Relationships Among Affect, Emotional Distress, and Physical Health Status in Fibromyalgia

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Abstract: Our main goal was to examine in a sample of female patients with fibromyalgia the associations among negative affect, positive affect, physical health status, and emotional distress. Moreover, we intended to determine whether emotional distress acts as a mediator between negative affect and physical health status, as well as between positive affect and physical health status. Results have shown that a lower physical health status is associated to higher levels of negative affect, emotional distress, and lower levels of positive affect. Furthermore, we have found support for the mediating role of emotional distress between negative affect and physical health status. On the other hand, the relationship between positive affect and physical health status was only partially mediated by emotional distress. Implications and future directions are discussed.

Keywords: Negative affect, positive affect, physical health status, emotional distress, fibromyalgia.

INTRODUCTION

Fibromyalgia (FM) is a musculoskeletal chronic pain syndrome which was initially classified by the presence of both a history of chronic widespread pain and the existence of, at least, 11 of 18 tender points [1]. However, the focus on tender points was not enough to capture the clinical medical presentation of those patients [2]. In 2010 Wolfe and colleagues proposed the American College of Rheumatology (ACR) preliminary diagnostic criteria for FM including both the widespread pain index (WPI) and the symptom severity scale (SS scale). The WPI is a measure of the number of painful body regions and the SS scale assesses cognitive problems, unrefreshed sleep, fatigue, and somatic symptoms. Taken together, both indicators helped to better define FM, as well as its symptom spectrum [3]. Concerning health-related quality of life in FM patients, the perception of both mental health and physical health status is generally reduced, even when compared with other rheumatic patients, with illnesses such as systemic lupus erythematosus, rheumatoid arthritis, and osteoarthritis. Additionally those differences tend to be more accentuated on physical dimensions compared with mental dimensions [4-9]. Across the recent decades the study of psychosocial variables has contributed to better understand health-related quality of life of FM patients, but the underlying mechanisms explaining relationships among variables are still far from being clearly understood [8, 10]. Considering the centrality of pain in FM and the IASP (International Association for the Study of Pain) definition of pain as 'An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage' [11], a research agenda on emotional experience is central when considering FM patients.

One of the classical conceptualizations between affect (as a personality trait) and health/disease was proposed by Watson and Pennebaker [12]. In order to understand processes associated with health status, the authors focused on the negative affect given its relationship with subjective health complaints through attentional processes, somatic hypervigilance, and emotional distress [12, 13]. Conversely, the role of positive affect was initially neglected as having an explaining role on health and disease. However, recent conceptualizations have been stated positive affect as a source of resilience to cope with chronic pain in periods of stress [14]. The Dynamic Model of Affect [15] suggests a distinction between positive and negative affect taking in account different situational contexts. The authors discuss that information processing could be influenced differently by emotional experience arising from environmental context. More specifically, in predictable environments individuals will be able to process information from multiple sources including both negative and positive aspects of situations which allow a higher access to the range of available information. On the contrary, in times of uncertainty the information processing is done more rapidly and with a scarce access to contextual resources; thus, attention is focused on immediate demands and potential threats in a way that negative information is preferentially processed at the expense of the positive one. Although the model proposes stressful contexts as influencing affective information

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processing for all individuals, the authors go forward defending that this effect could be especially strong for chronic pain patients given that the medical condition itself undermines emotional resources, especially when patients are distressed. Empirical evidence has shown that higher levels of negative affect and lower levels of positive affect are related to pain, physical disability, and axis I psychiatric conditions in FM [16]. Moreover, other studies have shown that levels of pain were positively associated to negative affect [17], and negatively associated to positive affect in FM patients [18].

As already stated, accordingly to the dynamic model of affect, pain could be related to higher levels of negative affect and lower levels of positive affect in FM patients, especially in stressful situations. So, at this point it is worth mentioning that lifetime and/or current prevalence of emotional distress is well documented in patients with FM; however, several answers remain unanswered concerning the mechanisms explaining such relationships [8, 10, 19-21]. Several studies conceptualize emotional distress as psychiatric categories, such as mood and anxiety disturbances, but it is frequent the study of emotional distress under the concept of minor psychopathological symptomatology reflecting an unspecified disturbance accompanying the illness [8]. In both cases, higher levels of emotional distress have shown positive associations with pain, functional impairment, and poor physical health status in FM patients [22-25].

