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Cognitive-behavioral therapy for patients with chronic pain

Implications of gender differences in empathy

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Abstract

Chronic pain is defined as persistent or recurrent pain lasting longer than 3 months; the severity of pain can be rated in terms of intensity, pain-related distress, and functional impairment. Researches have shown an association between psychosocial factors, such as empathic ability, and the severity of pain. Cognitive-behavioral therapy (CBT) is the most common psychologic intervention for individuals with chronic pain. The aim of this study was to investigate the effect of CBT on empathy in chronic pain patients, examining especially gender differences. In total, 89 patients with severe chronic pain (46 men and 43 women) underwent 8 sessions of CBT over the course of 4 weeks. Self-reported clinical symptoms were measured at the beginning and end of the CBT. Empathy was measured using the interpersonal reactivity index, and pain severity was assessed using the short-form McGill pain questionnaire. A comparison of male and female patients before CBT indicated that females showed higher levels of empathy in response to affective issues and reported greater affective pain than males. A mixed analysis of variance revealed that female patients showed higher levels of empathy than did male patients, both before and after CBT. We also found significant relationships between affective pain and empathy for others' personal distress in all patients. These results suggest that the effectiveness of CBT may be affected by chronic pain patients' level of empathy. Although the evident result was not shown in this study, the present findings imply that female patients may formulate excellent therapeutic alliance in CBT intervention that can lead to a clinical benefit.

Abbreviations: BAI = Beck Anxiety Inventory, BDI = Beck Depression Inventory, CBT = cognitive-behavioral therapy, CRPS = complex regional pain syndrome, EC = empathic concern, FS = fantasy scale, IRI = interpersonal reactivity index, PD = personal distress, PPI = present pain intensity, PRI = pain rating index, PT = perspective taking, SF-MPQ = short-form McGill pain questionnaire, VAS = visual analog scale, WHOQOL = World Health Organization quality of life abbreviated version.

Keywords: chronic pain, cognitive-behavioral therapy, empathy, gender differences

1. Introduction

Pain is a response to nociceptive stimuli and is often the driving force behind seeking treatment. Chronic pain tends to alter the psychologic state of being (and of mind) of those who experience it. Indeed, physical and emotional pain can be placed on the same continuum, but the evolution or transition to chronic pain is not obvious.[1–4] Chronic pain can involve a reward deficit syndrome or anti-reward processes, which may relate to ongoing circuit dysfunction. Increasing evidence suggests that the plasticity of neural circuits is responsible for the subtle changes over time that contribute to the behavioral manifestations of altered affective processes, including blunting of pleasurable responses and/or enhancement of depressed ones that accompany chronic pain.[1,3,5] One of phenotype of chronic severe pain is complex regional pain syndrome (CRPS). This chronic pain condition characterized by spontaneous pain, hyperalgesia, allodynia, and motor dysfunction, impairs the quality of life and social functioning of sufferers.[6,7] Most studies have provided compelling evidence that CRPS patients are more anxious and depressed than are healthy controls.[8] Additionally, disability and burden of cognitive impairments associated with depression pervasively impacts elementary and complex neurocognitive processes.[9] Although the mechanism underpinning CRPS remains unknown, investigators have proposed various hypotheses, including that CRPS is a systemic disease involving the central nervous system, the peripheral nervous system (ie, neuropathic), and associated interactions between the immune system and sensitive nociceptive nervous system transmissions.[10–12] Imaging studies in patients with CRPS have shown abnormalities in brain structure and functioning in regions associated with emotion, autonomic functioning, and pain perception.[13–16] The experience of pain and observation of others' painful injuries activate the anterior cingulate cortex and

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anterior insula, and these empathic responses are correlated with the intensity of pain.[17–20]

"Empathy" is a sense that there is a similarity between one's own feeling and the feeling expressed by others. It can be understood as an interaction between any 2 individuals, with one experiencing a feeling and the other sharing it.[21,22] In view of the subjectivity of chronic pain, understanding how patients experience pain and communicate it to others is crucial for accurate evaluation and treatment planning in clinical practice.[13] Given that empathy plays a key role in social interactions, the empathic ability of patients with chronic pain may influence their interactions with clinicians, the social support they receive from family or caregivers, their social functioning, and their quality of life in interpersonal contexts. In contrast to the abundant emphasis placed on others' empathy (eg, clinicians, caregivers, and spouses) in the evaluation and management of patients with chronic pain,[13,23–27] little attention has been devoted to the empathic abilities of the patients themselves.[13] Recent studies have shown that chronic pain patients lack empathy[13] and that the social emotions of patients with CRPS are impaired, providing evidence of defective socio-emotional perception in CRPS patients at the behavioral level.[6] Pain-related empathy was shown to be mediated by brain regions that represent the affective dimension of pain, but not by those that represent the sensory dimension.[6,20] Meanwhile, women typically have superior empathy compared with men, which seems to have a neurologic basis with sex differences in the structure and function of neural networks involved in empathy.[28,29] Tracy and Giummarra[28] has demonstrated a sex differences in empathy for pain are associated with divergent physiologic mechanisms using vagally mediated heart rate variability. Compared with men, women had superior trait empathy, especially empathic concern (EC) and affective distress when they imagine another person in pain from an injury.[28]

