Emotional regulation processes: influence on pain and disability in fibromyalgia patients

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ABSTRACT

Objective. *Fibromyalgia (FM) is a chronic syndrome characterised by widespread musculoskeletal pain associated with other symptoms, including psychological distress. While negative mood (anxiety, depression, and anger) has been widely explored in FM, few studies have investigated emotional dysregulation. Our purpose was to evaluate problems in the processes of emotional regulation and to explore their influence on the severity of pain and disability.*

Methods. *Emotional regulations, anxiety, depression, anger, pain and disability were evaluated in 47 FM patients and 47 healthy subjects. Regression analyses were performed to evaluate the role that emotional regulation processes have on pain severity and disability of FM patients.*

Results. *The results showed that although FM patients do not differ in terms of the attention paid to their emotional states, FM patients had greater difficulties in the emotional regulation process. In addition, emotional rejection and interference are two variables that influence the pain severity and disability.*

Conclusion. *FM patients need to be trained in strategies for regulating their emotions, in order to achieve a reduction in negative mood states, as well as their impact in pain and disability.*

Introduction

Fibromyalgia (FM) is a chronic syndrome characterised by widespread musculoskeletal pain with specific regions of localised tenderness, in the absence of apparent organic disease to justify it (1). FM occurs in all populations across the world and can affect all ages, particularly within 40–49 years (2). Symptom prevalence ranges between 2% and 4% in the general population and with the new criteria, without tender point examination, the female-to-male ratio is 1-2:1 (3, 4). In addition, FM patients are likely to have more comorbidities, poorer health status, and lower productivity and generate higher costs compared with other chronic widespread pain conditions, so nowadays it is an important health problem (2, 5).

In 2010, the American College of Rheumatology (ACR) adopted new criteria for the diagnostic of FM, where is not require counts of the number of tender points, although a full physical examination is still recommended. Besides widespread pain, the new criteria require assessing the severity of problems of sleep and fatigue, the presence of somatic symptoms (*i.e.* headaches, swelling/tingling, etc.), as well as cognitive difficulties (*i.e.* memory, attention, etc.) and psychological aspects such as anxiety and depression (6).

In this sense, currently, there is a large series of studies in the literature that point out the high presence of anxiety and sadness in these patients, compared to both healthy individuals and those with other chronic musculoskeletal disorder (7-9). In addition, approximately 30% have a comorbid disorder of anxiety and depression (10). Fewer studies have focused on anger, and those that do report a tendency among these patients to experience frequent feelings of anger, as well as a tendency to suppress them (11), even to a greater extent than the general population (12-13).

There is consensus not only on the high rate of negative mood states in FM patients, but also on their ability to predict higher levels of pain and disability (14) due to a lower threshold for tolerating pain and the effects of the physiological activation associated with these emotions (15-17).

Due to the presence of negative mood states in FM patients and their detrimental effect on pain and disability, it is important to explore how these emotions

are regulated among these patients (18). Emotional regulation may be conceptualised as the involvement of the following: (a) awareness and understanding of emotions; (b) emotional acceptance; (c) the ability to control impulsive behaviours and behave according to the desired goals when experiencing negative emotions; and (d) the ability to use emotional regulation strategies that suit the situation and are flexible for modulating emotional responses, according with personal goals or desires and the demands of the situation. The absence of one or more of these skills or processes may signal the presence of difficulties in emotional regulation, or emotional dysregulation (19).

A recent systematic review focusing on patients with chronic pain highlights the scarce knowledge about how emotion regulation styles influence pain and pain-related disability (20). Among the studies reviewed, some studies focused on antecedent emotion regulation which implies the use of strategies such as suppression or cognitive reappraisal, found an indirect relationship between difficulties in emotional regulation processes and pain, mediated by other psychological factors like depression (21), while others studies found out a direct association with the use of maladaptive response-focused strategies of emotional regulation such as expressive suppression with chronic pain, disability, and symptoms of depression (18, 22).