This Study

In the present study we intend to examine the associations between negative affect, positive affect, physical health status, and emotional distress in a sample of female patients who met the criteria for the classification of FM [1]. Moreover, we aim to determine if emotional distress acts as a mediator between negative affect and physical health status, as well as between positive affect and physical health status.

Based on the Dynamic Model of Affect [15], we argue that negative and positive affect are related to the way patients experience their symptoms and, subsequently, rate their own health status. Moreover, previous empirical evidence support interrelationships among negative affect, positive affect, physical health status, and emotional distress. More specifically, the expected relationships between affect and health status perception in FM would be stronger when facing stressful situations. Therefore it becomes relevant to investigate the possible mediating role of emotional distress in the relationship between negative affect and physical health status, as well as between positive affect and physical health status in FM patients. With this study we intend to broaden the knowledge in this domain ascertaining whether emotional distress could contribute to a partial or complete mediation on the mentioned relationships. If emotional distress functions as a complete mediator of the relationships between negative/positive affect and physical health status, those relationships will be explained and no longer exists when emotional distress is statistically controlled.

Our specific hypotheses are:

- Physical health status is positively related to positive affect and negatively related to negative affect, and emotional distress.
- Emotional distress is positively related to negative affect and negatively related to positive affect.
- Emotional distress acts as a mediator of the relationship between negative affect and physical health status.
- Emotional distress acts as a mediator of the relationship between negative affect and physical health status.

METHOD

Participants

117 female patients who met the ACR criteria for the classification of FM [1] were included in the sample. Additional inclusion criteria included the patient age ranging between 18 to 65 years old and having no major cognitive disturbances that would preclude questionnaire completion.

Procedure

The sample was recruited at the Psychosomatic Medicine Unit of Hospitals of University of Coimbra and at two Chronic Pain Units (Hospital Center of Porto and Hospital of Oliveira de Azeméis) located in the North of Portugal. The female patients were informed about the study and asked to participate when they attended consultations or treatments. Other patients were recruited at *Myos* – Portuguese National Association of Fibromyalgia and Chronic Fatigue Syndrome when they visited the Association. The study was approved

by the Ethics Committee of the involved Hospitals, as well as the Direction of *Myos* Association. All the participants were assured of anonymity and confidentiality and then gave their written informed consent. After that participants completed the set of self-report questionnaires.

Measures

Socio-Demographic Variables

Patients completed a questionnaire assessing age, marital status, education level, employment situation, as well as duration of symptoms, and time elapsed since the diagnosis.

Negative Affect and Positive Affect

Negative affect and positive affect were measured using the Portuguese version of Positive Affect and Negative Affect Schedule - PANAS [26]. Participants were asked to rate on a five-point Likert scale (1-5) the extent to which they describe themselves in terms of affects. The positive affect scale included 10 items (e.g. 'interested', 'proud'), and the negative affect scale included 10 items as well (e.g. 'fearful', 'irritable'). Positive affect and negative affect scores were obtained by calculating the mean of the items in each scale. In the present sample the Cronbach alpha coefficients were α = 0.83 (positive affect) and α = 0.81 (negative affect).

Physical Health Status

The Physical Health Component of the Portuguese Second Version of Medical Outcomes Study 36-item Short Form Health Survey [27, 28] was used to measure the physical health status perception of the participants. The Physical Health Component was computed as a mean of the four physical subscales of SF-36v2 specifically: Role Physical (α = 0.82), Physical Functioning (α = 0.74), Bodily Pain (α = 0.77), and General Health (α = 0.64).

Higher scores on physical health status component reflect a better perceived physical health status. Those scores can range from 0 to 100.

Emotional Distress

The Portuguese version of the Brief Symptom Inventory - BSI [29] was used to assess emotional distress. BSI is a 53-item self-report measure that assesses a variety of minor psychopathological symptoms that individuals have experienced during the previous week on a five-point Likert scale from 0 *(never)* to 4 *(very often)*. The dimensions include somatization, obsessive–compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. A summary score is derived by combining the items to create a Global Severity Index (emotional distress) which has shown good internal consistency in the current study (α = 0.97).

Data Analysis

Statistical analyses were performed using IBM/SPSS 21.0. Initially, frequencies, means, and standard deviations of scores on all key variables were computed. Then, zero-order correlations were calculated among negative affect, positive affect, physical health status, and emotional distress. Finally, a series of regression analyses were performed in order to test the meditational hypotheses.

