



# Catastrophizing, Acceptance, and Coping as Mediators Between Pain and Emotional Distress and Disability in Fibromyalgia

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## Abstract

Catastrophizing, acceptance, and coping have an important predictive value in chronic pain; however, it is not known which of these variables has the greatest contribution in fibromyalgia (FM). This study explored the mediating role of catastrophizing, acceptance, and coping in the relationship between pain and emotional distress/disability in a FM sample. Ninety-two FM patients and 51 healthy participants controls were evaluated on pain- and psychological-related variables. Catastrophizing, acceptance, behavioral coping, and emotional coping were significantly correlated with emotional distress and/or disability. Catastrophizing had a significant effect as a mediator on the relationship between pain and depression/anxiety. The current management of FM could improve by including cognitive techniques aimed at modifying the negative appraisal of pain.

**Keywords** Fibromyalgia · Pain · Catastrophizing · Acceptance · Coping

## Introduction

The American College of Rheumatology (ACR) defines Fibromyalgia (FM) as a condition characterized by widespread musculoskeletal pain for at least 3 months and pain on pressure in at least 11 of the 18 tender points (Wolfe et al., 1990). In addition to pain, FM patients also experience other disturbing symptoms such as fatigue, unrefreshed sleep, muscle weakness, irritable bowel syndrome, nervousness, depression, and cognitive/memory problems (Wolfe et al., 2010). FM has a negative impact on patients' quality of life (Pereira & Vázquez, 2012) and is associated with substantial impairments in functional status and mental and physical health (Wolfe, Walitt, Katz, & Häuser, 2014). The prevalence of FM is estimated to be 2–5% of the population and is predominantly among women (Serber, Cronan, & Walen, 2003).

Although the etiology of FM is still unknown, evidence suggests that genetic, biological, and environmental factors are involved in its development and maintenance (see Stisi et al., 2008, for a review). It is widely accepted that cognitive, affective, and behavioral variables are related to adjustment and well-being in several chronic musculoskeletal conditions, including FM (Keefe, Rumble, Scipio, Giordano, & Perri, 2004; Leeuw et al., 2007; Vlaeyen & Linton, 2012). For instance, Keefe et al. (2004) highlighted the relevance of factors that increase pain, psychological distress, and physical impairment (e.g., catastrophizing, pain-related anxiety/fear, and helplessness) and factors that decrease them (e.g., coping strategies, self-efficacy, readiness to change, and acceptance). Numerous experimental and clinical studies have shown the contribution of variables such as pain catastrophizing, pain acceptance, and coping style associated with the experience of chronic pain (for a review, see Peres & Luchetti, 2010; Quartana, Campbell, & Edwards, 2009; and Thompson & McCracken, 2011, respectively).

Some of the aforementioned variables have been considered in the fear-avoidance model of chronic musculoskeletal pain (Vlaeyen & Linton, 2000). This is the leading paradigm to understanding disability in pain conditions, and there is a large body of empirical evidence supporting its basic assumptions (for a review, see Leeuw et al., 2007; Vlaeyen & Linton, 2012). According to this model, in people who experience pain the tendency to appraise pain and

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its consequences in a catastrophic way gives rise to pain-related fear. This fear leads to excessive vigilance of bodily symptoms, and to the avoidance of behaviors/activities that are believed increase pain. These processes lead to deterioration of the muscular system, problems in executing daily life activities, and development of depression. All this exacerbates the pain experience, establishing a feedback loop between pain and fear-avoidance. This theoretical approach is open to additional refinements that may strengthen its validity. For example, recently, the incorporation into the model of the priority of goals and self-regulatory processes has been proposed (Crombez, Eccleston, van Damme, Vlaeyen, & Karoly, 2012) and the consideration of multiple pathways related to the development of pain-related disability has been suggested (Wideman et al., 2013). In addition to pain catastrophizing, pain acceptance and coping style may also be relevant mediators between pain experience and emotional distress (anxiety and depression)/disability.

Pain-related catastrophizing is characterized as an exaggerated and negative appraisal which is activated during actual or anticipated painful experiences, such as “I can’t stand the pain anymore” (Sullivan et al., 2001) and it is associated with the idea of pain as threatening. Although this construct shares variance with negative affectivity and cognitive-affective variables related to pain, the unique influence of catastrophizing on the pain experience is widely recognized (Quartana et al., 2009). In several chronic pain syndromes, catastrophizing has been related to disability (Picavet, Vlaeyen, & Schouten, 2002), negative mood (Grant, Long, & Willms, 2002), pain severity, affective distress, pain-related disability, poor outcome of treatment (Edwards, Bingham, Bathon, & Haythornthwaite, 2006a), lower self-efficacy concerning ability to function physically and to cope with symptoms (Sánchez, Martínez, Miró, & Medina, 2011) and an increased risk of suicide ideation (Edwards, Smith, Kudel, & Haythornthwaite, 2006b).

Acceptance of pain is defined as a willingness to live with pain with no need to reduce, avoid or try to change it (McCracken, 1999). This construct includes two aspects: activity engagement, that is, continuing life activities regardless of pain, and pain willingness, defined as experiencing pain without efforts to avoid or control it (McCracken, Vowles, & Eccleston, 2004). Acceptance has been associated with less pain, disability, depression, pain-related anxiety (McCracken & Eccleston, 2003), and pain catastrophizing (Boer, Steinhagen, Versteegen, Struys, & Sanderman, 2014), along with better functioning (Esteve, Ramírez-Maestre, & López5 Martínez, 2007), more activity (Gyurcsik, Brawley, Spink, Glazebrook, & Anderson, 2011), increased positive affect, reduced negative affect (Kranz, Bollinger, & Nilges, 2010) and greater success at living according to personal values (McCracken & Yang, 2006) in several musculoskeletal pain conditions.

