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Emotional intelligence impairments in women with fibromyalgia: associations with widespread pain

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This study aimed at testing differences in emotional intelligence ability between women with fibromyalgia and age-matched non-fibromyalgia control women, and analysing associations between emotional intelligence abilities and chronic widespread pain in fibromyalgia. A total of 133 women with fibromyalgia and 77 control women from the general population participated in this cross-sectional study. All participants performed the Mayer-Salovey-Caruso Emotional Intelligence Test. Women with fibromyalgia also completed the Pain Catastrophizing Scale and Widespread Pain Index. Control women outperformed women with fibromyalgia on emotion understanding. After accounting for pain catastrophizing and the remaining emotional intelligence dimensions, only emotion perception and management were significantly associated with widespread pain; β=-.24 and -.18, both *p's* ≥ .04. To conclude, women with fibromyalgia may experience difficulties in understanding emotional information. In fibromyalgia, higher emotion perception and management abilities were independently related to lower widespread pain. Experimental research addressing the causality of our findings is warranted.

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INTRODUCTION

Fibromyalgia is a chronic disease which is remarkably more common in women (Arout et al., 2018; Mas et al., 2008). Although it has well-defined criteria and is recognised as a disease by the World Health Organisation (WHO), fibromyalgia is often stigmatised by society (Briones-Vozmediano et al., 2017). Indeed, fibromyalgia is considered as a low-prestige disease (Album and Westin, 2008). A number of factors may contribute to the stigmatisation of fibromyalgia such as its heterogeneous and unpredictable symptomatology (Estévez-López et al., 2017; Vincent et al., 2016) and the absence of objective markers of the disease (Fitzcharles et al., 2014). Particularly worrisome is that the common invalidation and lack of understanding of this disease may reflect an extension of the prejudices that women have traditionally suffered from society (Briones-Vozmediano et al., 2017; Kool et al., 2009). In fact, in the literature, a negative wording has been used by for instance referring to fibromyalgia as the disease of the complaining women (Briones-Vozmediano et al., 2017).

In the earliest criteria, the diagnosis of fibromyalgia was based solely on the presence of chronic widespread musculoskeletal pain (Wolfe et al., 1990). In addition to pain, people with fibromyalgia experience an array of symptoms including, but not limited to, increased fatigue and poor mental health (Segura-Jiménez et al., 2015; Wolfe et al., 1990). The polysymptomatic nature of fibromyalgia was recognised in later updates of the original diagnostic criteria (Wolfe et al., 2016). Interestingly, only pain is included in all of the set of available criteria (Wolfe, 2017); emphasising the importance of pain in this condition. In the most updated fibromyalgia criteria, pain is identified as chronic widespread pain (Wolfe et al., 2016).

Previous research has suggested that emotions are related to pain. Early studies followed a 'which and how much' or emotional states approach, while more recently

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literature has moved to a 'how and why' or emotional processes approach (Lumley, 2010). From the latter approach, research has studied the role of specific emotional processes in the experience of pain. For instance, in comparison to non-chronic pain peers, people with chronic pain have poorer emotional awareness/appraisal (Di Tella and Castelli, 2016; Zunhammer et al., 2015). Previous studies on the impact of these emotional deficits in people with chronic pain are inconclusive (Di Tella and Castelli, 2016). A number of studies have demonstrated that maladaptive strategies of emotion regulation are related to increased pain (Baker et al., 2016), while others did not find such an association (Hamilton et al., 2007). Although some research has been conducted in people with chronic pain, there is limited work exploring the relationship between emotion and fibromyalgia. In the fibromyalgia population, we identified only one previous study in which higher anger inhibition and lower anger expression were related to more pain, which suggested a relationship between a specific emotional process (i.e., emotion regulation) and pain but this was limited to a particular emotion (i.e., anger) (van Middendorp et al., 2010).