Regarding FM patients, research has recently started to consider variables related to emotional management processes, although these have largely focused on alexithymia (23). Several studies report accordingly that patients with FM manifest high levels of alexithymia (24, 25), which suggests the presence of an emotional awareness deficit compared to healthy controls and patients with other chronic musculoskeletal disorder such as rheumatoid arthritis (12, 26-28). However, it cannot be affirmed that a personality pattern in fibromyalgia stable and widespread exists, because a recent review shows that, when depression is controlled, the levels of alexithymia and type D personality do not differ from those of healthy controls. (29).

Van Middendorp *et al.* (13) have explicitly assessed the strategies used to regulate emotions in FM patients, and how these variables are related to the condition's symptoms. This study reveals that emotions such as sadness or anger and the strategies for regulating them, either of approach (*e.g.* emotional processing or expression) or avoidance (alexithymia or suppression), play a significant role in maintaining and exacerbating the symptoms of FM. These authors also report the high frequency of negative emotions and the use of emotional avoidance strategies, and while these strategies are related to mental discomfort and are moderately correlated with greater perception of pain and fatigue, the intensity of the emotional experience is only associated with greater pain perceived in patients with a low ability to process or describe emotions. Moreover, Geenen *et al.* (18) point out that in women with FM and who experience their emotions intensely, the use of strategies like emotional expression or disclosure interventions can be beneficial and reduce the impact of the disease.

Therefore, it is essential to identify how FM patients regulate their emotions and what influence they have on pain and disability processes, due to the high frequency of negative emotions in FM patients, as well as the fact these constitute one of the psychological variables that most often impact upon chronic pain processes, aggravates main symptoms, worsening both its prognosis and evolution (28).

The purpose of the study was to evaluate the difficulties in emotion regulation processes in FM patients and to explore the influence of these difficulties on the severity of chronic pain and disability in these patients.

Methods
Setting
The study was conducted in accordance with the Declaration of Helsinki and Good Clinical Practice and was approved by the Ethics Committee at Camilo José Cela University.

The FM sample was recruited through two associations: the Fibromyalgia and Chronic Fatigue Syndrome Association "AFYNSIFACRO" in Móstoles (Madrid) and the Valencia Fibromyalgia Sufferers Association "AVAFI" in Valencia.

Study design, patient sample and data collection
A cross-sectional study was performed. This study has involved an overall sample of 94 participants divided into two groups, one of FM patients and a control group of healthy participants (CG). The following criteria were used for inclusion in the FM group: 1) more than 18 years, 2) diagnosed with FM by a specialist according to ACR criteria, 3) not having serious neurocognitive problems, and 4) being able to provide informed consent.

Almost the same criteria were used for inclusion in the CG, with the exception that these individuals could not have been diagnosed with a disease of chronic pain disorder.

Eligible participants gave their written informed consent to participate in the study. Their questionnaires were coded so that anonymity was guaranteed at all times.

All study subjects participated voluntarily and signed an informed consent. The assessment involved completing the demographic and clinical data and four psychological questionnaires lasting around 30 minutes. The FM associations conducted a group assessment, and the same researcher attended all the sessions to avoid any possible biases. Regarding the CG, the procedure for gathering the sample was conducted on an incidental basis, requesting the collaboration of healthy men and women that met the inclusion criteria, and who were similar to the group of FM patients as regards the main sociodemographic characteristics involved (sex and age).

Variables
We registered gender; age; marital status; educational level; clinical characteristics of the patients: diagnosis of FM, date of onset of first symptoms, date of medical diagnosis, medication prescribed, and significant comorbid mental health disorders.