Coping strategies are the cognitive and behavioral efforts of individuals to achieve control and manage the situation that has been evaluated as a physical or emotional threat (Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1986). Chronic pain and FM patients have shown a greater tendency to use passive coping strategies such as avoidance of pain experience/movements and escape from pain as well as more emotional expression as a way of coping compared to healthy controls (Ablin, Cohen, Neumann, Kaplan, & Buskila, 2008; Amir et al., 2000; McInnis, Mathesona, & Anisman, 2014). Studies carried out with these patients have identified passive behavioral coping as a predictor of disability, and passive cognitive coping as a predictor of depression (Samwel, Evers, Crul, & Kraaimaat, 2006). An avoidance-oriented coping style has been found to negatively impact pain intensity (Cui, Matsushima, Aso, Masuda, & Makita, 2009). Emotion-focused coping has been found to contribute negatively to mental and general health functioning (Boehm, Eisenberg, & Lampel, 2011); however, coping variables seem to be context specific (Smith & Wallston, 1996).

To date, few studies have simultaneously analyzed the role of these psychological variables in chronic pain patient samples but none in those with fibromyalgia. Some studies have compared the influence of catastrophizing and acceptance on the pain experience. Nicholas and Asghari (2006) found that in patients with persistent pain, catastrophizing was a significant predictor of pain intensity and depression and a lack of activity engagement was a significant predictor of physical disability and depression; this component of pain acceptance significantly contributed to depression when the effects of age, pain intensity, physical disability, fear of movement/(re) injury, and catastrophizing were controlled. In chronic pain patients, Esteve et al. (2007) observed that pain acceptance was associated with functional status through decreased functional impairment, passive coping was associated with emotional distress, with catastrophizing significantly effecting pain intensity and anxiety. In patients who completed an interdisciplinary pain treatment program, Vowles, McCracken, and Eccleston (2007) found that after controlling for changes in pain intensity, changes in both catastrophizing and acceptance were associated with improvement. In patients with chronic pain, Vowles, McCracken, and Eccleston (2008) showed that acceptance partially mediated the effects of catastrophizing across depression, pain-related fear, and disability. In a study of experimentally induced ischemic pain in patients with chronic back pain, Richardson et al. (2009) observed that catastrophizing, but not acceptance, was a significant predictor of depressive symptoms and sensory and present pain intensity ratings after controlling for the contribution of age, education, pain duration, and baseline chronic pain intensity. Later, Richardson et al. (2010) reported that catastrophizing and low pain willingness were significant predictors of self-reported pain interference, but only low pain willingness significantly

predicted task interference during induced pain, when demographic and pain variables were controlled. The low pain willingness is understood as the tendency to avoid the experience of pain.

Some studies have also compared the impact of acceptance and coping on the pain experience. McCracken and Eccleston (2006) studied chronic pain patients and found that acceptance variables were stronger predictors of distress and disability than coping variables. In patients with chronic pain, McCracken, Vowles, and Gauntlett-Gilbert (2007) observed that pain control-oriented coping significantly contributed to disability, depression, pain, avoidance, and sit-to-stand performance; by contrast, activity persistence was a significant predictor of uptime, pain-related anxiety, and avoidance. In FM patients, Rodero et al. (2011) found that several components of coping and acceptance were significant predictors of emotional distress and functioning but acceptance accounted for more variance than coping.

Although these studies represent an important contribution to the analysis of these psychological responses (catastrophizing, acceptance, and coping), there is disagreement about which one has a greater weight in adjustment/maladjustment to chronic pain. None of the previous studies jointly examined the value of these psychological responses (except Esteve et al., 2007) and all of them included mixed samples of patients with chronic pain or pain conditions other than FM (except Rodero et al., 2011).

To the best of our knowledge, the current study is the first to explore the predictive value of these psychological variables considered together in the affective distress and functioning of FM patients. To broaden previous research, this cross-sectional study was designed to examine the following specific hypothesis: (1) FM patients will show greater pain, emotional distress, pain-related catastrophic appraisal, avoidant coping style as well as less acceptance of pain experience than the healthy group; (2) FM patients will show significant correlation between pain, catastrophizing, acceptance, avoidant coping style, emotional distress, and disability; (3) in FM patients, the relationship between pain and emotional distress and disability will be mediated by the person's interpretation of pain as threatening (catastrophizing), the openness to the experience of pain (acceptance) and the avoidant style of coping. Hypothesis 1 was considered a preliminary step for the subsequent exploration of hypotheses 2 and 3.

## Method

### Participants and Design

Ninety-two FM patients (80 women and 12 men) and 51 healthy participants controls (39 women and 12 men) were

included in this study. The clinical group was recruited from several FM associations in Malaga, Seville, and Granada and from the Rheumatology Service and the Pain Unit of Virgen de las Nieves University Hospital in Granada, Spain. The centers were invited to participate in research aimed at analyzing how FM affects perceived health status and the relationship between psychological variables and distressing symptoms. The inclusion criteria were as follows: (1) being aged from 18 to 65 years old; (2) having been diagnosed with FM according to the ACR criteria (Wolfe et al., 1990); (3) being free of any severe psychological disorders and (4) being free of other significant medical diseases. The diagnosis of FM for the patients of the Hospital was verified by a rheumatologist of this center. In the case of the FM associations the patients reported the diagnosis of FM via a medical report issued by a rheumatologist.

A total of 120 FM women were contacted via a telephone call to invite them to participate in the study and to complete a brief eligibility screening. Of these patients, 103 eligible patients participated in the psychological assessment (including interviews and questionnaires). As 7 participants did not meet the criteria to collaborate in the study, and 4 did not return the questionnaires, the final sample was composed of 92 participants. Two semi-structured 1-h individual interviews were conducted with each FM participant to obtain socio-demographic data and psychological clinical information. After the interviews, participants were given a booklet of questionnaires that had to be completed individually at home and delivered in no more than 1 week. It took about 1 h to fill in the booklet.

