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Hypnosis for Chronic Pain Management

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Abstract

Recent psychophysiological data supports the concept that hypnotic interventions for pain management are beneficial. The aim of this study was to evaluate pain relief induced through hypnosis in two chronic pain conditions: fibromyalgia (FM) and chronic migraine (CM). Participants were treated during 5 weekly hypnosis sessions, each lasting 60 minutes. A battery of self-reported questionnaires assessing quality of life, pain intensity, and depression levels were administered at the beginning and at the end of treatment. We observed important group differences in outcomes, in particular for CM patients.

Keywords: Neuromatrix theory; Hypnosis; Fibromyalgia; Chronic migraine

Abbreviations: FM: Fibromyalgia; CM: Chronic Migraine

Introduction

In recent years, restrictive biomedical models have proven insufficient to explain mechanisms underlying the development and maintenance of chronic pain. Instead, there has been an increasing acceptance of neuromodulatory approaches that consider perception of noxious stimuli to be the result of supraspinal cortical processing, conditioned in turn by physical (body injury), emotional (anxiety and depression) and behavioral factors [1-8].

In line with this concept, many psychological-based treatments to reduce pain and suffering have been implemented in multidisciplinary chronic pain treatment programs [9-11]. Among several existing psychotherapy treatments, the most widely implemented includes a combination of operant conditioning (OP) and cognitive behavioural therapy (CBT) [12].

OP focuses on identifying pain behaviors and external contingencies that feed those behaviours and changing them by healthy ones while CBT model intend to modify cognitions and emotions related to pain, manage stress, improve coping abilities and restore functioning.

However, although effective in reducing disability and catastrophizing, there are studies suggesting that pain intensity reduction levels achieved using these approaches were not really remarkable compared to those observed in active controls [13-15].

The use of hypnosis in the treatment of pain as well as for other medical and psychological conditions is an old practice that mainly consists on techniques designed to develop a state of mental ease and absorption that heighten responsiveness to suggestions oriented to produce changes in subjective experience [16-26].

In recent years, neurophysiological research on pain processing from brain imaging studies has increased interest in its use. Using positron-emission tomography (PET) scans, Rainville and colleagues (1997) found cortical activity in specific areas receiving ascending nociceptive afferents such as primary and secondary somatosensory cortices (SI, SII), insular cortex (IC) and anterior cingulated cortex (ACC) that were related to suggestions to increase or decrease unpleasantness [27-30].

Other researchers [31,32] also using PET showed that hypnotic states can neuromodulate cortical and subcortical structures involved in different aspects of pain processing related to cognition, sensory perception and motor control allowing subjects to feel less of the pain and discomfort derived from many psychological and medical conditions.

One of the most researched form of acute pain management using hypnosis with successful outcomes is associated with burn patients in whom procedures involved in wound care are both frequent and extremely painful [33]. Other examples of acute pain control using hypnosis include treatment of orthopedic injuries, nephrolithiasis and muscle spasm. In such acute conditions, hypnotic inductions for pain modulation usually aim at altering individual awareness and reaction to pain by re-directing focus of attention to suggested mental imagery of relaxation and analgesia [34-36].

Also the use of hypnosis for chronic pain management is developing into a field of interest, presenting increasingly encouraging results. Some authors [37-39] published controlled clinical trials in cancer patients successfully treated with hypnosis.

Gay et al. [40] used hypnotic suggestion to stimulate joint mobility in a group of patients with osteoarthritis pain, most of whom reported substantial and significant decrease in pain intensity after 4 weeks of treatment, with effects lasting 3 to 6 months.

Simon et al. [41] examined the effectiveness of hypnosis on temporomandibular pain disorder in 28 patients. Results indicated significant decrease in pain frequency and duration as well as improvement in overall daily functioning.

Haanen et al. [42] used hypnosis to treat pain in fibromyalgia patients with significantly good outcomes on measures of muscle pain, fatigue, sleep disturbance, distress and general wellbeing.

Jensen et al. [43] examined the effects of 10 sessions of standardized script-driven hypnotic analgesia treatment on pain intensity, pain unpleasantness, depression and perceived pain control in 33 patients with chronic pain secondary to a disability. Analyses indicated significant pre-to post treatment improvement in pain intensity, unpleasantness and perceived control over pain lasting 3 months.