Baron and Kenny [30] proposed four steps to establish that a variable mediates the relationship between a predictor and an outcome. In the first step, the outcome variable is regressed on the predictor to establish that the predictor has a significant direct effect on the outcome variable that may be subject to mediation (path c). Next, the proposed mediator is regressed on the predictor to establish a direct effect on the outcome (path a). Finally, the outcome variable is simultaneously regressed on the predictor and mediator variables. This provides a test of whether the mediator is related to the outcome (path b), as well as an estimate of the relation between the predictor and the outcome controlling for the mediator (path c'). When the inclusion of the mediator in the model eliminates the previously significant relation between predictor and outcome variable a complete mediation is present. In contrast, when the relation between predictor and outcome variable is substantially reduced yet remains statistically significant a partial mediation occurs. The significance of the mediated effect is assessed by the Sobel test [30, 31].

RESULTS

Descriptive Statistics

The sample of 117 female FM patients ranged from ages 22 to 64 (*M* = 47.63, SD = 8.64). Most of the participants were married (85.5%) and 31.6% had an elementary school degree. 53.8% of the participants were employed. The time elapsed since the appearance of the first symptoms (*M* = 13.00 years, SD

= 10.96) ranged from 8 months to 52 years. On the other hand, the time elapsed since the diagnosis (*M* = 3.35 years, SD = 3.04) ranged from 1 month to 16 years.

As far as psychosocial variables are concerned, means and standard-deviations were calculated concerning negative affect, positive affect, physical health status, and emotional distress as shown in Table **1**.

Table 1: Means and Standard-Deviations of Negative Affect, Positive Affect, Physical Health Status, and Emotional Distress

	***M* (SD)** **N = 117**
Negative Affect [1-5]	2.80 (0.68)
Positive Affect [1-5]	2.87 (0.65)
Physical Health Status [0-100]	28.59 (10.66)
Emotional Distress [0-4]	1.70 (0.74)

Correlations Among Psychosocial Variables

Pearson coefficient correlations were calculated among the psychosocial variables as shown in Table **2**.

All variables correlated significantly with each other with the exception of negative affect and positive affect. Concerning physical health status, a significant inverse relation was found with both emotional distress and negative affect. On the other hand, physical health status correlated positively with positive affect. Regarding negative affect and emotional distress a large significant correlation was found. Conversely, positive affect showed an inverse relation with emotional distress.

Mediational Hypotheses

Considering the correlations pattern found, two mediational hypotheses were inspected. More specifically, the mediating role of emotional distress was examined for the relation between negative affect and physical health status. Then again, a hypothesis of emotional distress as a possible mediator between positive affect and physical health status was also investigated. To test each one of the mentioned hypotheses three regression equations were performed as suggested by Baron and Kenny [30].

Emotional Distress as a Mediator Between Negative Affect and Physical Health Status

The results of the first regression equation showed that negative affect was a significant predictor of physical health status (β = - .25; p < .01) – *path c*. The subsequent regression equation demonstrated that negative affect was a significant predictor of emotional distress (β = .71; p < .001) – *path a.* Finally, negative affect and emotional distress were entered simultaneously as independent variables. It was found that emotional distress (β = -.32, p < .05) – *path b*, but not negative affect (β = -.02, ns) – *path c'*, contributed significantly to the prediction of physical health status. Hence, the results support that emotional distress mediates the relation between negative affect and physical health status. The difference between path c and path c' was statistically significant, as showed by the Sobel test (–2.51, p < .05) (Figure **1**).

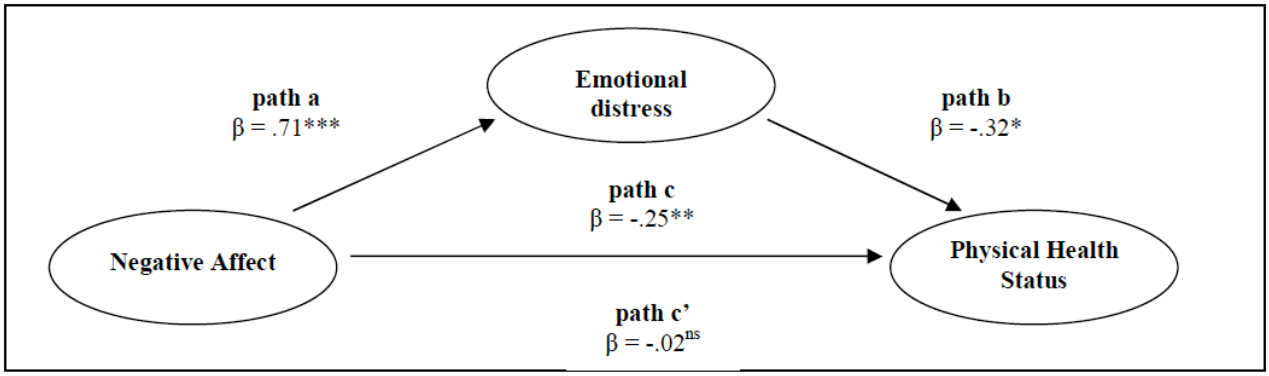
Emotional Distress as a Mediator Between Positive Affect and Physical Health Status