Cognitive-behavioral therapy (CBT), a form of psychotherapy, has recently been applied to patients with chronic pain. Several studies have found that, whether administered alone or in combination with medical treatment, CBT improved pain and related problems. Pain is affected by individual cognitions as well as by tissue injury, and the core premise of CBT is that maladaptive cognitions contribute to the maintenance of emotional distress and behavioral problems.[30] Previous studies have shown that CBT is effective for depression, anxiety, stress, and chronic pain.[31–34] Additionally, CBT has been reported to improve quality of life and activities of daily living, chronic headache, facial pain, arthralgia, and fibromyalgia.[35–40] CBT focuses on reducing pain and distress by modifying physical sensations, catastrophic thinking, and maladaptive behaviors.[30] Pieh et al[41] provided a evidence that women benefit more from multimodal pain therapy including CBT-oriented group program than men.

Given that men and women have shown different patterns of pain presentation and empathic abilities,[29,42] the present study examined the clinical characteristics and effects of CBT in patients with chronic pain according to gender. In addition, we evaluated the association of symptom severity of pain and empathic ability in patients with chronic pain. We hypothesized that female patients with chronic pain would score higher on empathic ability and exhibit greater clinical improvement than would male patients before and after CBT. We also expected that affective component of pain would be specifically related to empathic ability in patients with chronic pain.

2. Methods

2.1. Participants

We recruited 89 patients with severe chronic pain from the Seoul National University Hospital Psychiatric Pain Clinic: 12 patients were diagnosed with CPRS, 4 were diagnosed with only fibromyalgia alone, and 73 patients were diagnosed with multiple symptoms (19 CRPS, 20 fibromyalgia, 39 back pain, and 41 headache). Forty-five patients were also diagnosed with somatic symptom disorder, 2 patients were diagnosed with visceral pain, and 6 patients were diagnosed with neuropathic pain. Additionally, 3 patients were diagnosed with post-traumatic stress disorder, and 1 patient was diagnosed with panic disorder. Severe pain was defined as a score greater than 7 on a 1- to 10-point visual analog scale (VAS). All participants were 18 to 70 years of age and suffered from chronic pain lasting at least 3 months. None of the participants had an acute illness that could have affected their pain or psychiatric symptoms during 1 month prior to CBT. Demographic information on educational level, occupation, and marital status were obtained. Following completion of CBT, 39 of the 89 patients completed the self-report questionnaire (20 men and 19 women; 10 CRPS, 11 fibromyalgia, 22 back pain, 21 headache). The patients received routine care throughout the CBT. The study protocol was approved by the Seoul National University Hospital Institutional Review Board (Seoul, South Korea).

2.2. CBT for chronic pain

The patients participated in group CBT twice per week for a total of 8 sessions over a 4-week period. Groups were usually composed of up of 5 or 6 patients, and interventions were delivered by an experienced psychiatrist. We used mindfulness-based CBT, which has been found to reduce self-reported pain and pain-related behaviors in patients with chronic pain.[43] The format of the sessions included a review of the previous session, an introduction of new principles, a review of the new content, and assignment of homework. The foci of the 8 sessions were as follows: Session 1: introduction to CBT, training in abdominal breathing, and training in the use of the daily pain, mood, and activity charts; Session 2: identification of automatic thoughts (recording automatic thoughts) and the first part of progressive muscle relaxation; Session 3: evaluation of automatic thoughts (identification of thinking errors) and the second part of progressive muscle relaxation; Session 4: correction of automatic thoughts (alternative thoughts) and the third part of progressive muscle relaxation; Session 5: understanding the core beliefs related to pain and the first part of mindfulness meditation; Session 6: problem-solving strategies and the second part of mindfulness meditation; Session 7: assertiveness skills training, coping with stress-related pain, and the third part of mindfulness meditation; and Session 8: final remarks and strategies for preventing relapse.