In the case of chronic pain management hypnotic suggestions are not only directed to achieve a state of mental ease, dissociation, relaxation to decrease pain and the associated feelings of unpleasantness and stress, but also interventions aim to develop ego strengthening to enhance the patient's competence and mastery to better cope with symptoms of their medical condition. In support of the concept that hypnotic strategies can modulate peripheral and central nociceptive processes and thus effectively change thought patterns, perceptions and behavior, we decided to explore the efficacy of hypnosis for pain management in two specific chronic pain conditions: chronic migraine (CM) and fibromyalgia (FM). Migraine is considered to be of vascular origin and has been linked to changes in the size of arteries both inside and outside the brain. Biochemical shifts (such as of serotonin levels in blood vessels) may lead to inflammation of perivascular nerves, ultimately changing blood flow and contributing to crisis onset. Both constitutional and environmental factors have been shown to be important in combination with personality type and psychological stress, the latter an important trigger for migraine attacks [44].

Fibromyalgia on the other hand is a more debilitating condition, psychologically and physically. Patients report chronic pain in bones and muscles, with specific trigger or "tender points" reflecting a generalized lowering of pain thresholds. Symptoms are considered emotionally complex and associated with childhood or adult trauma, or victimization of a physical or emotional nature [45-47].

Materials and Method

Patients

Thirty five chronic pain patients were recruited from the Fleni Neurological Institute Pain Center consented to participate in five (once a week) 60 minutes hypnotic sessions.

Inclusion criteria:

Be at least 21 years of age.

Undergo complete medical workup for diagnosis

Have experienced chronic pain as defined by IASP criteria, for over three months.

Have a FM diagnosis based on American College of Rheumatology (ACR) criteria or a CM diagnosis according to the definition of the International Headache Society (HIS).

Exclusion criteria:

Serious psychiatric disorders that could interfere with treatment.

Personal history or ongoing substance abuse issues.

Patients with cognitive impairment

From the sample initially recruited, twenty six patients (11 FM and 15 CM patients) completed all five, weekly 60-minute hypnosis sessions.

Nine patients were unable to complete treatment (1 male and 8 female). Two were women who manifested delusional symptoms and dissociative disorders. Another two women showed severe personality disorders and were referred for psychiatric treatment, as these symptoms were considered a priority overriding the need for pain management. The remaining patients prematurely discontinued treatment with no explanation. Any pharmacological treatments patients were receiving at time of study entry remained unmodified during the investigation. Study protocol was approved by the Institutional Ethics Committee and participating patients gave written informed consent.

Hypnotic methods

Hypnotic sessions were conducted by a psychologist trained in hypnotherapy. Hypnotic induction and suggestion procedures were adapted from: Hypnosis for Chronic Pain Management, Therapist Guide [14]; Hypnosis and Suggestion in the Treatment of Pain, A Clinical Guide [48] and Handbook of Hypnotic Suggestions and Metaphors [49].

Individual sessions involved:

a) A brief explanation on how hypnosis for pain management works and clarification of possible misconceptions or false expectations.

b) Induction, generally using a progressive muscle relaxation technique focusing on the beneficial effects of relaxation and a series of permissive and indirect suggestions to create a positive state of mind and narrow awareness to feelings of calm and comfort. For example the therapist would begin saying: "allow these muscles and tendons to relax, noticing whatever sensations make you aware that muscles in that area have relaxed. Perhaps you will experience a sense of heaviness, or warmth, or a sense of lightness generating relaxation. You are becoming more and more comfortable with every breath"; and then continue by progressively moving on to the next body segment until all areas are covered.