As opposed to the study of specific emotional processes in isolation, emotional intelligence is a more comprehensive construct that jointly takes account of diverse emotional processes, which is of interest in the perception of chronic pain. Emerging evidence suggests differences between people with and without chronic pain (i.e., cases and controls, respectively) in specific dimensions, but not in general levels, of emotional intelligence (Costa, Petrides, & Tillmann, 2014). The impaired dimensions of emotional intelligence may differ across chronic pain populations. People with inflammatory diseases scored worse in well-being and sociability (Costa et al., 2014). These deficits in emotional intelligence may have an impact in people with chronic pain. For instance, higher emotional intelligence is associated with lower pain (Burri, Lachance, et al., 2015;

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Costa et al., 2017) and prevents the onset of chronic pain (Burri, Ogata, et al., 2015). Indeed, past studies concluded that emotional intelligence is more strongly related to chronic pain than genetic (Burri, Ogata, et al., 2015) or other emotional factors (Doherty et al., 2017).

Due the current state-of-the-art in the field, there are only very few studies analysing the association of either isolated emotional processes or emotional intelligence with chronic pain, which precludes to suggest conclusions. Furthermore, the co-existence of several theoretical models for studying emotional intelligence and diverse approaches for assessing emotional intelligence make difficult to compare previous studies. Overall, there are two different approaches, namely, the ability models and the mixed/trait models (Cherniss, 2010; Mayer et al., 2000). Emotional intelligence, from the ability models, is the skill to perceive and express emotion, assimilate emotion in thought, understand and reason with emotion, and regulate emotion in the self and others (John D. Mayer et al., 2016). Emotional intelligence is considered as a *hot*-type of intelligence (John D. Mayer et al., 2016) involving the management of the most significant information to a person: his/her sense of social acceptance, identity coherence, and emotional well-being. Failures in these aspects result in psychic pain, which is processed within the same brain regions that process physical pain (Eisenberger, 2015).

Although the personality and dispositional attributes, as targeted by the mixed/trait models, also contribute to reason and solve problems, they should not be confused with emotional intelligence understood as a (discrete and measurable) mental ability (John D Mayer et al., 2008). Another common caveat in the literature is to assess emotional intelligence ability by relying on self-reported assessments, which can give inaccurate results (Brackett et al., 2006) by, for example, including non-intellectual features (e.g., self-confidence, self-esteem, misunderstandings of what is involved in

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successful reasoning, or wishful thinking (John D. Mayer et al., 2016). Previous research which measured emotional intelligence as an ability, demonstrated robust associations with health (mental and physical) (Martins et al., 2010) in several environments, such as social, academic and work (John D. Mayer et al., 2008). In chronic pain, research has been focused on specific or diverse emotional processes, the latter under the umbrella term of emotional intelligence, and has always used self-reported measures and mostly from mixed/trait models. There is therefore a paucity of knowledge of the role of emotional intelligence ability in people with chronic pain. Only two previous studies assessed emotional processes with an ability measure in people with chronic pain, these studies excluded those with fibromyalgia (Doherty et al., 2017; Zunhammer et al., 2015).

Therefore, the aims of the present study were, for the first time, (i) to test differences in emotional intelligence ability between women with fibromyalgia and their age-matched non-fibromyalgia counterparts, and (ii) to analyse the association between emotional intelligence ability, as a *hot* intelligence, and widespread pain in women with fibromyalgia.

METHODS

Participants

In the present case-control cross-sectional study, we recruited people with fibromyalgia mainly from local fibromyalgia associations in southern Spain (Andalusia). Additional participants were recruited via e-mail, letter, telephone, and mass-media advertisements. We also asked people with fibromyalgia taking part in the study to recruit a pairwise non-fibromyalgia control. The inclusion criteria for fibromyalgia participants were (i) to be previously diagnosed of fibromyalgia by a rheumatologist and (ii) to meet the 1990 American College of Rheumatology (ACR) fibromyalgia criteria (Wolfe et al., 1990), as