FM patients had a mean age of 50.21 years ( $SD = 8.15$ ) and most were married (81.7%). Twenty-nine percent of these participants had elementary education, 23.7% had secondary education and 36.6% had professional training or university education. More than half of the patients were not working at the time (24.7% unemployed, 15.1% retired, and 22.6% on sick leave). The average time from FM diagnosis was 6.58 years ( $SD = 5.22$ ) but the mean duration of symptoms reported was 10.5 years ( $SD = 9.55$ ). In this group, 53.6% of participants selected the category poor or bad in the question about their state of health. Eighty-nine percent of patients were receiving pharmacological treatment, but none were received services from a psychologist or psychological therapy.

The healthy control group was recruited randomly from non-healthcare community settings (e.g., students' families, associations of housewives or trades workers) through an informal network and compared to the FM patient group in the main socio-demographic variables. The inclusion criteria for this group were being between 18 and 65 years old and being free of pain conditions and other important medical or psychological diseases. A total of 80 participants were invited to participate in a study about the relationship

between perceived health status and pain-related behaviors and attitudes. A researcher contacted the participants and explained to them the objective of the study, the requirements for participation, and handed them the same booklet of questionnaires as the clinical group (also including questions about socio-demographic and health data) with the aim of comparing the levels of cognitive-affective variables of pain between both groups. The participants were not interviewed. Of these, 14 declined to participate, 9 did not return the booklet, and 6 were excluded for failing to meet eligibility criteria, so the health sample was composed of 51 participants. Healthy group had a mean age of 48.12 (SD = 8.97) and most of them were married (70.6%), had professional training or university education (52.8%) and had an active job status (84.3%). In this group, 67.5% of the participants reported good health status.

All participants signed informed consent for their questionnaire data to be used for research purposes. The study was approved by the Ethics Committee for Human Research of the University of Granada.

## Measures

### Short-Form McGill Pain Questionnaire (SF-MPQ; Melzack, 1987)

This questionnaire assesses pain experience with 15 descriptive items (11 sensory and 4 affective descriptors) rated on a scale from 0 (no) to 3 (severe). Pain intensity during the previous week was assessed with a visual analogue scale (from 1—no pain—to 10—extreme pain), and pain intensity at the time of the test was rated on a scale from 0 (no pain) to 5 (excruciating). The lowest and highest possible score for the sensory scale is 0–33; the affective scale is 0–12, and the total scale is 0–45. The Spanish version has shown adequate concurrent validity (Lázaro et al., 2001) and internal consistency (Masedo & Esteve, 2000). In the present study, the sensory-affective scale of pain experience was used, and the Cronbach's alpha in this sample was good ( $\alpha = .92$ ).

### Pain Catastrophizing Scale (PCS; Sullivan, Bishop, & Pivik, 1995)

This 13-item self-report evaluates three aspects of catastrophic appraisal: magnification (3 items, e.g., "I become afraid that the pain will get worse" and "I keep thinking of over painful events"), rumination (4 items, e.g., "I anxiously want the pain to go away" and "I can't seem to keep it out of my mind"), and helplessness (6 items, e.g., "I feel I can't go on" and "It's terrible and I think it's never going to get any better"). The items are rated on a scale from 0 (*not at all*) to 4 (*all the time*), and the total scale scores range from 0 to 52 (high scores indicating high pain catastrophizing).

The Spanish version has shown good internal consistency, test–retest reliability and sensitivity to change (García-Campayo et al., 2008), and in the present study the values were as follows: total scale ( $\alpha = .95$ ), rumination ( $\alpha = .90$ ), magnification ( $\alpha = .80$ ), and helplessness ( $\alpha = .92$ ).

### Chronic Pain Acceptance Questionnaire (CPAQ; McCracken et al., 2004)

This 20-item self-report assesses two aspects of acceptance of pain during the last 2 weeks: activity engagement (11 items, e.g., "I am getting on with the business of living no matter what my level of pain is" and "Although things have changed, I am living a normal life despite my chronic pain") and pain willingness (9 items with inverted punctuation, e.g., "I would gladly sacrifice important things in my life to control this pain better" and "My thoughts and feelings about pain must change before I can take important steps in my life"). The items are rated on a scale from 0 (*never true*) to 6 (*always true*), with total scale range from 0 to 120, with higher scores indicating greater acceptance and willingness to experience pain. Scores on the activity engagement subscale range from 0 to 66, and on the pain willingness subscale from 0 to 54. The Spanish version has shown adequate test–retest reliability, internal consistency, and construct validity (Rodero et al., 2010).

### Cope-Dispositional Questionnaire (Carver, Scheier, & Weintraub, 1989)

This is a 60-item questionnaire that assesses coping style. The items are rated on a scale from 1 (*never or almost never*) to 4 (*very usual*). The Spanish adaptation (Crespo and Cruzado 1997) includes six subscales: behavioral problem-focused coping (11 items; scores range from 11 to 44, e.g., "I try to grow as a person as a result of the experience" and "I make a plan of action"), cognitive problem-focused coping (15 items; scores range from 15 to 60; e.g., "I laugh about the situation" and "I get used to the idea that it happened"), coping of emotions (12 items; scores range from 12 to 48; e.g., "I get upset and let my emotions out" and "I try to get advice from someone about what to do"), behavioral avoidance (7 items; scores range from 7 to 28; e.g., "I turn to work or other substitute activities to take my mind off things" and "I go to movies or watch TV, to think about it less"), cognitive avoidance (11 items; scores range from 11 to 44, e.g., "I say to myself "this isn't real" and "I daydream about things other than this""), and alcohol/drug use (4 items; scores range from 4 to 16; e.g., "I use alcohol or drugs to make myself feel better"). High scores on these subscales indicate greater use of the particular coping style. The Spanish version has shown good internal consistency and test–retest reliability in most subscales (Crespo and Cruzado 1997).



### Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983)

The HADS is a 14-item inventory designed to screen depression (7 items, e.g., “I still enjoy the things I used to enjoy” and “I feel cheerful”) and anxiety symptoms (7 items, “I feel tense or wound up” and “Worrying thoughts go through my mind”) in non-psychiatric hospital contexts. The items are rated on a scale from 0 to 3 and each subscale range from 0 to 21. Cut-off scores for the original versions are as follows: scores up to 7 are “normal,” from 8 to 10 refers to “doubtful clinical problems,” and over 11, suggest “clinical problems.” The Spanish version has shown good internal consistency and external validity with adequate sensitivity and specificity (Herrero et al., 2003).

### Fibromyalgia Impact Questionnaire (FIQ; Burckhardt, Clark, & Bennett, 1991)

This 10-item self-report evaluates the current health status of FM patients based on their functional capacity for daily living, days they felt well/unable to work, and other clinical manifestations. Item 1 evaluates daily functioning through several questions as “Have you been able to do the shopping in the last week?” with a scale that ranges from 0 (*always*) to 3 (*never*). Item 2 asks about “How many days in the past week you feel well?” in a scale that ranges from 0 to 7 days. Item 3 asks about “How many days in the past week you could not do your job as always?” rating from 0 to 7 days. Items from 4 to 10 evaluate symptoms such as “pain, fatigue, nervous or depressive,” with an answer range from 0 (*nothing*) to 10 (*very much*). The total score ranges from 0 to 94. The Spanish version has shown good test–retest correlations, internal consistency, validity, and sensitivity to change (Rivera & González, 2004).

Healthy participants were instructed to respond to the PCS and the CPAQ considering the thoughts and feelings that they have when they are in pain (e.g., headaches, tooth pain, joint, or muscle pain).

### Data Analyses

All statistical analyses were performed with SPSS 18.0 software (SPSS Inc., Chicago, IL, USA), and SPSS macro for multiple mediation (<http://www.quantpsy.org>). An alpha level of .05 was used as the critical level of significance. The minimum required sample size for comparison analyses was 26 participants in each group, considering an alpha level of .05, a desired statistical power level of .80, and an anticipated effect size of 0.8 (large). The minimum required sample size for regression analyses in mediation models

was 76 patients with FM, given an alpha level of .05, three mediators, a desired statistical power level of .80, and an anticipated effect size of .15 (medium).

Student *t* tests were computed to identify differences between FM and control groups. Cohen’s *d* was used to examine effect sizes, which refers to the magnitude of the standardized difference. Pearson’s correlation coefficients were performed to analyze the relationships between variables in the FM group. A multiple mediation model was tested in the clinical group with catastrophizing, acceptance, and coping as mediators of the effect of pain on depression, anxiety, and FM impact. Mediation processes consider the direct effect, the indirect effect, and the total effect (Preacher & Hayes, 2008). We calculated the direct effect of the *X* variable on the *Y* variable (*c'* path) and the specific indirect effects of *X* on *Y* through each *M* mediator (*ab* paths). Path *a* represents the effect of *X* on the proposed mediator, whereas path *b* is the effect of *M* on *Y* controlling the effect of *X*. Lastly, we determined the total effect of *X* on *Y* (*c* path), which is the sum of the direct effect and specific indirect effects (Preacher & Hayes, 2008). The paths were quantified with unstandardized regression coefficients (*B*) because in causal modeling these coefficients are the preferred metric and standardized coefficients are considered uninterpretable in this type of analysis. To test the significance of the indirect effects, bias-corrected (BC), and bias-corrected and accelerated (BCa) bootstrap confidence intervals (CIs) were computed following the procedures recommended by Preacher and Hayes (2008). The bootstrap estimates were based on 5000 bootstrap samples and a 95% CI was used.

## Results

### Comparative Analysis

No significant differences were found between the FM and control groups in age or level of education ( $t_{141} = 1.42$  and  $\chi^2_5 = 16.14$ , respectively,  $p > .06$ ), but significant differences were found in job status ( $\chi^2_4 = 31.07$ ,  $p < .01$ ). Neither no significant differences were found between men and women in the FM group ( $t_{86}$  between  $-2.14$  and  $0.44$ ,  $p > .10$ ) or in the control group ( $t_{48}$  between  $-1.93$  and  $0.48$ ,  $p > .09$ ) among the variables evaluated. The only exception was the scale of alcohol/drug use, in which men in the FM and control groups had higher scores than women ( $t_{91} = 4.46$  and  $t_{48} = 2.97$ ,  $p < .01$ ). Thus, women and men were analyzed together in the control and FM groups.

Table 1 shows the comparisons between FM patients and healthy participants on the clinical variables. The FM group reported significantly higher scores in pain, anxiety, and depression than the control group. While depression and anxiety scores in the FM group were significantly

higher than in the healthy group, the score did not reach clinical significance. Results on the impact of FM showed considerable impairment in the FM group. The FM group showed significantly higher mean scores in pain catastrophizing and significantly lower mean scores in pain acceptance than the control group. No differences were found between groups on coping styles, except for alcohol/drug use, where FM patients obtained lower mean scores than control participants.

### Correlation Analysis

Correlation analyses were calculated for all the variables evaluated (see Table 2). Significant correlations were observed between pain and depression, anxiety, and FM impact. Likewise, pain was significantly correlated with catastrophizing; however, no significant correlations were found between pain and acceptance or between pain and coping styles. Depression, anxiety, and FM impact showed

significant positive correlations with catastrophizing, and significant negative correlations with acceptance. Regarding coping styles, only significant correlations were observed between depression and behavioral coping and between anxiety and emotional coping and behavioral coping. Likewise, significant negative correlations were observed between pain acceptance (activity engagement, pain willingness, and total) and pain catastrophizing (subscales and total scores). Regarding coping styles, emotional coping, and cognitive avoidance significantly correlated with pain catastrophizing (subscales and total), while behavioral coping correlated negatively with pain magnification, rumination, and total pain catastrophizing. Emotional coping showed significant negative correlation with pain willingness, and cognitive coping showed positive correlation with activity engagement.