We collect the other variables using the following questionnaires:

Difficulties in Emotion Regulation Scale-DERS (30, 31). It assesses different aspects of emotional dysregulation through 28 items using a five-point Likert scale. The five subscales that make up the Spanish version of the DERS are as follows:

- Lack of emotional control: feeling of being overwhelmed by the intensity of emotions and a sense of persistence of negative emotional mood states;
- Emotional rejection: an individual's tendency not to accept reactions that make them feel uncomfortable;
- Life interference: difficulty in concentrating or performing tasks when experiencing negative emotional mood states;
- Lack emotional attention: lack of attention or awareness regarding emotional responses; and
- Emotional confusion: assessing the degree to which someone is aware of and clear about the emotions they are experiencing. Reliability as internal consistency, estimated through Cronbach's alpha, was adequate in all the DERS subscales α=94 in the subscales of lack of control, rejection and interference, α=0.81 in lack emotional attention, and α=0.77 on the scale of confusion.

The West Haven-Yale multidimensional pain inventory WHYMPI
The questionnaire consists of three separate sections. This study used section I in the questionnaire to assess the intensity of pain and its impact on several areas of the patient's life. This section has 20 items overall, which are distributed into six factors. In this research we took the severity of the pain as dependent variable, and the factors 'interference of pain in life' and 'interference of pain in social activities' as measures of the dependent variable of disability. The items in this questionnaire are rated on a seven-point Likert scale, and each scale in this study recorded a reliability as internal consistency of α=0.70 and α=0.72, respectively (32, 33).

Hospital anxiety and depression scale HADS
It is a self-assessment questionnaire comprising 14 items (34, 35). It has two subscales that measure the symptoms of anxiety and depression over the past week, with seven items in each one, using a Likert-type scale of 0–3. Each scale recorded internal consistency indices of α=0.90 and α=0.93, respectively.

State-trait expression of anger inventory - anger expression and anger control scales STAXI-2
It is a self-report instrument with 49 items that are answered using a four-point Likert-type scale (36, 37). This study used the scales of anger as trait -frequency of experiencing feelings of anger over time- and internal and external expression of anger -tendency with which feelings of anger are manifested. Reliability as internal consistency in this study for the scale of the anger trait was α=0.92 and α=0.77 for the scales of internal and external expression.

Statistical analyses
A description of the characteristics of sample was performed. Subsequently, for the primary aim of the study, compared the difficulties in emotional regulation processes between a group of FM patients and a CG, equal variance analyses were conducted using the Student t-test, after checking the assumption of homoscedasticity with the Levene statistic.

For the second aim, we explored the possible influence of the difficulties in the emotional regulation processes on the severity of chronic pain and disability in FM patients, a stepwise multivariate regression analysis was performed adjusted by age and sex, together with the variables that were significant in the bivariate analyses ($p<0.01$). Before the regression analyses, a check was made of the assumptions of linearity, homoscedasticity, normality and collinearity, which were verified. The statistical analyses were conducted using SPSS v. 23.0 software.

Results
Sample characteristics
The FM group was composed of 47 patients (44 women and three men) and a

Table I. Sociodemographic and clinical characteristics.

Characteristics	GC n=47	FM n=47	t	X^2/F	p
Sex:					
Women, n (%)	44 (93.61)	44 (93.61)		72.53	.97
Age, M (SD)	50.55 (8.78)	50.53 (10.14)	.11		.99
Marital status, n (%):				1.07	.28
Single	1 (2.12)	3 (6.38)			
Married	40 (85.10)	34 (72.34)			
Separated	6 (12.76)	10 (21.27)			
Education, n (%):				36.14	.00**
Without studies	–	1 (2.12)			
Primary school	5 (10.63)	23 (48.93)			
Secondary school	11 (23.40)	15 (31.91)			
University studies	31 (65.95)	8 (17.02)			
Employment, n (%):				13.91	.00**
Unemployed	11 (23.40)	18 (38.29)			
Employment	34 (72.34)	9 (19.14)			
Retired	1 (2.12)	7 (14.89)			
Sick leave	1 (2.12)	13 (27.65)			
Treatments, n (%):					
Pharmacological	–	43 (91.48)			
Psychological	–	17 (36.17)			
Health problems comorbidity, n (%):					
Rheumatoid arthritis	–	9 (19.14)			
Other musculoskeletal conditions	–	21 (44.68)			
Digestive problems	–	6 (12.76)			