The results of the first regression equation showed that positive affect was a significant predictor of physical health status (β = .33; p < .001) – *path c*. The following regression equation demonstrated that positive affect was a significant predictor of emotional distress (β = -.31; p < .01) – *path a*. Finally, positive affect and emotional distress were entered simultaneously as independent variables. It was found that emotional distress (β = -.26, p < .01) – *path b* - contributed significantly as a unique variance of prediction of physical health status, and the effect of

Table 2: Correlations Among Negative Affect, Positive Affect, Physical Health Status, and Emotional Distress

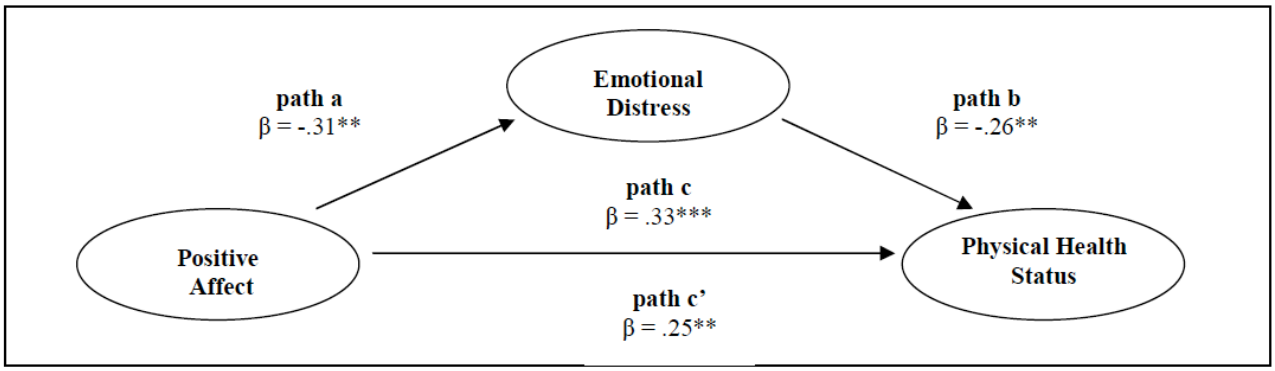
	Negative Affect	**Positive Affect**	**Physical Health Status**	**Emotional Distress**
Negative Affect	1	-.17^{ns}	-.25**	.71***
Positive Affect		1	.33***	-.31**
Physical Health Status			1	-.34***
Emotional Distress				1

N = 117.
***p < .001, **p < .01, ns – not significant.



*** $p < .001$ ** $p < .01$ * $p < .05$ ns – not significant.

Figure 1: Emotional distress as a mediator variable between negative affect and physical health status.



*** $p < .001$ ** $p < .01$.

Figure 2: Emotional distress as a mediator variable between positive affect and physical health status.

positive affect on physical health status (β = .25, $p < .01$) is less than in the first regression equation. These results support that emotional distress partially mediates the relation between positive affect and physical health status. The Sobel test has shown that the difference between path c and path c' was statistically significant (2.23, $p < .05$) (Figure **2**).

DISCUSSION

On a descriptive level a low score on the physical health status was found considering that in a scale ranging from 0 to 100 the mean score was 28.59 (SD = 10.66). This result is consistent to previous research, reflecting the considerable impairment on physical dimensions reported by FM patients, specifically in terms of role physical, physical functioning, bodily pain, and general health, as assessed by SF-36v2 [4, 9, 23, 32]. Also on a descriptive level, the mean score found to negative affect and positive affect were quite similar (M = 2.80; SD = 0.68 and M = 2.87; SD = 0.65, respectively), although these two dimensions constitute two independent ones [15]. However, the similarity of these values could be partially indicative of a reactive affect balance style which is characterized by higher levels of both negative and positive affect. A reactive affect balance style tends to be associated with worse physical functioning and mental distress [16]. Finally, the mean score of emotional distress reflects a moderate level (M = 1.70; SD = 0.74) but, as already stated, it does not constitute evidence of specific psychiatric categories; however, it reflects physical and psychological symptoms denoting an unspecified distress on those dimensions [8, 33].