### Mediators in the Relationship Between Pain and Depression

Figure 1 shows the effect of pain on depression through pain catastrophizing, pain acceptance, and behavioral coping as proposed mediators. Significant total and direct effects of pain on depression were found ( $t=2.64$ ,  $p<.01$  and  $2.05$ ,  $p<.05$ , respectively). A significant effect of pain on catastrophizing ( $t=2.03$ ,  $p<.05$ ) was also observed, although the effect of pain on acceptance or behavioral coping was not significant ( $t=-1.43$  and  $.19$ ,  $p>.15$ , respectively). The effects of the proposed mediators catastrophizing and behavioral coping on depression were significant ( $t=2.95$ ,  $p<.01$  and  $-2.81$ ,  $p<.05$ , respectively), but the effect of acceptance on depression was not ( $t=-1.64$ ,  $p=.10$ ). The model explained 36.12% of the variance in depression ( $F_{4,76}=12.31$ ,  $p<.01$ ). Table 3 summarizes the point estimate and 95% CIs (BC and BCa). When the 95% CI for the estimates of the mediation effect does not include zero, the mediation effect is considered significant at the .05 level. Pain had an indirect effect on depression through the mediator catastrophizing, but not through acceptance or behavioral coping.

### Mediators in the Relationship Between Pain and Anxiety

The mediating role of pain catastrophizing, pain acceptance, and emotional coping in the relationship between pain and anxiety was examined (see Fig. 2). The total effect of pain on anxiety was significant ( $t=2.10$ ,  $p<.05$ ). A significant contribution of pain on catastrophizing ( $t=2.03$ ,  $p<.05$ ) and catastrophizing on anxiety ( $t=2.26$ ,  $p<.01$ ) was observed. No significant effects of pain on acceptance or emotional coping ( $t=-1.43$  and  $1.45$ ,  $p>.15$ , respectively) were found. Finally, significant effects of acceptance

**Table 1** Comparative analysis between FM and healthy groups in the clinical variables

Variables	FM group ( $n=92$ ) M (SD)	Healthy group ( $n=51$ ) M (SD)	$t$	$d^a$
SF-MPQ (pain)	19.55 (9.30)	2.82 (5.25)	11.18**	2.29
HADS (emotional distress)				
Depression	9.87 (4.48)	3.66 (3.46)	8.50**	1.66
Anxiety	10.45 (4.21)	5.90 (4.05)	6.17**	1.09
FIQ (FM impact)	58.86 (16.32)	–	–	–
PCS (pain catastrophizing)				
Rumination	8.04 (4.33)	5.61 (4.58)	3.11**	.54
Magnification	4.72 (2.89)	2.90 (2.99)	3.43**	.62
Helplessness	11.00 (6.01)	4.88 (4.75)	6.18**	1.14
PCS-total	23.75 (12.34)	13.47 (11.33)	4.84**	.87
CPAQ (pain acceptance)				
Activity engagement	30.12 (15.71)	38.33 (12.65)	-2.91**	-.58
Pain willingness	23.97 (10.32)	29.29 (14.39)	-2.41*	-.43
CPAQ-total	53.04 (20.49)	65.15 (19.92)	-3.13**	-.60
COPE (coping style)				
Behavioral coping	29.38 (7.73)	31.22 (5.61)	-1.82	
Cognitive coping	33.85 (6.78)	33.61 (7.12)	.20	
Emotional coping	28.90 (7.73)	28.94 (8.57)	-.03	
Behavioral avoidance	18.71 (2.69)	18.86 (3.61)	-.27	
Cognitive avoidance	20.01 (5.02)	19.32 (5.41)	.93	
Alcohol/drugs use	4.11 (.74)	4.55 (1.53)	-2.31*	-.39

\* $p<.05$ , \*\* $p<.01$

<sup>a</sup>Cohen's  $d$ =effect size

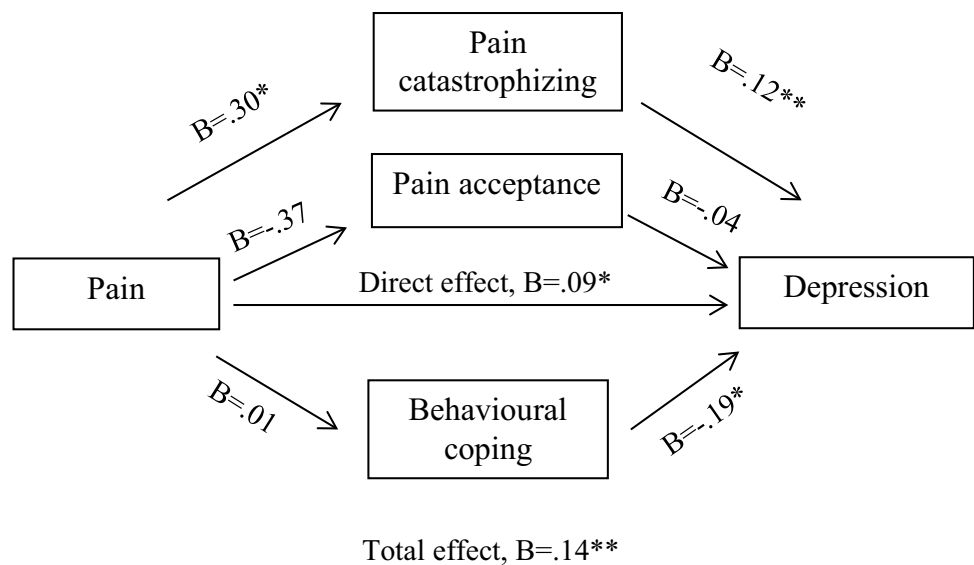
**Table 2** Correlations between the variables included in the study for the FM group