CG: control group; FM: fibromyalgia group; SD: standard deviation.
Other musculoskeletal conditions: arthritis, osteoporosis, neck pain and chronic fatigue syndrome.
**$p<.01$.

mean age of 50.53 (10.14) years. The CG consisted of 47 participants (44 women and 3 men), and a mean age of 50.55 (8.78) years.

Table I shows the sociodemographic and clinical characteristics of both groups of participants. The results record statistically significant differences ($p<0.01$) between the CG and the FM group in terms of level of education and employment status. Most of the patients with FM had primary studies (48.93%) and were unemployed (38.29%), on sick leave (14.89%), or retired (27.65%); in the other hand, for the HC, most of the participants had high-level education (65.95%) and were active workers (72.34%). Nevertheless, both samples are similar in age, sex, and married status ($p>0.01$).

Regarding the clinical characteristics of our FM sample, most of the patients (91.48%) received medication. In addition, 44% report having musculoskeletal comorbidities (arthritis, osteoporosis, neck pain, and chronic fatigue syndrome), and 19% report a comorbid diagnosis of rheumatoid arthritis (Table I).

Differences between the two groups in emotion regulation processes
Firstly, when the difficulties in emotional regulation processes were compared between the two groups the results reveal statistically significant differences in the subscales of emotional lack of control, rejection, interference, and confusion ($p<0.01$), as well as in the overall questionnaire). The FM patients had greater difficulties in the emotional regulation process compared to the CG (Table II).

FM patients differed from the CG regarding both the symptoms of anxiety ($p<0.01$); and depression ($p<0.01$), recording higher levels. Assessing anger, the results show that FM patients recorded high levels of the anger trait, as well as a greater expression of the same, both externally and internally, compared to the HC ($p<0.01$ and $p<0.05$).

Influence of difficulties in emotional regulation processes on pain and disability
After acknowledging the presence of negative emotions in the sample of FM

Table II. Differences in psychological measures between fibromyalgia group and control group.

Measure	Range	CG n=47	FM n=47			
		M (SD)	M (SD)	t	p	d
Total DERS	(28-140)	46.87 (10.89)	83.0 (22.56)	9.90	.00**	2.04
Lack of control	(9-45)	12.26 (3.59)	25.17 (9.81)	8.47	.00**	1.80
Emotional rejection	(7-35)	10.87 (3.69)	21.21 (8.80)	7.42	.00**	1.53
Life interference	(4-20)	7.47 (2.86)	16.40 (3.65)	13.19	.00**	2.72
Lack emotional attention	(4-20)	10.06 (3.42)	10.43 (4.03)	.46	.32	__
Emotional confusion	(4-20)	6.21 (1.87)	9.79 (3.83)	5.73	.00**	1.20
Anxiety (HADS)	(0-21)	5.06 (3.37)	12.96 (4.23)	9.90	.00**	2.07
Depression (HADS)	(0-21)	1.96 (2.22)	10.72 (4.38)	12.27	.00**	2.52
Trait Anger (STAXI)	(10-40)	18.36 (4.91)	25.81 (7.75)	5.56	.00**	1.15
Anger-out	(6-24)	10.09 (2.87)	11.77 (3.81)	2.41	.02*	.50
Anger-in	(6-24)	10.77 (3.27)	14.32 (3.96)	4.73	.00**	1.00

DERS: difficulties in emotion regulation scale; HADS: hospital anxiety and depression scale; STAXI: state-trait expression of anger inventory - anger expression and anger control scale; CG: control group; FM: fibromyalgia group; Range: range of minimum and maximum scores of the questionnaires; M: mean; SD: standard deviations.
*$p<0.05$; **$p<0.01$.

