

Generalized hypervigilance in fibromyalgia patients: An experimental analysis with the emotional Stroop paradigm

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Abstract

Objective: In recent years, a good deal of serious research has been carried out on the hypothesized presence of generalized hypervigilance to sensory stimulation in fibromyalgia (FM). However, there are no studies which, following an operationalization of generalized hypervigilance as a propensity to attend to any task-irrelevant stimuli presented, make use of interference paradigms as the most appropriate experimental models for its analysis. The purpose of this study was to test the hypothesis of generalized hypervigilance in FM using the emotional modification of the Stroop task and to explore the possible mediating role of anxiety. **Methods:** To this end, 25 women diagnosed with fibromyalgia and 25 matched controls were shown 32 stimulus words equally distributed in four categories: fibromyalgia symptoms, arousing-negative (A-), arousing-positive (A+), and

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neutral (N). These words had been selected on the basis of the results of an independent study. In addition to the emotional Stroop task, measures of trait and state anxiety were included.

Results: The results showed the possible presence of a generalized hypervigilance response in fibromyalgia patients based on significant slowness in the color-naming. This effect was mediated by the degree of perceived unpleasantness of the A- stimuli. However, the expected mediation effect of anxiety was not found. **Conclusions:** These results suggest the presence of a generalized hypervigilance response in FM patients that is not mediated by anxiety. Implications for the correct functioning of controlled self-regulatory processes in fibromyalgia and similar pathologies are discussed.

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Introduction

Given the limitations of the biomedical model in diverse pain conditions [1], there is growing popularity of explanations based on cognitive and emotional factors, where the presence of dysfunctional attentional processes is especially relevant. Among many others, “hypervigilance to pain and pain-associated information” is probably the most significant (e.g., Refs. [2–5]).

An alternative to the “hypervigilance to pain” hypothesis posits the presence of a generalized hypervigilance for

sensory stimuli in fibromyalgia (FM) [6–8], and preliminary evidence supports this hypothesis (e.g., Refs. [9–12]). However, the doubtful operationalization and measurement of sensory hypervigilance in these studies, based on standard assessments of pain threshold or pain tolerance, has been strongly criticized, with suggestions that a correct measurement of hypervigilance should involve the detection of weak somatosensory stimuli, rather than the level of pain tolerance [8]. As regards this operationalization of hypervigilance, there are only two studies testing the hypothesis of generalized hypervigilance in FM, providing only partial support [7,8]. Recently, Hollins et al. [6], studied perceptual amplification in patients with FM, finding robust evidence of amplification of pressure stimuli together with weaker evidence of amplification of auditory stimuli. However, despite the suggestion that perceptual

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amplification and hypervigilance may be aspects of the same process, controversy still remains with respect to the most appropriate definition and delimitation of generalized hypervigilance [13,14].

According to Eysenck [15,16], *general* hypervigilance or distractibility is demonstrated by a propensity to attend to any task-irrelevant stimuli presented. In this direction, Crombez et al. [5] have argued that the use of situations with competing attentional demands is the preferable approach to the measurement of hypervigilance. This assertion, together with the proposition of hypervigilance as not a mechanism under conscious control (controlled processes), but largely the result of automatic processes [5], imply that the use of interference paradigms is the most appropriate experimental model for the study of hypervigilance. In this context, there is clearly a lack of studies on generalized hypervigilance in FM using the most relevant cognitive methods commonly employed for demonstrating attentional biases—such as the emotional modification of the Stroop task—and relatively few testing the hypothesis of hypervigilance to pain in patients with heterogeneous chronic pain conditions, and these yield contradictory results with regard to the existence of bias for either affect or sensory pain words (or both), and to the mediating role of variables such as anxiety or fear of pain (e.g., Refs. [17–21]).

The main aims of this study are (1) to test the hypothesis of generalized hypervigilance using the emotional modification of the Stroop task in a sample of FM patients and (2) to explore the possible mediating role of anxiety in the relationship between FM and generalized hypervigilance. For these purposes, we employed words referring to FM symptoms (SF) together with arousing-negative (A−), arousing-positive (A+), and neutral (N) words. In the context of the hypothesis of generalized hypervigilance, we expected FM patients to display an attentional bias not only to SF words, but also to arousing-negative and neutral words. Typically, in a modified Stroop task, the color-naming slows down when words are threatening and relevant to patients, while no response delay is found with neutral words [22]. However, within the context of generalized hypervigilance as a propensity to attend to any task-irrelevant stimuli presented [15,16], slowing-down should be especially evident for neutral words, which may need extra processing time because their threatening potential is not obvious to the patient.

Methods

Participants

In the absence of pilot data and of information about the magnitude of what can be considered a theoretically important effect in the context of the study [23], a power analysis was performed to determine the sample size

required to detect a large experimental effect ($f^2=.35$) with a target power of .90, following Cohen's guidelines for small, medium and large effects [24]. As a result, sample size estimation was $n=50$, which corresponds to the sample sizes usually employed in studies using the emotional Stroop paradigm in pain research [17,21].

A total of 25 women diagnosed with FM and 25 healthy women completed the testing. However, in the preliminary analyses, one participant from the healthy group was detected as an outlier [25], with a standardized score of 3.09 ($P<.001$) in trait anxiety, and her data were not included in the subsequent analyses. The FM patients were recruited from the Fibromyalgia and Chronic Fatigue Syndrome Association of Getafe and from the Fibromyalgia Association of Madrid. Inclusion in the FM group required a diagnosis of fibromyalgia syndrome according to the criteria of Wolfe, Smith, Yunus et al. [26]. Healthy control participants were recruited from the relatives of students at the Rey Juan Carlos University (Madrid, Spain), and the sample was made up in such a way as to allow matching of age and education level with patients. Inclusion criteria for both groups were: aged between 25 and 65 years, normal or corrected-to-normal vision, and ability to read and write in Spanish to the equivalent of English Grade 8 level. Exclusion criteria for both groups were: significant medical illness, substance abuse/dependence, psychosis, current regimens of psychoactive medication (except low-dose benzodiazepines and tricyclic antidepressants), and color blindness. Participants were also excluded from the healthy control group when a self-reported history of chronic pain was present.

Mean age of the FM group ($n=25$) was 50.56 (S.D.=8.66), and mean time elapsed since the diagnosis was 107.28 months (S.D.=52.49). Mean age of the healthy controls ($n=24$) was 48.04 (S.D.=7.55). No differences were observed between groups on the basis of age ($t=1.08$, $P=.28$) or educational level ($\chi^2(3)=5.82$, $P=.12$).

Self-report instruments

All participants provided informed consent and completed the State-Trait Anxiety Inventory (STAI) [27]. This is a well known 40-item self-report questionnaire designed to measure state and trait anxiety. Participants had to rate on a 4-point scale the accuracy of the statements in relation to themselves. The STAI has been found to possess adequate reliability and validity [28]. The state scale was administered immediately after the emotional Stroop task, while the trait scale was completed at home after the experimental task.

Patients were asked to rate the familiarity (1=completely unfamiliar, 5=completely familiar), the symptom-relatedness (in the FM group only) (1=not at all, 4=very strongly), the arousal (1=very relaxing, 5=very arousing) and the valence (−2=very unpleasant, 2=very pleasant) of each word in the emotional Stroop task. Patients completed these rating scales at home, together with the STAI-trait scale, returning them to the authors by mail.

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