health and a psychological resource (42). Our findings demonstrate that positive and negative affects are variables with great explanatory and predictive capacity for functional and right-handed disability in FM.

#### *Strengths and limitations*

This study has three main strengths. First, the psychological variables assessed were related to variables of physical impact or functional capacity and to variables of anxiety, depression and distress. Second, all the psychological variables entered the final regression model of depression, except catastrophising; however, catastrophising emerged as one of the explanatory variables of anxiety, along with negative affect and mindfulness. Third, with regard to

physical and emotional impact, positive affect and negative affect, mindfulness, and injustice all made substantial contributions. The study's main limitations are its correlational cross-sectional design; an experimental or a longitudinal design would have been better suited to reaching a consensus on the acceptance of FM. Other limitations include the absence of a control group and the use of performance-based instruments alone, it would have been useful to apply a validated and reliable tool such as the Polysymptomatic Distress Scale to measure disease severity. More research is now needed on the construction of strengths, virtues and competences that increase patients' positive emotions and quality of life and help them to learn to cope with this debilitating disease.

#### **Conclusions**

Although more research is needed to further refine the psychological factors and their physical and emotional impact in FM, we believe that this study represents an important step forward in the development of psychological assessment and its association with physical symptoms and emotional distress as a way to improve the quality of life of FM patients. The findings may open up interesting avenues for personalised neuropsychological therapy in individuals with FM.

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#### **Key messages**

- Although some physiological factors may act as predisposing conditions, the exact aetiology of FM remains unknown.
- Negative affect, catastrophising, surrender, inflexibility, and perceived injustice are associated with symptoms of anxiety/depression in FM.
- Psychological interventions may constitute a beneficial complement that improves symptoms and health-related quality of life in these patients.

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