Concerning the correlations among the variables in study (negative affect, positive affect, physical health status, and emotional distress) results were in accordance to our initial hypotheses. As expected, physical health status was negatively related to emotional distress and negative affect, and positively related to positive affect. The inverse relations between physical health status and emotional distress could be explained by different mechanisms. Actually emotional

distress could be seen as a reaction facing a chronic pain experience due to the burden and stressful consequences of the pain [34]. However, research have demonstrated higher levels of emotional distress, and even psychopathology, in FM patients than those found in other rheumatic diseases, such as rheumatoid arthritis [21, 35]. Another theoretical view states that pain and emotional distress could share pathophysiological roots even though this position has not a sufficient amount of empirical support [8]. In the view of the inverse relation between physical health status and negative affect, we could point out that subjects with higher levels of negative affect could be more predisposed to notice and attend to normal body sensations and minor discomfort [12]. Thus, higher levels of negative affect in FM patients could be largely responsible for their enhanced somatic complaining due to their perceptual style. On the other hand, positive associations between physical health status and positive affect give support to results found by Zautra *et al*. [18] who stated the role of positive affect in blunting the impact of exacerbation of pain and interpersonal stress among women with FM.

Still considering the correlations among variables, emotional distress was positively related to negative affect, and negatively related to positive affect, as initially expected. In fact the conceptualization of negative affect and positive affect as personality traits [12] could help to explain that in a certain moment of time individuals could be more predisposed to experience emotional distress considering higher levels of the former and lower levels of the latter.

Considering the first mediational hypothesis tested, we concluded that when emotional distress was statistically controlled, negative affect no longer contributed significantly to the prediction of lower levels of physical health status. Moreover, it seems to be a nearly complete mediation by emotional distress. This result has shown the influence of emotional distress on the relationship between negative affect and the perception of physical health status, giving empirical evidence to some of the assumptions of the dynamic model of affect [15]. Enlightening those results it is worth mentioning that individuals with higher levels of negative affect tend to have an apprehensive, negativistic, and vigilant characteristic style. Accordingly, emotional distress could emerge more easily given that perceptual style, thus explaining the relationship between negative affect and physical health status. Therefore, the experience of chronic pain could be an event triggering maladaptive thoughts and behaviors typical of emotional distressed individuals.

In view of the second mediational hypothesis tested, results have suggested that emotional distress mediate partially the association between positive affect and physical health status. This finding gives support to the notion that negative affect and positive affect are independent constructs [15], having different roles on physical health status. Nevertheless, in order to better comprehend how positive affect intertwine with physical health status, others variables need to be considered beyond emotional distress.

Taken together our results support some of the assumptions of the dynamic model of affect, namely that affect is associated with information processing (specifically the physical health status perception) in chronic pain patients when they are emotionally distressed. Moreover, results suggest that failures on emotion regulation, namely inability to reduce negative affect and increase positive affect, could be problematical to physical health status in female FM patients. Thus, the intervention should target the individuals' ability to process affect with greater complexity. Increasing their emotional complexity individuals will be able to maintain access to positive affective resources, even when they are facing difficult or painful experiences [14]. On the other hand, the presence of minor psychopathological symptoms should be clinically assessed in order to identify possible major disturbances which can require psychiatric attendance. In fact, not only emotional distress has been present in FM patients, but also psychiatric disorders, such as mood and anxiety disorders [21]. Both of them should be considered in the assessment and treatment of FM patients, since failure to do so may result in physical impairment.

The present study holds some limitations such as the absence of a control group which precludes some of our conclusions. In fact, we are not yet able to state the specificity of the results which were found in FM patients. Thus, the replication of the study with other chronic pain patients would be useful. Moreover, the patients in this study were all women. This fact helps to control differences due to gender, but the emotional distressing symptoms could be over-represented in our sample [35]. In addition, the variables assessment through self-report measures at a single point in time does not allow cause–effect inferences regarding the found interrelationships. Finally, assessment of patients' health status and adjustment outcomes could

be further enhanced by including physician' ratings as well.

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