Hypnotic suggestions designed to address the multidimensional experience of pain: pain reduction, pain unpleasantness, sensory substitution and the affective component of symptoms (e.g. reassuring thoughts, or feelings of anxiety or sadness, making positive behavioral changes and improving sleep quality) With CM patients, hypnotic sessions were guided to imagine that the bony walls of the skull expand, while a cool stream of inhalation flows into the head generating a soothing sensation. Metaphors were also provided to release or let go of obsessive or anxious thoughts. Whereas in FM patients suggestions linking the painful area to warm and relaxing sensations were used, for example: "imagine the afflicted area loosens up and becomes soft and warm especially during exhalation, feel the warm tingling sensation or the numbness that make you aware of feeling more and more comfortable". We also used the Gate control theory metaphor [50] telling both groups of patients for example: "The more peaceful sensations your unconscious mind can produce, the more likely these sensations are to actually occur. Because the unconscious mind can relax all the nerve and muscle fibers in areas of the body where there is tension or pain, it can also interrupt pathways along which those sensations travel up the spinal cord through the brain stem and into pain perception areas. There are many gates through which these pain impulses must pass, and your unconscious

mind can close several of these gates, reducing the number of nerve impulses you perceive. You can most certainly collaborate with this process visualizing the pain perception area as a compartment or a well-lit room where there is a dimmer switch you can turn down. As the light becomes dimmer and dimmer your will experience less and less discomfort" visual images were slightly modified as sessions progressed, but always followed a similar pain reduction pattern.

Suggestions to reduce pain unpleasantness, improve sense of comfort and reduce negative pain connotations were also included. E.g. "You may be aware that pain intensity and the distress pain can sometimes produce are two different feelings, processed in different parts of the brain. It is possible to be aware of a painful sensation and not be bothered by it. Sometimes it is even possible to experience significant pain and still not seem bothered by it" [43].

c) Post-hypnotic suggestion for extending session benefits to daily life. "All the benefits that you have obtained from the session today you can make use of and these can become more and more a permanent part of how your brain works, so that any time you need to do so, you can easily switch to this state of mind" [14].

d) Hypnotic sessions were also recorded and sent to the patients via e-mail for practice at home between sessions.

We did not test patients for degree of suggestibility because we, as do other researchers [50-52] think all patients can benefit from hypnotic interventions and that suggestibility levels can be increased with practice.

Questionnaires used

A battery of self-reported questionnaires assessing quality of life, pain intensity and depression levels were administered at the beginning and at the end of treatment for objective outcome evaluation. Personality trait interviews were only administered at the beginning, with the purpose of identifying participant personality characteristics that could influence pain perception or pain-related behaviour.

Questionnaires applied included

Short-form health survey (SF36) (Ware 1993-Score range 0-100): One of the most widely used instruments to assess health status; it contains 36 items that yield 8 domains. Physical functioning (PF 10 items) assesses limitations in physical activities, such as walking and climbing stairs. Role-physical (RP 4 items) and Role-Emotional (RE 3 items) domains measure drawbacks related to work or other daily activities resulting from physical or emotional problems. Bodily Pain (BP 2 items) assesses limitations due to pain, and Vitality (VT 4 items) measures energy and tiredness. The Social Functioning domain (SF 2 items) examines effects of physical and emotional health on normal social activities, and Mental Health (MH 5 items) assesses happiness, nervousness and depression. The General Health perception domain (GH 5 items) evaluates personal health and expectation of health changes. All domains are scored on a scale from 0 to 100, with 100 representing the best possible state of health.

The eight domains are hypothesized to form two distinct higher-ordered clusters due to the physical and mental health variance they have in common. Three scales (PF, RP, BP) correlate most highly with the physical component and contribute most to the scoring of the Physical Component Summary (PCS) measure. The mental component correlates most highly with the MH, RE, and SF domains, which also contribute most to the scoring of the Mental Component Summary (MCS) measure. Three domains (VT, GH, and SF) have noteworthy correlations with both components.

State Trait Anxiety Inventory (STAI) (score range from 20-23 and 72-74): suitable to differentiate a state anxiety caused by a specific event from an anxious personality. It is a self-report assessment device which includes separate measures of state and trait anxiety. State anxiety reflects a "transitory emotional state or condition of the human organism that is characterized by subjective, consciously perceived feelings of tension and apprehension, and heightened autonomic nervous system activity". It may fluctuate over time and can vary in intensity. In contrast, trait anxiety denotes relatively stable individual differences in anxiety proneness and refers to a general tendency to respond with anxiety to perceived threats in the environment.