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corroborated by the research team. The inclusion criterion for control participants was (i) to report not having fibromyalgia and (ii) not to meet the 1990 American College of Rheumatology (ACR) fibromyalgia criteria (Wolfe et al., 1990), as corroborated by the research team. A total of 220 people with fibromyalgia (i.e., cases) and 97 people without fibromyalgia (i.e., controls) showed interested in partaking in the present study. In order to match both groups, the present study only included women aged between 37 and 61 years old. All the interested participants (n = 317) gave their written informed consent after receiving detailed information about the study aims and procedures. The present study was reviewed and approved by the Ethics Committee of the *Virgen de las Nieves* Hospital (Granada, Spain). The ethical guidelines of the Declaration of Helsinki were followed.

Measures

Emotional intelligence by the Spanish adaptation of the Mayer-Salovey-Caruso Emotional Intelligence Test Version 2 (MSCEIT V2.0) (John D Mayer et al., 2016). The MSCEIT is a 141-item questionnaire assessing the abilities of (i) perceiving emotions (emotion perception), (ii) using or facilitating emotions (emotion facilitation), (iii) understanding emotions (emotion understanding), and (iv) managing or regulating emotions (emotion management). The MSCEIT asks participants to either perform or solve emotional tasks by choosing among a number of plausible solutions, each potential answer was ranked according to an expert consensus. Scores are computed as empirical percentiles (mean = 100 and standard deviation = 15) with higher scores representing higher levels of ability.

Pain catastrophizing by the Spanish adaptation of the Pain Catastrophizing Scale (PCS) (García Campayo et al., 2008). The PCS is a 13-item questionnaire in which patients are asked to reflect on past painful experiences and indicate their thoughts or feelings about

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pain, on a 5-point scale. For this study, the total score (range 0–52) was used, where higher scores represent a more negative appraisal of pain.

Widespread pain by the Spanish adaptation of the Widespread Pain Index (Segura-Jiménez et al., 2014). Participants graded whether (or not) they had pain or tenderness over the previous week in 19 body areas; i.e., shoulder girdle, hip, jaw, upper arm, upper leg, lower arm and lower leg, on the right and the left side of the body, separately, and additionally neck, chest, abdomen, upper back and lower back. The scores of this questionnaire is the total number of painful body areas, which ranges from 0 to 19.

Statistical analyses

To confirm that both fibromyalgia and control groups were age-matched, age was compared using unpaired samples *t*-test. Then, multivariate analysis of variance (MANOVA) was conducted to compare the mean scores of fibromyalgia and control groups on the MSCEIT. MANOVA allows dependent variables to be correlated and is more powerful than ANOVA for detecting group differences. One-way MANOVA was conducted on five dependent variables corresponding to the overall emotional intelligence, emotion perception, and emotion facilitation, emotion understanding and emotion management.

A set of analyses was carried out to analyse the association of emotional intelligence and widespread pain in people with fibromyalgia. First, preliminary bivariate correlations of age with widespread pain were conducted to identify their role as potential confounders. Age was not correlated with widespread pain and therefore was not included as potential confounders in the analyses; $r = .15$, $p = .133$. Second, the individual unadjusted association of emotional intelligence with widespread pain was tested by bivariate correlation. Given that pain catastrophizing may confound the associations under study (Quartana et al., 2009), in additional analyses, the individual association of emotional

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intelligence (predictor variable) with widespread pain (criterion variable) were adjusted for pain catastrophizing using separate hierarchical regression models for each variable of emotional intelligence and with *enter* methods. Finally, to test for the independent association of pain catastrophizing as well as of emotion perception, facilitation, understanding, and management with widespread pain, a linear regression model using *forward stepwise* methods was performed.

RESULTS

Figure 1 shows the flowchart of participants through the study and the characteristics of the 210 participants included in the study are presented in Table 1. Fibromyalgia (n = 133) and non-fibromyalgia (i.e., controls, n = 77) participants were matched on age; t = 1.03, p = .306.