2.3. Clinical measures

2.3.1. Interpersonal reactivity index. The Korean version of the Interpersonal reactivity index (IRI)[44,45] was used to measure multiple dimensions of empathy. The IRI is a 28-item self-report multidimensional scale that measures the cognitive and emotional dimensions of empathy. The scale consists of four 7-item subscales, each of which addresses an aspect of the global concept of empathy; the perspective taking (PT) subscale and the fantasy subscale (FS) are used to measure the cognitive dimension, and

the EC and personal distress (PD) subscales are used to measure the emotional dimension. The total score for each subscale ranges from 0 to 28. The PT subscale assesses the tendency to employ a psychologic perspective in interaction with others. The FS measures the tendency to get involved in fictional stories and imagine the feelings and actions of fictitious characters in books, movies, and plays. The EC subscale assesses sympathy and concern for others, and the PD subscale measures feelings of personal anxiety and unease in tense interpersonal settings.[44] As the IRI is not intended to measure overall empathy, each subscale should be used separately. This instrument is intended to provide continuous measures of empathy-related dimensions rather than a categorical measure that stratifies study participants into groups such as "high empathy" and "low empathy."[46]

2.3.2. Short-form McGill pain questionnaire. Pain intensity was assessed using the short-form McGill pain questionnaire (SF-MPQ), a widely used short version of the MPQ.[47] The main component of the SF-MPQ consists of 15 pain rating index (PRI) descriptors (11 sensory and 4 affective) that are rated on an intensity scale from 0 (none) to 3 (severe). The SF-MPQ includes a VAS and the present pain intensity (PPI) index drawn from the standard MPQ.[48] Scores on the PPI range from 1 (mild) to 5 (excruciating). The Korean version of the SF-MPQ has been shown to be cross-culturally equivalent to the original questionnaire, with demonstrated reliability and validity.[49]

2.3.3. Beck depression inventory. Depression was measured using the 21-item Beck depression inventory (BDI).[50] Each item consists of 4 statements reflecting different levels of severity of a particular symptom experienced during the past week. Total scores from 0 to 13 are classified as reflecting minimal depression, those from 14 to 19 as reflecting mild depression, those from 20 to 28 as reflecting moderate depression, and those from 29 to 63 are classified as reflecting severe depression.[50] We used the Korean version of the BDI, which has demonstrated reliability and validity.[51]

2.3.4. Beck anxiety inventory. The Korean version of the Beck anxiety inventory (BAI)[52,53], which consists of 21 items rated on a 4-point scale, measures the severity of anxiety experienced during the past week. Total scores from 0 to 7 indicate a minimal level of anxiety, those from 8 to 15 indicate mild anxiety, those from 16 to 25 indicate moderate anxiety, and those from 26 to 63 indicate severe anxiety.[54]

2.3.5. World Health Organization quality of life-abbreviated version. Quality of life was assessed using the 26-item Korean version of the World Health Organization quality of life-abbreviated version (WHOQOL-BREF).[55,56] This instrument is a self-report multidimensional measure that addresses the important aspects of life, thereby allowing for a comprehensive assessment of quality of life. It investigates the following 4 domains: the domain of physical health, the psychologic domain, the domain of social relationships, and the environmental domain. WHOQOL has been shown to assess adequately domains relevant to quality of life.[56]

2.4. Statistical analysis

The Statistical Package for the Social Sciences version 21.0 (IBM Corp, Armonk, NY) was used to analyze demographic and clinical characteristics. We conducted data cleaning prior to the analysis. The demographic characteristics and baseline clinical features of participants were compared according to gender using chi-square and independent *t* tests. A repeated-measures analysis of variance (rmANOVA) was used to compare the self-reported clinical data of male and female patients who completed questionnaires both pre- and post-CBT (male, n = 20; female, n = 19). Furthermore, a Pearson's correlation analysis was used to assess the pre-CBT associations between empathic ability and subjective pain severity scores. *P*-values $<.05$ were considered significant.

3. Results

3.1. Demographic and clinical characteristics

The mean age was 44.32 ± 10.75 years (males = 43.27 ± 10.37 years; females = 45.45 ± 11.17 years). We found no significant differences between males and females in age, educational level, marital status, and cohabiting status. Diagnostic distribution between males and females were somewhat different. CRPS were prominent than fibromyalgia in male patients; however, female patients were diagnosed more with fibromyalgia than CRPS ($\chi^2 = 9.670$, $P = .046$). Males were more likely to have jobs than females ($\chi^2 = 3.986$, $P = .046$).

Females had higher level of affective score on the SF-MPQ PRI than males ($t(80) = -2.384$, $P = .020$), while sensory score and overall pain severity on the SF-MPQ were comparable in females and males. Also, female patients showed higher scores on emotional dimension of IRI-EC ($t(86) = -2.760$, $P = .007$) and IRI-PD ($t(87) = -2.761$, $P = .007$) than males. For the WHO-QOL, only environmental subscore was higher in females than that of males ($t(87) = -2.078$, $P = .041$). These results are presented in Table 1.