Variables	SF-MPQ (Pain)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
HADS-Depression		–															
HADS-Anxiety	.33**																
FIQ-Impact	.29**	.72**															
PCS-Rumination	.42**	.30**	.39**														
PCS-Helplessness	.25*	.46**	.44**	.26*													
PCS-Magnification	.32**	.56**	.49**	.34**	.82*												
PCS-Total	.26**	.46**	.53**	.29**	.76*	.79**											
CPAQ-Pain willingness	.31**	.54**	.52**	.33**	.93**	.96**	.88**										
CPAQ-Activity engagement	–.11	–.38**	–.34**	–.25*	–.44**	–.50**	–.37**	–.45**									
CPAQ-Total	–.17	–.31**	–.36**	–.36**	–.40**	–.44**	–.28**	–.42**	.06								
COPE-Behavioral coping	–.19	–.44**	–.44**	–.37**	–.52**	–.46**	–.52**	–.55**	.78**	.59**							
COPE-Cognitive coping	–.04	–.37**	–.27**	–.11	–.25*	–.14	–.23*	–.23*	–.002	.19	.15						
COPE-Emotional coping	.11	–.17	–.16	–.01	–.04	–.002	.01	–.01	–.13	.30**	.17	.39**					
COPE-Behavioral avoidance	.18	.20	.31**	.17	.30**	.30**	.27**	.31**	–.28**	.07	–.13	.22*	.23*				
COPE-Cognitive avoidance	–.20	–.02	.03	–.15	–.06	–.11	–.09	–.09	.13	–.08	.02	–.30**	–.15	–.03			
COPE-Alcohol/drugs use	.01	–.02	.07	–.12	.26*	.21*	.21*	.24*	–.08	.07	–.04	.12	.34**	.37**	–.03		
CPAQ-Chronic Pain	–.06	–.01	.14	–.20	–.002	.03	–.02	.02	–.06	.16	.10	–.09	.11	–.08	.12	.02	

SF-MPQ Short-form McGill Pain Questionnaire, HADS Hospital Anxiety and Depression Scale, FIQ Fibromyalgia Impact Questionnaire, PCS Pain Catastrophizing Scale, CPAQ Chronic Pain Acceptance Questionnaire, COPE Dispositional Questionnaire

\* $p < .05$ , \*\* $p < .01$

**Fig. 1** Multiple mediation model of the relationship between pain and depression. \* $p < .05$ , \*\* $p < .01$



**Table 3** Mediations of the effect of pain on depression, anxiety, and FM impact

	Point estimate	BC 95% CI		BCa 95% CI	
		Lower	Upper	Lower	Upper
<b>Bootstrapping</b>					
<b>Mediators between pain and depression</b>					
Indirect effects					
Total	.49	-.01	.13	-.01	.12
Pain catastrophizing	.04	.01	.09	.01	.09
Pain acceptance	.01	-.01	.05	-.01	.05
Behavioral coping	-.01	-.04	.02	-.04	.02
<b>Mediators between pain and anxiety</b>					
Indirect effects					
Total	.06	.01	.13	.01	.12
Pain Catastrophizing	.03	.01	.09	.01	.09
Pain acceptance	.02	-.01	.06	-.01	.06
Emotional coping	.01	-.01	.05	-.01	.05
<b>Mediators between pain and FM impact</b>					
Indirect effects					
Total	.13	-.01	.30	.01	.29
Pain catastrophizing	.04	-.06	.24	-.06	.24
Pain acceptance	.09	-.01	.31	-.01	.29

The point estimate is the indirect effect calculated in the original samples

CI Confidence interval, BC bias corrected, BCa bias corrected and accelerated

on anxiety ( $t = -2.09, p < .05$ ) and non-significant effects of emotional coping on anxiety ( $t = 1.85, p = .07$ ) were found. In this model, the direct effect of pain on anxiety was not

significant ( $t = 1.05, p = .29$ ), so the total effect was mainly due to the influence of catastrophizing as a mediator. The model accounted for 28.12% of the variance in anxiety ( $F_{4,76} = 8.82, p < .01$ ). The indirect effect of pain on anxiety, with catastrophizing as a mediator, was significant (see Table 3), indicating that catastrophizing mediated the influence of pain on anxiety, but acceptance and emotional coping did not.