Differences between fibromyalgia and controls in emotional intelligence

A significant effect of group emerged on emotional intelligence; V = 0.11, $F(5, 204)$ = 4.81, p = 0.001. Table 1 shows that control participants outperformed participants with fibromyalgia on emotion understanding; $F(1, 208) = 15.71$, $p < .001$, mean differences = 7.1, the effect size of the difference was medium. No between groups differences emerged on overall emotional intelligence, emotion perception, emotion facilitation and emotion management; $F(1, 208) = 1.31$, $p = .254$, $F(1, 208) = 2.64$, $p = .106$, $F(1, 208) = 0.06$, p = . 805, and $F(1, 208) = 17.71$, p = . 093, respectively.

Association of emotional intelligence and widespread pain

The bivariate correlation between emotion understanding and widespread pain was not significant; r = -.08, p = .372. However, the remaining dimensions, as well as overall emotional intelligence, significantly correlated with widespread pain; r =-.23 to -.24, all $p \leq .007$. The significance of these associations was similar on regression models when

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controlling for pain catastrophizing; Table 2. The amount of the variance of widespread pain explained by pain catastrophizing and emotional intelligence was similar; 4% and 3%, respectively. It is noteworthy that the contribution of emotional intelligence was over and above pain catastrophizing.

Table 3 shows the independent association of pain catastrophizing and the dimensions of emotional intelligence with widespread pain using forward stepwise methods. Emotion perception entered in the first step (t = 2.82, p = .006) and emotion management in the second step (t = 2.10, p = .038). Pain catastrophizing, emotion facilitation, and emotion understanding was not entered in the regression model (data not presented). Overall, the potential contribution of emotion perception and management on widespread pain was 7%.

DISCUSSION

The present case-control cross-sectional study yields three key findings. First, emotion understanding ability was worse among women with fibromyalgia (i.e., cases) than in age-matched women from the general population (i.e., controls). Second, in fibromyalgia, higher overall emotional intelligence ability and all its dimensions, except emotion understanding, were individually associated with lower widespread pain; even when taking in to account pain catastrophizing. Third, emotion perception and emotion management abilities were independently related to widespread pain; even when pain catastrophizing, emotion facilitation, and emotion understanding were accounted for.

Previous cases-controls studies suggested that people living with chronic pain have deficits in specific emotional processes (e.g., awareness/appraisal) (Di Tella and Castelli, 2016; Zunhammer et al., 2015) but not in general levels of emotional intelligence (Costa et al., 2014). Most of the previous research omitted the study of fibromyalgia (as

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a particular chronic pain-related disease), or included a mixed chronic pain sample including different diseases (Baker et al., 2016). Only one previous study in fibromyalgia (based on a mixed/trait model) showed an association of higher anger inhibition and lower anger expression with more pain in women with fibromyalgia (van Middendorp et al., 2010). In the present study and in line previous literature on chronic pain, we observed that women with fibromyalgia performed worse in emotion understanding than their age-matched non-fibromyalgia counterparts, but not in general emotional intelligence. Emotion understanding, along with emotion management, is part of strategic emotional intelligence (John D. Mayer et al., 2016). Thus, our findings seem to point out that people with fibromyalgia experience deficits on their ability to deliberately and deeply process emotional information, which in turn may hampers their ability to make strategic judgements (MacCann et al., 2014).

Although still under debate, the main hypothesis for the pathogenesis of fibromyalgia is the existence of central aberrations (Baek et al., 2016; de la Coba et al., 2018). Chronic pain may lead to impaired emotional processing due to changes at different levels, such as, morphological, neurochemical, and gene expression (Cao et al., 2009; Lumley et al., 2011). In the present study, the differences between fibromyalgia and non-fibromyalgia women in emotion understanding ability might be also consequence of central nervous system impairments. Further, alterations in the white matter microstructure might be related to worse emotion understanding ability (Pisner et al., 2017). Additional changes in the neurons from the amygdala to the hypothalamus might drive emotionally maladaptive responses to coping with pain (as a threatening stimuli), which may perpetuate pain (Bartley et al., 2009). The experience of chronic pain might have a negative impact on emotion understanding ability, while poorer ability in strategic emotional intelligence might lead to inappropriate pain coping strategies and,

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consequently, to higher pain (Costa et al., 2017; Di Tella and Castelli, 2016). Another possibility is that there is interplay between the chronic pain experienced by women with fibromyalgia and their emotional processes (Lumley et al., 2011).

