Research paper

Alexithymia, not fibromyalgia, predicts the attribution of pain to anger-related facial expressions

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A R T I C L E   I N F O

A B S T R A C T

Background: Fibromyalgia (FM) is a syndrome characterized by chronic, widespread musculoskeletal pain, occurring predominantly in women. Previous studies have shown that patients with FM display a pattern of selective processing or cognitive bias which fosters the encoding of pain-related information. The present study tested the hypothesis of an increased attribution of pain to facial expressions of emotions (FEE), in patients with FM. As previous studies have shown that alexithymia influences the processing of facial expressions, independent of specific clinical conditions, we also investigated whether alexithymia, rather than FM per se, influenced attribution of pain to FEE.
Methods: One hundred and twenty-three women (41 with FM, 82 healthy controls, HC) were enrolled in this cross-sectional case-control study. We adopted two pain-attribution tasks, the Emotional Pain Estimation and the Emotional Pain Ascription, both using a modified version of the Ekman 60 Faces Test. Psychological distress was assessed using the Hospital Anxiety and Depression Scale, and alexithymia was assessed using the Toronto Alexithymia Scale.
Results: Patients with FM did not report increased attribution of pain to FEE. Alexithymic individuals demonstrated no specific problem in the recognition of basic emotions, but attributed significantly more pain to angry facial expression.
Limitations: Our study involved a relatively small sample size. The use of self-reported instruments might have led to underestimation of the presence of frank alexithymia in individuals having borderline cut-off scores.
Conclusions: Alexithymia, rather than FM per se, plays a key role in explaining the observed differences in pain attribution to anger-related facial expressions.

1. Introduction

Fibromyalgia (FM) is a syndrome characterized by chronic, widespread musculoskeletal pain, associated with a series of other conditions, such as fatigue, non-restorative sleep, irritable bowel, psychiatric disorders, cognitive impairment, and other functional complaints (Mease, 2005; Schmidt-Wilcke and Clauw, 2011). Its prevalence ranges from 3% to 6%, and it occurs predominantly in women (Branco et al., 2010). Growing evidence suggests that FM could be considered a *central sensitization syndrome*, caused by an increased sensitivity of the central nervous system to pain signals (Williams and Gracely, 2006).

A relevant and emerging topic of research is the emotional regulation and processing in patients with FM (Geenen et al., 2012; Weiss et al., 2013). With regard to emotional regulation, high affect intensity and low emotional expression are independently associated with a larger impact of FM. Although high affect intensity could be considered a general risk factor for emotional maladjustment, intense experience of emotions is not necessarily associated with maladaptive outcomes in patients with FM, as long as emotional expression is involved. However, suppression of emotions, i.e., not expressing strongly felt emotions, is a particularly maladaptive combination of emotional processing and regulation (Geenen et al., 2012). To our knowledge, till date only one study has specifically investigated the issue of emotional processing in patients diagnosed with FM (Weiss et al., 2013), and found an impaired recognition of emotional facial expression, indicating greater misclassification of emotional expressions (such as happy, angry, disgusted,

anxious, sad, and neutral expressions) than controls, with no difference being observed in the ratings of arousal and valence dimensions of emotional experience. The distribution of specific misclassifications did not differ between healthy individuals and patients with FM, indicating generally reduced accuracy of recognizing emotional facial expression rather than a specific pattern of mistakes.

Facial expression of pain represents a highly salient stimulus for human beings, as it provides information about a potential danger or threat to the observer, and conveys a request for help from the sufferer (Williams, 2002). Previous studies have shown that patients with FM may display a pattern of selective processing or cognitive bias, which fosters the encoding of pain-related information (Asmundson et al., 1997; Gonzalez-Roldan et al., 2013). The evaluation of pain in other individuals is considered to be modulated by several factors, including the level of empathy with the individual experiencing pain, the observer's previous experience with pain, and the presence of certain personality characteristics (Cheng et al., 2007; Wandner et al., 2012).

Evidences for the importance of emotions in FM pain are provided by neuroimaging studies that reported hyperactivity of brain regions mediating the affective component of pain rather than the structures related to the sensation of pain in patients with FM (Burgmer et al., 2010, 2009; Duschek et al., 2012). For example, differences in the time of pain anticipation without pain stimulation were reported in patients with FM compared to HC, with atypical brain activation in FM group in areas of the pain network, particularly in the anterior cingulate cortex (ACC), supplementary motor areas, and thalamus (Burgmer et al., 2009). These findings highlight the role of the cingulo-frontal network for central sensitization in FM, supporting the hypothesis of central pain augmentation in FM syndrome (Burgmer et al., 2010).

In addition, different studies reported an enhanced sensitivity to pain in patients with central sensitivity syndromes such as FM, with respect to a variety of psychophysical stimuli, including pressure, heat, and electricity, as well as environment stimuli, such as noise, stress, and chemical stimuli (Yunus, 2009). Moreover, in both healthy individuals and patients with FM, emotions have also been observed to increase pain, in particular those involving anger and sadness (Fernandez and Turk, 1995; Janssen, 2002; van Middendorp et al., 2010).