Beck Depression Inventory (BDI) (score range 6-63): A very useful aid in determining the presence and intensity of depression. It consists of a 21-item scale concerning each particular aspect of depression experience and symptoms (mood, sense of failure, indecisiveness, work inhibition and appetite). Each item contains four statements of graded severity expressing how a person might feel or think about the aspect of depression under consideration.

Structured Clinical Interview for DSM (SCID II) (score range 0-119): is a semi-structured interview to diagnose personality traits, originally developed for diagnoses according to DSM-III-R criteria, and later updated for use with the DSM IV.

Statistical methods

Student's test was used to compare differences between two means when normality was not rejected. Fisher exact test was used to compare percentages of categorical variables. To assess normality, Shapiro-Wilk's test was applied. To analyze performance before and after treatment in each patient, as they are not independent measures, Wilcoxon test was applied, partitioning by group, because most of the differences were not normal. Evolution of SF-36 domains, Beck and STAI were calculated as final less initial score. Box and whiskers plot includes, into the box, the data contained between 1st and 3rd quarters (close the 50% of the data); also, a difference=0 line is shown in the plot. The whiskers go to the lowest datum still within 1.5 IQR (interquartile rank) of the lower quartile, and the highest datum still within 1.5 IQR of the upper quartile. Data outside the whiskers are considered outliers. Bars plots show personality disorder proportions for each pathology group. Factorial correspondence analysis was made and plots to show association between pathology and personality disorders. Significance level was established at 5%. Bonferroni criteria were applied to correct p-values in multiple comparisons. Software used was SPSS 18.0 (Chicago, Illinois) and Info Stat (Version 2014, Universidad Nacional de Córdoba).

Results

Ages of the patients were between 22 and 74 years. Chronic migraine patients ages were between 23 and 74 years old, with a mean age=39 and a standard deviation=13.8; and Fibromyalgia patients ages were between 22 and 68 years, with a mean age=47 years and a standard deviation=13.4. There was no significant difference in mean ages between the two groups; p-value=0.1851. There was no difference between sex distribution in both groups; there is majority of women in both groups: 86.7% of women in chronic migraine and 90.9% in Fibromyalgia; p-value>0.99 (Table 1).

Variable	Diagnosis	Descriptive statistics	p-value
Age	Chronic Migraine (n=15)	39 (13.8)	0.1851§
(Mean (SD)	Fibromyalgia (n=11)	47 (13.4)	
Gender	Chronic Migraine (n=15)	86.70%	>0.99†
(%women)	Fibromyalgia (n=11)	90.90%	
§Student test; †Fisher exact test			

Table 1: Demographic information.

In Table 2 we show increments in SF-36 domains in each group. There was statistically significant increasing in final scores in five domains for chronic migraine sufferers: Physical functioning, physical role, general health, vitality and social functioning, but there wasn't any significant increasing in domains for fibromyalgia patients.

Diagnosis	Domain	Final score less initial score (increasing in score)	p-value# (Bootstrap estimation)
Chronic Migraine	Physical functioning	5 (0; 10)	0.0256
	Physical role	0 (0; 50)	0.0064
	Bodily pain	10 (0; 20)	0.4352
	General health	5 (0; 10)	0.0008
	Vitality	5 (0; 15)	0.0032
	Social functioning	12.5 (0; 22.5)	0.0192
	Emotional role	33.3 (0; 66.7)	0.0896
	Mental health	4 (-4; 8)	>0.9999
Fibromyalgia	Physical functioning	0 (-20; 10)	>0.9999
	Physical role	0 (-50; 25)	>0.9999
	Bodily pain	0 (-22; 10)	>0.9999
	General health	0 (-10; 5)	>0.9999
	Vitality	10 (-25; 30)	>0.9999
	Social functioning	0 (-12.5; 12.5)	>0.9999
	Emotional role	33.3 (0; 33.3)	>0.9999
	Mental health	0 (-4;20)	>0.9999
Data are presented as Median (Interquartile range). Wilcoxon signed Rank test. (#p-value after Bonferroni correction)			

Table 2: SF-36-Evolution of score for each group after treatment.