Table III. Regression model for severity of chronic pain.

Model	B	SE(B)	β	t	p	R²	R²corr
Constant	3.47	.79		4.35	.00**	.36	.30
Age	-.00	.01	-.05	-.41	.68		
Sex (women)	-.61	.46	-.17	-1.33	.18		
Emotional Rejection	.04	.02	.38	2.50	.02*		
Life Interference	.08	.03	.34	2.36	.02*		

Fibromyalgia group (n=47); B: non-standardised coefficient; SE (B): standard error B; β: standardised coefficient; t: statistical constant; R²: determination coefficient; R²corr: adjusted determination coefficient.
*$p<0.05$; **$p<0.01$.

Table IV. Regression model for pain interference in social activities.

Model	B	SE (B)	β	t	p	R²	R²corr
Constant	3.64	1.27		2.86	.01*	.35	.29
Age	-.02	.02	-.18	-1.44	.16		
Sex (women)	-1.07	.74	-.19	-1.45	.15		
Emotional Rejection	.06	.02	.37	2.41	.02*		
Life Interference	.11	.05	.30	2.05	.04*		

Fibromyalgia group (n=47); B: non-standardised coefficient; SE (B): standard error B; β= standardised coefficient; t: statistical constant; R²: determination coefficient; R²corr: adjusted determination coefficient.
*$p<0.05$; **$p<0.01$.

patients, and identifying their difficulties in emotional regulation processes, bivariate analyses were conducted and the variables that were significant or showed a trend ($p<0.1$) were used to conduct stepwise multivariate regression analyses to evaluate the influence of emotional regulation processes on these patients' pain and disability.

Table III shows the model for the dependent variable pain, adjusted by age and sex. The results reveal that the independent variables emotional rejection ($p=0.02$) and life interference ($p=0.02$), were significantly associated. The processes of emotional lack of control, neglect, and confusion were excluded of the final model.

Regarding the dependent variable disability, it was measured as interference of pain in social activities and interference of pain in daily life activities. The

Table V. Regression model for pain interference in daily life activities.

Model	B	SE (B)	β	t	p	R^2	R^2_{corr}
Constant	3.27	.84		3.86	.00**	.18	.13
Age	.01	.01	.07	.56	.57		
Sex	-.18	.46	-.05	-.39	.69		
Life interference	.09	.03	.43	3.12	.00**		

Fibromyalgia group (n=47); B: non-standardised coefficient; SE (B): standard error B; β: standardised coefficient; t: statistical constant; R^2: determination coefficient; R^2_{corr}: adjusted determination doefficient.
*p<0.05; **p<0.01.

models for these two variables are presented in Tables IV and V.

For the model of the interference of pain in social activities, adjusted by age and sex, the independent variables emotional rejection and life interference was associated (*p*<0.01), with emotional rejection being the one with the greatest weight in the prognosis (β=.37; *p*<0.05). The processes of emotional lack of control, neglect, and confusion were excluded as predictors in the final model (Table IV).

Finally, in the final model for the interference of pain in daily life activities, adjusted by age and sex, the only associated variable was life interference, (*p*<0.01) (Table V).

Discussion

This study has explored the difficulties in emotional regulation processes and their influence on the pain and disability in FM patients.

The importance of evaluating emotional regulation processes lies in the high frequency of negative emotions verified through different studies (14, 38) and their influence on the pain and disability of FM patients (39-40).

Regarding to this, a review concluded that overlapping features were highlighted between mood spectrum and fibromyalgia suggesting common underlying mechanisms at pathophysiological level involving both central nervous and the immune systems (41).