The literature suggests that, in people with chronic pain specific emotional processes are not related to their pain (Di Tella and Castelli, 2016; Hamilton et al., 2007). When emotional processes are jointly considered in the construct of emotional intelligence, however, higher levels of general emotional intelligence are associated with lower pain (Burri, Lachance, et al., 2015; Costa et al., 2017). The findings of the present study have demonstrated that, in line with chronic pain literature, women with fibromyalgia with higher emotional intelligence experience lower widespread pain. According to our findings, interventions for improving emotional intelligence may be not only related to benefits for women with fibromyalgia but also to decrease the costs of healthcare systems (Mikolajczak and Van Bellegem, 2017).

It is well-known that catastrophizing, which is the tendency to focus on and magnify pain experiences and to feel helpless during pain episodes (García Campayo et al., 2008), is a contributing factor to pain, particularly in fibromyalgia (Ellingson et al., 2018). Interestingly, over and above pain catastrophizing, the single association of each specific dimension of emotional intelligence explained an additional 3% of the widespread pain in our sample of women with fibromyalgia; one exception was emotion understanding, which was not significantly related to widespread pain. Furthermore, independently of pain catastrophizing and the other dimensions of emotional intelligence, we found that higher emotion perception and emotion management were associated with lower widespread pain. Thus, the findings of the present study corroborate the importance of emotional processes in the understanding of the experience of pain in fibromyalgia. It may be the case that the ability of perceiving and managing emotions might impact on

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pain through the same pathways that catastrophizing does; i.e., directly through alterations of neural processes involved in pain perception and attention and indirectly via promoting negative emotions and maladaptive responses to pain (Lumley et al., 2011).

In relation to the first (direct) pathway underpinning the association of emotion perception and emotion management with pain, it should be born in mind that the sensory-discriminative aspect of pain (Melzack and Casey, 1968) is assessed in the widespread pain index. Thus, deficits in emotional awareness/appraisal may be related to poor emotion perception and consequently to somatosensory amplification (Lumley et al., 2011). It may be the case that a state of pain exacerbation exists in which painful and non-painful stimuli are confused leading to increases widespread pain in women with fibromyalgia with poor emotion perception (Lane et al., 2009).

Deficits in the sensory-discriminative aspect of pain and the close relationship between emotion management ability and several psychological outcomes (Côté et al., 2011; Wranik et al., 2007), may result in poorer emotion management driving negative emotions and maladaptive responses to pain in fibromyalgia (Lumley et al., 2011). It has been demonstrated that the association of higher emotional intelligence and lower pain is mediated by negative affect; as higher emotional intelligence is related to lower negative affect and the latter to lower pain (Ruiz-Aranda et al., 2011). Defined as the ability to perceive and reverse negative emotions (which is a type of emotion management), higher emotional repair is associated with both lower negative affect and pain (Ruiz-Aranda et al., 2010). Emotion management may supress or reverse negative emotions (Mayer and Salovey, 1997) and consequently improve the experience of pain.

Another potential mechanism behind the association identified in the present study between emotion management and widespread pain is the social aspects of pain. Higher levels of emotional intelligence are related to better social interaction and can

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promote positive social functioning by helping individuals to detect others' emotion states, adopt others' perspectives, enhance communication, and regulate behaviour (Brackett et al., 2011). It is well-known that social factors, e.g., social support (Montoya et al., 2004), are related to the experience of pain. Emotion management ability, for example, is associated with secure attachment styles (Kafetsios, 2004), and with a perception of increased levels of emotional support (Lopes et al., 2005).