All Chronic migraine patients had lower final Beck depression inventory (BDI) scores, while only 55 percent of the fibromyalgia group had lower final depression scores; no patient showed increasing in BDI score, and 45% of fibromyalgia patients were invariant. Chronic migraine patients showed significant decreasing in BDI score (Median decreasing=3; p-value<0.0001), but no significant decrease was seen in fibromyalgia patients (Median decreasing=3; p-value=0.2838) (Table 3 and Figure 1).

Diagnosis	Domain	Final score less initial score (decreasing in score)	p-value# (Bootstrap estimation)
Cronic Migraine	Beck	-3 (-7; -2)	<0.0001

	STAI.S	-5 (-11; -2)	0.0006
	STAI.G	-4 (-5; 0)	0.021
Fibromyalgia	Beck	-3 (-4; 0)	0.2838
	STAI.S	-4 (-6; -1)	0.0012
	STAI.G	0 (-4; 0)	>0.9999
Data are presented as Median (Interquartile range). Wilcoxon signed Rank test. (#p-value after Bonferroni correction)			

Table 3: Beck, STAI-S and STAI-G: Evolution of score for each group after treatment.

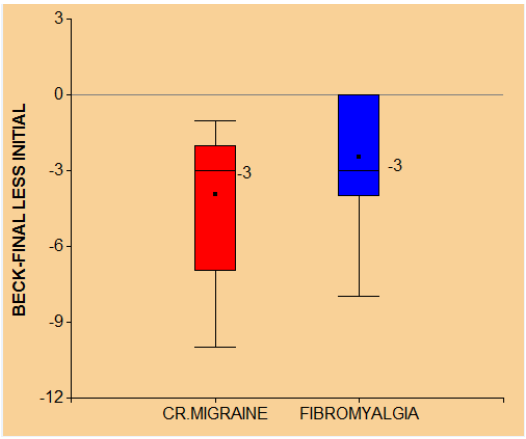

Figure 1: Beck depression inventory.

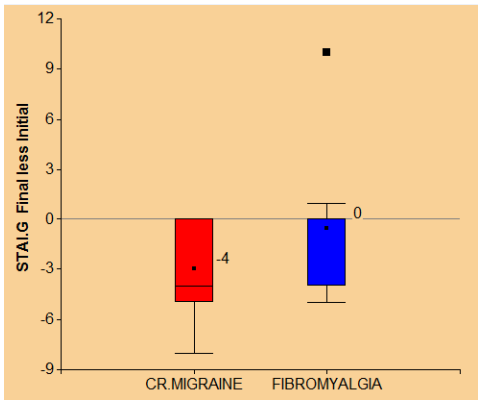

Figure 2: State trait anxiety inventory-G.

In chronic migraine patients, anxiety measures showed reduction for both anxiety questionnaires: STAI-S: Median decrease=5; p-value=0.0006 (80% of patients decreased, 13.3% were invariant and 6.7% increased); in STAI-G, Median decrease=4; p-value=0.0210 (66.7% decreased, 33.3% were invariant, and zero increased). In Fibromyalgia patients, significant reduction in STAI-S was seen: Median decrease=4; p-value=0.0012 (90.9% decrease and 9.1% were invariant), but there wasn't reduction in STAI-G in fibromyalgia group: Median=0; p-value>0.9999 (36.4% decreased, 45.5% were invariant and 18.2% increased) (Table 3, Figures 2 and 3).

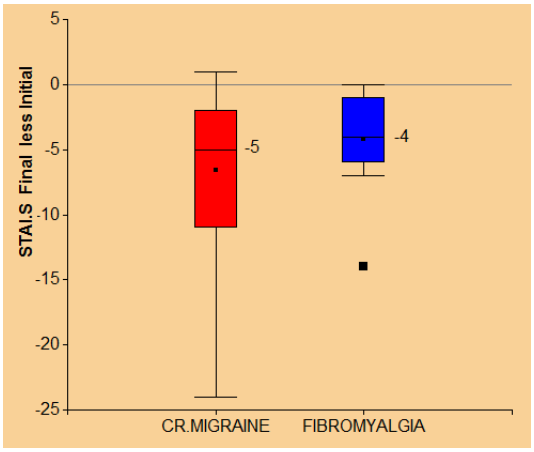

Figure 3: State trait anxiety inventory-S.