The results of this study were consistent with those in the literature that indicate that FM patients presented higher levels of symptoms of anxiety and depression compared to a control group (7, 9). In addition, it is worth mentioning that consonant with the literature, FM patients tend to experience frequent feel-

ings of anger that they suppress (internal expression) (12, 42), although they also have a greater external expression of the same compared to the CG (43). Therefore, is necessary to consider this emotion and keep it in mind in order to improve the treatment of these patients. Due to the high presence of negative emotions in FM patients compared with CG showed in the literature and in this study, we considered important to assess the possible difficulties in emotional regulation processes that could have these patients. The results indicated that although FM patients did not differ to the CG in the attention or awareness given to their mood states, they were different in relation to the feeling of being overwhelmed by emotional intensity and its persistence, in the acceptance of mood states, in the difficulty in concentrating or performing tasks when they experience negative mood states, as well as in their understanding and clarity of the emotions they experience. In other words, despite be aware in how they feel, they were unable of implementing other strategies to regulate this emotional state. These results were in line with others that found that FM patients have difficulties identifying their affective states, differentiating them from other emotions, expressing and communicating their feeling (44) and those studies that indicated that FM patients present greater alexithymia than the CG (12, 45), mainly depressed patients (29).

Furthermore, the importance of addressing emotional regulation processes in FM lied not only in the high frequency of negative mood states, but also in the influence of these processes on pain and disability. Thus, the rejection and interference of emotional states were the two difficult processes in emotional

regulation that predict and had an impact upon the severity of chronic pain and on the interference of pain in social activities. Moreover, emotional interference also predicted the greater interference of pain in daily activities. Other researchers have identified the relationship between difficulties in emotional regulation processes and greater levels of pain (46) and Van Middendorp *et al.* (13), have established a relationship among emotional avoidance strategies; for example, suppression with higher levels of pain.

These emotional regulation problems could be related to other patients concerns at a cognitive level, increasing disability burden, since it has been found that the subjective evaluation of cognitive impairment is closely and significantly related to the functional capacity of patients (47).

Due to the relation between pain and emotional responses, should be consider to included emotional regulation processes both in assessment and in care protocols, as well as of their influence in the severity of pain and disability in these patients. It is interested to point out that chronic pain treatments which have included modules on the use of emotional regulation strategies record positive results in both adults and adolescents (20). Moreover, it is important to consider studies that reveal that for individuals who carry out mood regulation strategies, pay attention to their emotions is effective, whereas for individuals with low mood regulation strategies, attention is detrimental to affective well-being (48), so FM patients should train in effective emotional regulation processes.

This research has some limitations that need to be considered. Firstly, its cross-sectional design does not permit establishing relations of causality. Secondly, regarding sample size, a larger sample of FM patients would carry more weight and enable the statistical analyses to be more generalised. Thirdly, sociodemographic and clinical data were only evaluated using self-report questionnaires and were differences in academic level between FM and HC. In addition, 19% FM patients reported a comorbid diagnosis of rheumatoid arthritis, but

it is quite difficult to find FM patients without any pain comorbid diseases or other physical diseases (4) as well as, patients who do not take any drug, so we have to assume that these are affecting the results. Also, it is important to address that men and women differ in the emotional regulation processes (49) but it is quite complicated to find an equal distribution by sex, although FM is less prevalent in men, it is important to consider them in the studies. Finally, some studies pointed out the low intercorrelation of attention subscale with the other subscales (except for clarity or confusion) (50), so the results should be interpreted with caution, although in our study this subscale had a good internal reliability.

Despite these limitations, this study provides further data on the psychological profile of this group of patients, since there is a growing awareness of the importance of the psychological factors involved in the persistence of the symptoms in FM (8). In addition, an original perspective here is the attribution of more weight to emotional regulation processes.

In conclusion, it should be necessary to assess this variables in order to design of specific care programmes, reducing the frequency of negative mood states and focusing into the emotional regulation processes (18) that involve emotional acceptance, processing and expression, with the purpose of reduce the influence of these processes have on pain and disability.

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