Before drawing conclusions, several limitations of the present work should be mentioned. First, we did not include a non-fibromyalgia chronic pain sample, which precluded testing whether our findings are specific to women with fibromyalgia or generalizable to other chronic pain diseases. Second, the features of fibromyalgia might differ between genders. Thus, replication of our study in men with fibromyalgia is warranted. The main strengths of the present study are the relatively large sample size, and the fact that emotional intelligence was assessed by means of an ability measure instead of a self-reported assessment (Estévez-López et al., 2018). In our analysis we also adjusted for pain catastrophizing, a traditional and well-known pain-related cognition, when testing the associations of emotional intelligence with widespread pain.

To conclude, the present study showed that, in comparison to age-matched women from the general population (i.e., controls), women with fibromyalgia have worse emotion understanding ability. In women with fibromyalgia, higher overall emotional intelligence ability and all its dimensions, except emotion understanding, were individually associated with lower widespread pain; even when account of pain catastrophizing was taken. Emotion perception and emotion management abilities were related to widespread pain; even when pain catastrophizing, emotion facilitation, and emotion understanding were accounted for. Further experimental research to address the causality of our findings is warranted. It would be of particular interest to test whether

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intervention programmes enhancing levels of emotion management, as part of the *hot* intelligences, are effective in reducing widespread pain in women with fibromyalgia.

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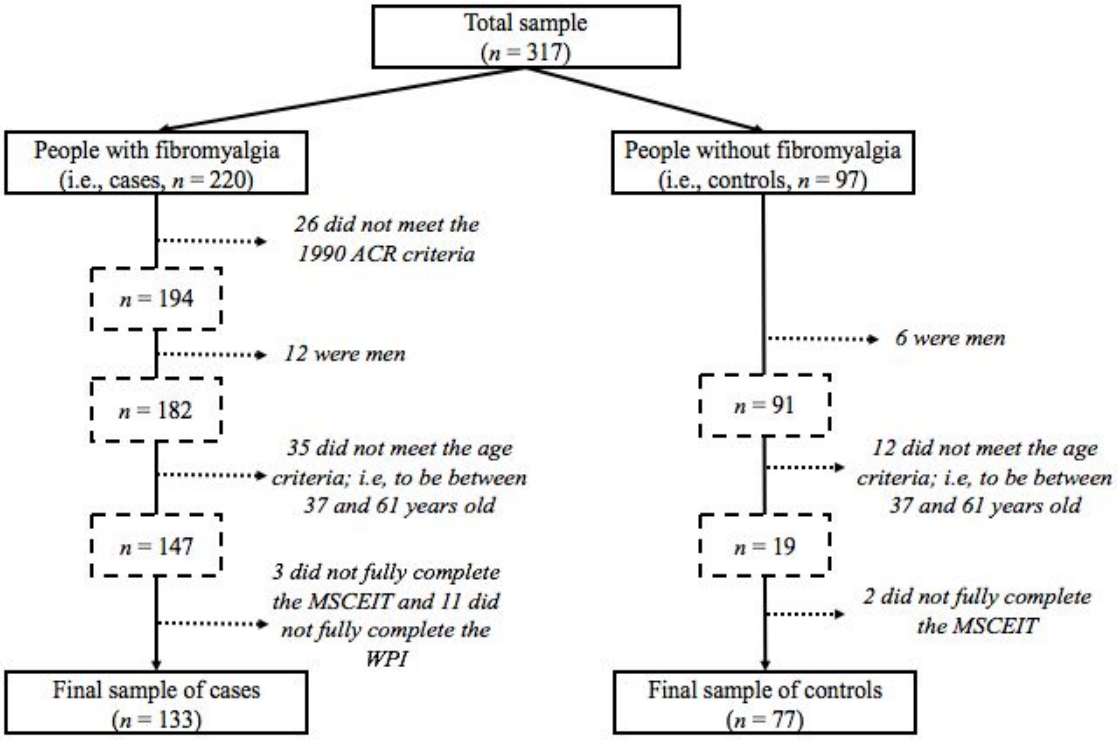