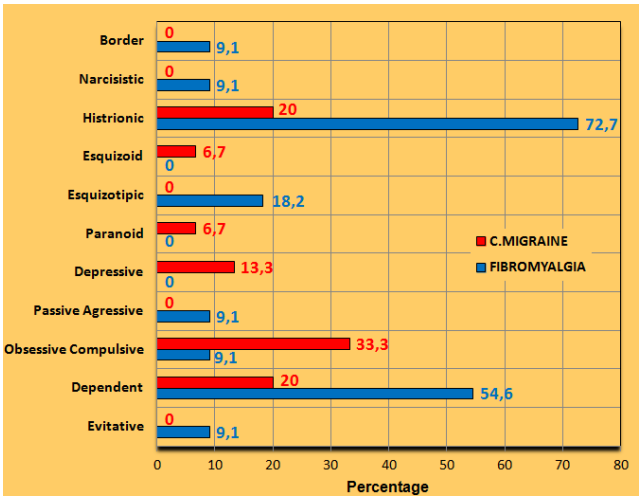

Figure 4: Prevalence of personality disorders.

Structured Clinical Interview for DSM (SCID II) results indicated 65% of the patients evaluated in this sample fulfilled criteria for at least

one Axis II personality disorder. For each group we calculated the proportions of personality disorders (Figure 4).

Correspondence analysis indicates that CM is more associated to squizoid, paranoid, obsessive compulsive and depressive disorders while FM is more associated to evitative, esquizotipic, passive aggressive, histrionic and dependent disorders (Figure 5).

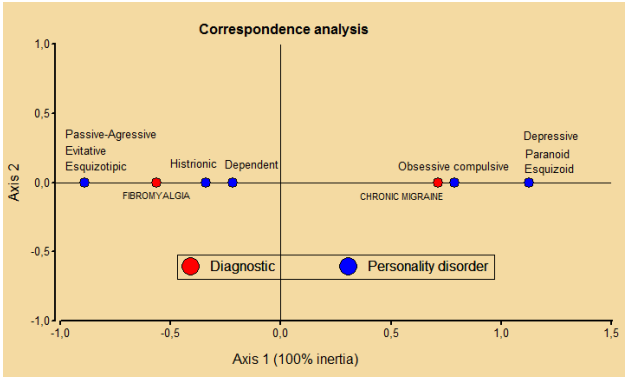

Figure 5: Correspondence analysis.

Discussion

Experiencing pain is in itself stressful and anxiety-inducing, generating a vicious circle in which as stress levels build, so do symptoms, to the point that stress in itself is sufficient to fire cells and trigger the perception of pain [53].

Cognition, beliefs, attention, anticipation all contribute to build a state of mind, which in turn plays an important role in pain control [54-56]. When a person feels relaxed and in control, there are physiological mechanisms that neuromodulate the transmission of nociceptive signals from a particular part of the body up the spinal cord to cerebral structures, ultimately reducing discomfort whether physical or psychological.

In this study, we used hypnosis techniques to create the conditions (profound mental ease, feelings of self-absorption and reduction in vigilance) to facilitate incorporation of suggestions for alternative positive experiences, both physical (pain discomfort) and emotional (unpleasantness). Authors [57-60], believe that the level of hypnotic analgesia achieved in many of the patients in our sample was the result of positive modulation of brain networks critically involved in the pain matrix.

However, different treatment outcomes were observed for FM and CM patients, in which the latter clearly benefited more from hypnotic interventions.

CM patients showed statistically significant differences between initial and final scores for six SF36 domains: Physical Functioning, Physical Role, Emotional Role, General Health, Vitality and Social Functioning as well as improved scores for depression and anxiety levels after treatment. In comparison, FM patients did not show significant SF36 score improvements, although it is important to mention that 55% of FM patients did lower depression and anxiety scores for both state and trait, which is an interesting finding given the complex nature of the pathology and corroborates the fact that many patients report some degree of treatment satisfaction, whether or not they experience meaningful clinical pain relief [61].