3.2. Clinical characteristics before and after CBT according to gender

Table 2 shows the clinical changes after mindfulness-based CBT among male and female patients. There was no significant main effect of time and group×time interaction effect for any clinical variables. However, we found significant group effects for gender in IRI-FS ($F(1, 36) = 8.904$, $P = .005$, $\eta_p^2 = 0.198$) and IRI-EC ($F(1, 37) = 6.869$, $P = .013$, $\eta_p^2 = 0.157$) scores. Female patients had higher pre- and post-CBT IRI-FS and IRI-EC subscale scores compared with male patients (Fig. 1). Both before and after CBT, female patients scored higher in all 4 domains of empathic ability than did male patients, although the statistical significance of these differences varied.

3.3. Correlation between pre-CBT empathy and pain severity

We also examined the correlations between each subscale of the IRI and the pain and clinical measures in participants. Table 3 shows the correlations between the pre-CBT clinical scales. SF-MPQ PRI affective scores were positively correlated with IRI-PD ($r = 0.390$, $P < .001$, Fig. 2), BDI ($r = 0.538$, $P < .001$), and BAI ($r = 0.584$, $P < .001$) scores. SF-MPQ PRI affective scores were negatively correlated with all aspects of the WHOQOL subscales (physical health: $r = -0.460$, $P < .001$; psychological: $r = -0.466$, $P < .001$; social relationships: $r = -0.356$, $P = .001$; environmental: $r = -0.331$, $P = .002$). There were no significant associations between SF-MPQ PRI sensory scores and IRI subscales. However, SF-MPQ PRI sensory scores were also positively

Table 1

Baseline demographic and clinical characteristics of patients with chronic pain.

	Male (n= 46)	Female (n = 43)	x2 or *t*	*P*
Demographics				
Age (y)	43.27 ± 10.37	45.45 ± 11.17	−0.900	.371
Diagnosis (%)				
CRPS	25.5	12.7	9.670*	.046
Fibromyalgia	6.4	17.6		
Back pain	20.2	20.6		
Headache	19.1	22.5		
Others	28.7	26.5		
Level of education (%)				
Elementary school	4.4	2.3	3.165	.531
Middle school	11.1	7.0		
High school	40.0	46.5		
Undergraduate	42.2	34.9		
Graduate	2.2	9.3		
Marital status (%)				
Single	44.4	32.5	4.229	.238
Married	48.9	52.5		
Divorced	6.7	7.5		
Bereavement	0.0	7.5		
Cohabitant (%)				
Yes/no	78.9/21.1	89.5/10.5	1.583	.208
Job (%)				
Yes/no	35.6/64.4	16.7/83.3	3.986*	.046
Clinical variable				
IRI-PT	20.46±4.92	22.28±5.07	−1.722	.089
IRI-FS	19.04±5.99	21.47±6.46	−1.824*	.072
IRI-EC	23.22±6.32	26.50±4.65	−2.760*	.007
IRI-PD	22.26±4.83	25.38±5.82	−2.761*	.007
SF-MPQ PRI sensory	20.34±7.92	21.73±8.35	−0.767	.445
SF-MPQ PRI affective	6.66±3.50	8.37±2.90	−2.384*	.020
SF-MPQ PPI	3.33±0.95	3.18±0.99	0.673	.503
SF-MPQ VAS	7.04±1.99	6.36±3.16	1.065	.292
BDI	31.67±13.42	31.51±12.26	0.059	.953
BAI	33.01±13.61	35.94±15.65	−0.944	.348
WHOQOL physical health	6.86±2.18	6.72±2.36	0.275	.784
WHOQOL psychological	8.01±2.57	7.52±3.02	0.825	.412
WHOQOL social relationships	9.62±2.71	10.47±3.09	−1.370	.174
WHOQOL environmental	9.16±2.39	10.33±2.88	−2.078*	.041

Continuous variables are presented as mean ± standard deviation.

CRPS = complex regional pain syndrome, IRI = interpersonal reactivity index, PT = perspective taking, FS = fantasy scale, EC = empathic concern, PD = personal distress, SF-MPQ = short-form McGill pain questionnaire, PRI = pain rating index, PPI = present pain intensity, VAS= visual analog scale, BDI = Beck Depression Inventory, BAI = Beck Anxiety Inventory, WHOQOL = World Health Organization quality of life abbreviated version. Others on diagnosis include somatic symptom disorder, visceral pain, neuropathic pain, post-traumatic stress disorder, and panic disorder.

* $P < .05$.

correlated with the BDI and BAI, and negatively correlated with all of the WHOQOL subscale scores.