### Mediators in the Relationship Between Pain and FM Impact

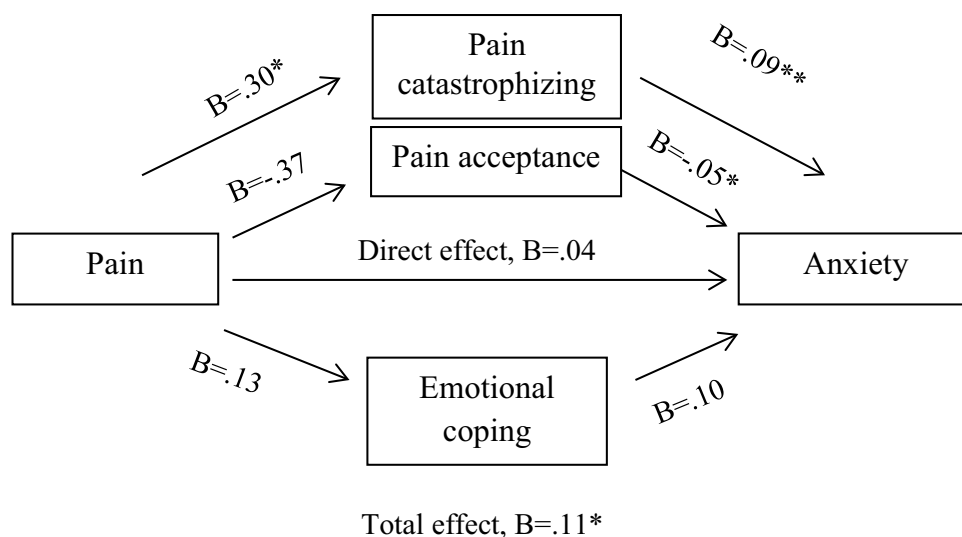
Pain catastrophizing and pain acceptance were evaluated as mediators of the effect of pain on FM impact (functional impact of FM on the person) (see Fig. 3). The total and direct effects of pain on FM impact were significant ( $t = 3.68$  and  $3.14, p < .01$ , respectively). The effect of pain on catastrophizing was significant ( $t = 2.03, p < .05$ ) but the effect of catastrophizing on FM impact was not ( $t = .79, p = .43$ ). Moreover, the effect of pain on acceptance was not significant ( $t = -1.43, p = .15$ ) but the effect of pain acceptance on FM impact was significant ( $t = -2.58, p < .05$ ). The model explained 24.62% of the variance in FM impact ( $F_{3,77} = 9.71, p < .01$ ). The indirect effects in this model were not significant (see Table 3). Neither catastrophizing nor acceptance were significant mediators of the effect of pain on FM impact.

### Discussion

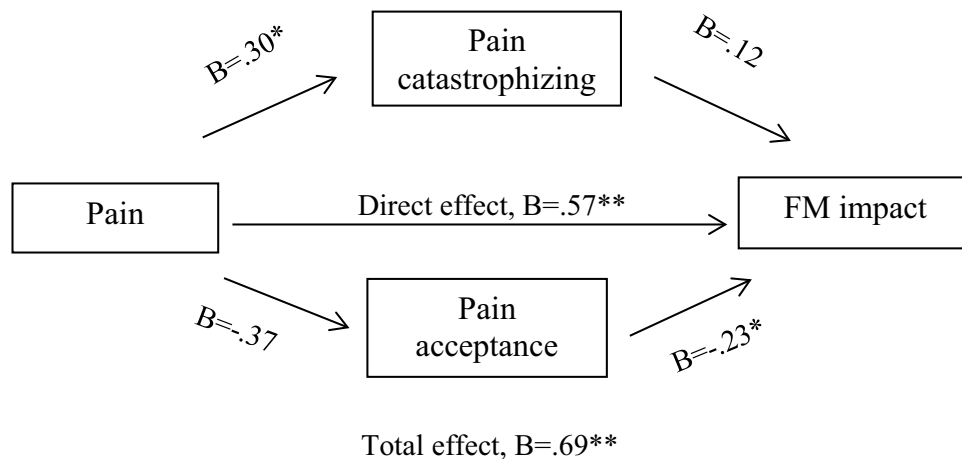
Although pain catastrophizing, pain acceptance, and coping style have been shown to have a role in the pain experience, it was not exactly known how these variables contributed



**Fig. 2** Multiple mediation model of the relationship between pain and anxiety.  
\* $p < .05$ , \*\* $p < .01$



**Fig. 3** Multiple mediation model of the relationship between pain and FM impact.  
\* $p < .05$ , \*\* $p < .01$



to adjustment to pain in a FM population. The aim of this study was to explore the relationship between pain, affective distress, and impairment in FM patients, considering the potential mediating role of catastrophizing, acceptance, and coping.

As expected, FM patients showed significantly higher levels of pain, depression, anxiety, and pain catastrophizing than control participants. However, the clinical group reported significantly lower levels of acceptance of pain than the healthy group. These results are consistent with previous research (Geisser et al., 2003; Gormsen, Rosenberg, Bach, & Jensen, 2010) finding no differences in coping strategies between FM patients and healthy controls (McInnis, Matheson, & Anisman, 2014; Raak, Hurtig, & Wahren, 2003). The results also revealed differences between groups on the alcohol/drug use subscale but not in behavioral, cognitive, and emotional coping or behavioral and cognitive avoidance. The results differ from others who found avoidant coping strategies to be used by those with FM (Ablyn et al., 2008;

Amir et al., 2000). These differences may be due to the use of different coping instruments in the present and comparison studies described above.

Secondly, the relationships between clinical measures in the FM group were examined. Significant correlations were found between pain and anxiety, depression, and FM impact. In addition, pain catastrophization was correlated with higher levels of pain, emotional distress, and disability, findings that are widely recognized in chronic pain patients (Grant et al., 2002; Keefe et al., 2004; Picavent et al., 2002; Quartana et al., 2009). Additionally, results revealed that acceptance of living with pain without reducing, avoiding, or trying to change it was associated with less depression, anxiety, and impairment, and these findings are similar to those reported in previous research (Keefe et al., 2004; Kohl, Rief, & Glombiewski, 2014; Kranz et al., 2010; McCracken & Eccleston, 2003; Thompson & McCracken, 2011). It should be noted that pain did not significantly correlate with pain acceptance (pain willingness or activity engagement). This

result is consistent with other studies (Esteve et al., 2007; Nicholas & Asghari, 2006; Richardson et al., 2009) that have not shown acceptance to be a significant predictor of pain intensity. In addition, the present study found that behavioral coping was associated with a lower level of depression and anxiety while emotional coping was associated with a higher level of anxiety. By contrast, none of the coping styles were related to pain experience or disability. These findings are consistent with previous reports that have shown that problem-focused coping, regarding a behavioral approach to the problem, is related to better psychological functioning (Peres & Lucchetti, 2010), and emotional-focused coping is related to worse mental health (Boehm et al., 2011) in chronic pain population.