Patients with FM also show high levels of alexithymia, a personality disposition affecting emotional self-awareness (Castelli et al., 2012; Di Tella and Castelli, 2016; Di Tella et al., 2017, Ghiggia et al., 2017). Alexithymia is mainly characterized by difficulty in identifying and describing subjective feelings, restricted process of imagination, and an externally oriented cognitive style (Sifneos, 1972; Taylor et al., 1999). Previous studies have indicated that alexithymia influences the processing of facial expressions of other individuals independent of a specific clinical condition, such as autism spectrum disorder, somatoform disorders or eating disorders (Cook et al., 2013; Grynberg et al., 2012; Pedrosa Gil et al., 2009).

The presence of alexithymia has been related to impairment in the processing of facial expressions of other individuals, in both healthy individuals and specific clinical populations, including FM (Di Tella et al., 2015; Pedrosa Gil et al., 2009; Subic-Wrana et al., 2010). Human faces are considered the main source of information about feelings of other individuals (e.g., Adenzato and Garbarini, 2006; Enrici et al., 2015) (through internal feedback from the facial skin and muscles), and the accurate interpretation of facial expressions contributes in turn to an awareness of one's own emotions (Parker et al., 1993). The inability to correctly identify feelings and the somatic manifestations of emotions has also been associated with an intensification of the symptomology for alexithymic individuals, due to their tendency to misinterpret their emotional arousal as symptoms of disease (Lumley et al., 1996; Tuzer et al., 2011).

Based on these suggestions, the main aim of the present study was to test the hypothesis that the attribution of pain to emotional facial expressions (other than pain) is greater in patients with FM. To achieve this goal, a cross-sectional case-control study was conducted. In order to

investigate the pain attribution processes, we distinguished pain estimation from pain ascription, in particular analysing the degree of pain associated with emotional facial expressions, namely *emotional pain estimation*, and the attribution of pain to emotional facial expressions, namely *emotional pain ascription*.

The presence of alexithymia in patients with FM and the impact of the alexithymic component on the attribution of pain to emotional facial expressions have also been discussed in this study.

2. Materials and methods

2.1. Participants

Forty-one women with FM were consecutively recruited from the Fibromyalgia Integrated Outpatient Unit at the '*Città della Salute e della Scienza*' Hospital of Turin. All patients had a major diagnosis of FM, made by an expert rheumatologist. Exclusion criteria used were as follows: less than 18 years old, low education level (< 5 years), and the presence or history of a neurological or a severe psychiatric disorder, according to an expert psychiatrist examination. Eighty-two healthy women were recruited for the Healthy Controls (HC) group. Exclusion criteria used were the presence of rheumatic diseases or chronic pain, as well as the presence or history of a neurological or psychiatric disorder.

The study was approved by the '*Città della Salute e della Scienza*' hospital ethics committee and was conducted in accordance with the Declaration of Helsinki. All the participants gave their written informed consent to the study.

2.2. Measures

2.2.1. Psychological distress

The presence of psychological distress was assessed using the Italian version of the Hospital Anxiety and Depression Scale (HADS) (Bjelland et al., 2002; Costantini et al., 1999). This consists of 14 items and is divided into two subscales, one for depression (HADS-D) and one for anxiety (HADS-A). A score of 8 or more suggests a clinically relevant level of depression/anxiety (Zigmond and Snaith, 1983). A score of 15 or more is, instead, considered the optimal cut-off point for the HADS total score (Bjelland et al., 2002; Herrmann, 1997).

2.3. Alexithymia

Alexithymia was assessed using the Italian version of the Toronto Alexithymia Scale (TAS-20) (Bagby et al., 1994; Bressi et al., 1996; Taylor et al., 2003), which provides a total score and three subscale scores: difficulty identifying feelings (DIF); difficulty describing feelings (DDF); externally-oriented thinking (EOT). The TAS-20 cut-off scores are as follows: ≤51 no alexithymia, 52–60 borderline alexithymia, ≥61 alexithymia.

2.4. Pain attribution

In order to evaluate the attribution of pain to facial expressions associated with basic emotions (other than pain), we adopted two pain-attribution tasks, the Emotional Pain Estimation and Emotional Pain Ascription task, both using a modified version of the Ekman 60 Faces Test (Ekman and Friesen, 1976).

The Emotional Pain Estimation task (Ekman Pain VAS) is a modified version of the Ekman 60 Faces Test in which the 60 stimuli of the original version of the test were modified by removing the labels of the six basic emotions usually displayed under each photograph (happiness, sadness, disgust, fear, surprise, and anger) and by adding a Visual Analogue Scale (VAS) under each photograph. Participants were required to evaluate how much pain, if at all, each image expressed, using the VAS ranging from 0 ('No pain') to 10 ('Worst pain'), and checking the point of the line which best corresponded to the amount of pain