Although both groups correspond to chronic pain patients, differences in the interplay between painful physiological inputs and central processing will shape their individual perception and response to these inputs. Also, other aspects related to personality, mood, coping mechanisms, traumatic life events, memories, expectations, level of function, underlying disease and extent of exposure to a chronic situation will influence the way patients respond to self-regulatory treatments [62,63].

CM generates a recurrent type of pain which can come and go over a life time, while FM is considered a disorder of the central nervous system with augmented peripheral facilitation and decreased inhibition [64-66]. In addition, FM is often accompanied by other somatic symptoms like fatigue, stiffness, sleep disorders, and mood disturbance [67]. Some clinicians believe FM symptoms are a manifestation of clinical depression, or of another psychiatric illness, while others believe FM is an illness in itself, often accompanied by depression and anxiety [68,69]. All these issues may ultimately influence treatment response.

In our sample, FM patients seemed to have experienced more intense suffering-related emotions involving depression and frustration, and to have undergone more traumatic experiences in their lives, possibly generating oversensitivity to painful perception [46,70]. In the fields of psychosomatics and health psychology, researchers have long known that traumatic experiences, anxiety and stress as well as psychological disturbances can exacerbate disease processes or show poor treatment outcomes [71-74].

On the other hand, CM patients have a tendency to hyper control, responding more often with internal tension, especially at work and during other achievement-related situations. Generally headache onset was preceded by resentment and anxiety over excessive demands or conflicts causing emotional distress, persistent negative self-talk and rumination. Patients were prone to repress feelings, especially those of anger which in turn increased the perception of stress and worsened migraine symptoms [75].

It is important to mention that most CM patients were employed, while half of the FM patients were un- or underemployed. There were more feelings of helplessness among FM patients than among CM patients, such that motivation and expectation of self-efficacy may have influenced outcomes in both groups. A possible indicator of this was that FM patients did less home practice, and argued that listening to audiotapes was not as effective as therapist-guided interventions. On the other hand, CM patients seemed more motivated to practice at home, which probably contributed to changes in the way they perceived stressors or even physical discomfort. Their emotional reactions were calmer and more detached, positively influencing physical symptoms that then became easier to manage.

It is possible that FM patients may have benefited more from suggestions specially tailored to target their particular psychological needs, including other suggestions aside from those for pain relief, to help improve psychological symptoms, such as to "let go" of unpleasant memories, problems, and feelings of helplessness, and increase ego-strength to overcome feelings of victimization, so commonly observed in this type of patients. An example might be: "As you are able to ignore feelings of discomfort more and more, you are free to consider other things and to move towards your own important life goals, leaving all discomfort behind".

Although it was not the purpose of the present study to correlate changes in psychological symptoms, physiological pain and psychological traits, it is important to recognize that psychological variables in both groups probably affected pain perception processes, as personality traits exert their largest effects on the secondary stage of pain affect [6]. Psychological status of a patient deserves special attention, in order to identify conditions that may interfere with treatment and that need to be addressed before pain management can begin.

Conclusions

The combination of anatomical, neurophysiological and psychological data helps us to understand the way in which sensory and affective dimensions of pain are interrelated and can be modulated by physiological, emotional and cognitive factors. Hypnotic suggestions are thought to modulate pain by decreasing or increasing neural activity within many brain pain matrix structures.

Especially in highly hypnotizable subjects, neural changes associated with mental relaxation, profound self-absorption and attention focalized on therapist suggestions, reduced monitoring and increased acceptance, facilitating the incorporation of alternative feelings and sensations associated with comfort and anesthesia.

These preliminary observations suggest that hypnosis can be effective in chronic pain management as well as to reduce anxiety and depression levels in the great majority of CM patients and in a minority of the FM population.

We think that hypnotherapy for chronic pain patients could be a useful aid, especially when applied as an adjunct to other psychological approaches such as CBT or OP.

It would be very interesting to conduct further investigations in larger patient cohorts with other types of pathology, as well as longitudinal studies to see how long the effects of hypnotic techniques last.

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