Lastly, several mediator models were tested to explore how pain affects emotional distress and functioning of FM patients through specific mediators. In the first model higher catastrophizing and lower coping behavior significantly contributed to depression, however, only catastrophizing was identified as a significant mediator between pain and depression. In the second model higher catastrophizing and lower acceptance significantly contributed to anxiety, but only catastrophizing played a significant mediator role between pain and anxiety. This model did not show a significant direct effect of pain on anxiety. Therefore, the impact of the pain experience on this negative emotion is due to the mediators, particularly catastrophizing. In the third model, acceptance but not catastrophizing had a significant influence on disability. However, none of these variables were significant mediators in the relationship between pain and FM impact.

The only previous research that has compared the influence of pain-related cognitions, acceptance, and coping on adjustment to chronic pain is the study by Esteve et al. (2007). These authors found that pain acceptance significantly influenced functional status and decreased functional impairment; passive coping had a significant effect on emotional distress, and catastrophizing significantly determined pain intensity and anxiety. They also found that catastrophizing had indirect effects on depression and functional impairment due to the mediating role of pain intensity. Our results partially agree with these findings. However, the present study differs from that of Esteve et al. in some methodological aspects. The mentioned study (Esteve et al., 2007) was performed with a mixed sample of chronic pain patients (the inclusion criterion was the experience of pain for at least 6 months), structural equation modeling, and different self-report measures.

The mediating role of pain catastrophizing between pain experience and emotional distress identified in the current study reveals that appraisal of pain as threatening could be more important than pain per se. The findings also suggest that catastrophizing has a greater weight than other psychological variables such as acceptance or behavioral/emotional

coping. Catastrophizing is a key construct in several theoretical approaches to chronic pain, such as the fear-avoidance model of chronic musculoskeletal pain (Leeuw et al., 2007; Vlaeyen & Linton, 2012). The current study provides additional evidence of the validity of this model (Cook, Brawer, & Vowles, 2006; Kamper et al., 2012; Martínez, Sánchez, Miró, Medina, & Lami, 2011) and underlines the crucial role played by catastrophizing as a precursor of the dysfunctional responses to painful stimuli. Several studies have shown that catastrophizing appears to affect the neurophysiological pathways compromised in the pain experience by amplifying the pain-related cortical activation, interfering with the optimal functioning of the endogenous opioid pain-control system and activating systemic inflammatory processes (see the review by Campbell & Edwards, 2009). Although the influence of catastrophizing on pain experience is well accepted, more research is needed in order to define the function of this variable compared to others such as self-efficacy and sleep quality that have been shown to play a mediating role in the relationship between pain and several manifestations of FM (Miró, Martínez, Sánchez, Prados, & Medina, 2011).

The present study highlights the importance of assessing catastrophizing appraisal and promoting more functional cognitions associated with pain in order to reduce emotional suffering in FM patients. Cognitive restructuring techniques aimed at replacing catastrophic thoughts about pain with more realistic appraisals (e.g., “I can’t stand this pain” becomes “I don’t like this pain”) is one approach that might serve to interrupt the fear-avoidance cycle. Alternatively, based on psychological flexibility model (McCracken & Morley, 2014), catastrophizing appraisal might be managed through defusion and perspective taking. If one has a tendency to over identify with one’s thoughts, thus amplifying them, being able to look at them rather than from them could promote a greater willingness to live with/experience pain without trying to reduce, avoid or change it. Future research will have to examine the clinical utility of addressing pain catastrophizing in FM from these therapeutic perspectives.

Although some approaches consider that catastrophizing and acceptance are complementary and other approaches consider them as antagonistic constructs, FM patients are likely to benefit from interventions that address both psychological variables. For example, it has been suggested that an intervention could focus on decreasing or accepting of emotional distress depending on the type of affective experience. Experiencing and expressing secondary emotions such as depression or anxiety may exacerbate pain, thus therapies aimed at reducing them are preferred. However, the awareness and expression of primary adaptive emotions such as sadness or fear may reduce pain and interventions like mindfulness may be advisable (Lumley et al., 2011). Recent studies

(Veehof, Oskam, Shreurs, & Bohlmeijer, 2011; Wetherell et al., 2011) have shown that both interventions have similar benefits in chronic pain patients. Therefore, a comprehensive therapeutic approach that combines some effective therapeutic strategies from CBT and ACT according to the clinical profile of patients and according to a theoretical consistency may be a desirable option.

The present study has some limitations. The data were based on a cross-sectional design, so it is not possible to establish cause and effect between the variables. FM patients were recruited from different care settings. Also, these participants were not in psychological treatment at time of the study, so the results could be generalizable only to this group of patients. Pain experience was evaluated via a self-report and it would have been preferable to complete these data with objective measures such as a pressure algometer. The influence in emotional distress and disability of FM patients of other potential mediators such as neuroticism, self-efficacy beliefs and sleep disturbances was not explored. Besides pain itself, the possibility that other psychological variables can explain the differences in emotional distress between FM and healthy controls was not examined. Although the mediator variables examined (catastrophizing, acceptance and coping) refer to theoretically different constructs, they may show some degree of overlap, and such multicollinearity may have attenuated the specific indirect effects of acceptance and coping.

In conclusion, the present research provides greater understanding of the connections between psychological parameters involved in the experience of FM patients. The findings revealed that pain catastrophizing mediates the relationship between pain and depression/anxiety and that although neither pain acceptance nor coping style play a mediator role in these relationships, both contribute to emotional distress or disability. Future research analyzing alternative paths and mediators is needed to improve our understanding of FM.

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## Compliance with Ethical Standards

**Conflict of interest** María J. Lami, M. Pilar Martínez, Elena Miró, Ana I. Sánchez, and Manuel A. Guzmán declare that they do not have conflict of interest.

**Human and Animal Rights** All procedures performed in this study involving human participants were done in accordance with the ethical standards of the University of Florida and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Informed Consent** Informed consent was obtained from all individual participants included in the study.

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