Figure 1. Participants' flowchart of the present study

ACR, American College of Rheumatology; MSCEIT, the Mayer-Salovey-Caruso Emotional Intelligence Test; WPI, Widespread Pain Index

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Table 1. Characteristics of the participants (n = 210)

Characteristics	Fibromyalgia (*n* = 133)		Controls (*n* = 77)		*p*-value	Effect size
Age (years old) [37-61]	50.9	(6.2)	50.1	(5.3)	.306	.14
Emotional intelligence (MSCEIT) [65-135]						
Overall emotional intelligence	104.8	(20.8)	108.2	(20.3)	.254	.17
Emotion perception	104.4	(14.5)	100.9	(15.2)	.106	.23
Emotion facilitation	100.7	(21.0)	100.0	(17.6)	.805	.04
Emotion understanding	88.1	(11.7)	95.2	(14.6)	< .001	.57
Emotion management	94.4	(16.0)	98.1	(14.6)	.093	.24
Widespread pain (WPI) [0-19]	13.7	(3.5)				
Pain catastrophizing (PCS) [0-52]	24.4	(11.9)				

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Means (standard deviations) are presented unless otherwise indicated. *p*-value based on *t*-test (continuous data) or χ^2 (categorical data). Effect size based on Cohen's *d*. MSCEIT, the Mayer-Salovey-Caruso Emotional Intelligence Test; WPI, the Widespread Pain Index; PCS, the Pain Catastrophizing Scale.

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Table 2. Individual associations of emotional intelligence (MSCEIT) and widespread pain (WPI) in people with fibromyalgia (n = 133)

Criterion variable	*b*	SE	β	Δ Adj. R^2
Overall emotional intelligence [65-135]	-0.03	0.02	-.19 *	.03 *
Emotion perception [65-135]	-0.05	0.02	-.19 *	.03 *
Emotion facilitation [65-135]	-0.03	0.02	-.19 *	.03 *
Emotion understanding [65-135]	-0.01	0.03	-.04	-.01
Emotion management [65-135]	-0.05	0.02	-.21 *	.04 *

All the analyses were adjusted for Pain Catastrophizing (by means of the PCS, the Pain Catastrophizing Scale [0-52]), which was entered in a first step ($b = 0.07$, SE = 0.03, β = .22, $p = 0.01$, Δ Adj. $R^2 = .04$, $p = 0.01$).

b, unstandardized regression coefficient; β, standardized regression coefficient with significance levels of *t*; SE, standard error; Δ Adj. R^2, change in adjusted R^2 with significance levels on *F*-change; MSCEIT, the Mayer-Salovey-Caruso Emotional Intelligence Test; WPI, Widespread Pain Index.

* $p < .05$.

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Table 3. Independent associations of emotional intelligence (MSCEIT) and widespread pain (WPI) in people with fibromyalgia (n = 133)

Criterion variable	*b*	SE	β	Δ Adj. R^2
Step 1				
Emotion perception [65-135]	-0.06	0.02	-.24 **	.05 **
Step 2				
Emotion management [65-135]	-0.04	0.02	-.18 *	.02 *

Pain catastrophizing and emotional intelligence (i.e. perception, facilitation, understanding, and management) were entered as independent variables using forward stepwise methods. *b*, unstandardized regression coefficient; β, standardized regression coefficient with significance levels of *t*; SE, standard error; Δ Adj. R^2, change in adjusted R^2 with significance levels on *F*-change; MSCEIT, the Mayer-Salovey-Caruso Emotional Intelligence Test; WPI, Widespread Pain Index.

* $p < .05$; ** $p < .01$.

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