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The Effectiveness of Cognitive-Behavioral Therapy on Pain Management Self-Efficacy and Reduction of Worry in Patients with Chronic Pain

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ABSTRACT

Objective: Chronic pain is one of the most prevalent health problems worldwide, associated not only with physical suffering but also with numerous psychological consequences, including reduced pain management self-efficacy and chronic pain-related worry. Cognitive-Behavioral Therapy (CBT) is an evidence-based psychological approach with high potential for targeting these variables. The present study aimed to determine the effectiveness of CBT on pain management self-efficacy and reduction of chronic pain-related worry in patients with chronic pain.

Methods: This study was a randomized clinical trial with a pretest-posttest design and a control group. The statistical population included all patients with chronic pain referred to pain clinics in Tehran, Iran, in 2024. A total of 30 patients were selected using convenience sampling and then randomly assigned to two groups: experimental (n = 15) and control (n = 15). The experimental group received 10 sessions of 90-minute CBT based on a standard pain management protocol, while the control group was placed on a waiting list. Research instruments included the Pain Self-Efficacy Questionnaire (PSEQ) and the Chronic Worry Scale (CWS) for chronic pain. Data were analyzed using multivariate analysis of covariance (MANCOVA) with SPSS version 26.

Results: The results showed that CBT significantly increased pain management self-efficacy (p < .001) and reduced chronic pain-related worry (p < .001) in the experimental group compared with the control group. The effect size (eta squared) was .62 for self-efficacy and .58 for worry, indicating moderate to large effectiveness of CBT.

Conclusions: Cognitive-Behavioral Therapy, through restructuring dysfunctional beliefs about pain, reducing pain catastrophizing, and teaching coping skills, is an effective tool for increasing pain management self-efficacy and reducing pain-specific worry in patients with chronic pain. It is recommended that CBT be integrated as a complementary treatment in pain clinics.

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Introduction

Chronic pain, defined as persistent pain lasting more than three months, is one of the most challenging health problems worldwide. The global prevalence of chronic pain among adults has been reported to range from 20% to 30% (Cohen et al., 2021), and this condition not only imposes substantial economic costs on healthcare systems but also severely affects patients' quality of life (Dalhamer et al., 2018). Unlike acute pain, which serves a warning and protective function, chronic pain often lacks adaptive utility and becomes a disabling phenomenon that affects all aspects of an individual's life (Gatchel et al., 2014). Contemporary biopsychosocial models conceptualize chronic pain not merely as a sensory experience but as a multidimensional phenomenon influenced by cognitive, emotional, and behavioral factors (Nicholas & Blyth, 2016). Within this framework, two cognitive-emotional variables play key roles in the persistence and exacerbation of disability resulting from chronic pain: pain management self-efficacy and pain-related worry. Pain management self-efficacy, introduced by Bandura (1977) within social cognitive theory, refers to an individual's belief in their ability to perform daily activities and function effectively despite the presence of pain. The Pain Self-Efficacy Questionnaire (PSEQ), developed by Nicholas (1989), is one of the most widely validated instruments for assessing this construct. Extensive psychometric studies have shown that the PSEQ has high reliability and validity, and low scores are strong predictors of functional disability and poor treatment response (Costa et al., 2017; Nicholas et al., 2019). Research has shown that low self-efficacy is associated with greater reported pain intensity, reduced physical activity, and increased use of analgesic medications (Jackson et al., 2014).

On the other hand, worry is defined as a chain of negative, repetitive, and relatively uncontrollable thoughts about potentially threatening future outcomes (Borkovec et al., 1983). In the context of chronic pain, chronic pain-related worry refers to specific and recurrent concerns about the nature, cause, persistence, and consequences of pain (Harley & Schulin, 2014). Unlike general measures of worry, such as the PSWQ, which assess transdiagnostic worry, specific measures of chronic pain-related worry, such as the Chronic Worry Scale (CWS), target content related to pain and its consequences (Eccleston et al., 2012). This scale was developed by Simpson et al. (2018) and consists of 12 items across three domains: "worry about worsening pain," "worry about future occupational and financial circumstances," and "worry about others' judgments." Chronic pain-related worry is strongly associated with activity avoidance, pain catastrophizing, and functional

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disability (Aldrich et al., 2019). Cognitive-Behavioral Therapy (CBT), as an evidence-based psychological approach, has been widely used in recent decades to manage chronic pain (Ade et al., 2014). CBT is based on the assumption that thoughts, emotions, and behaviors mutually influence one another; therefore, identifying and modifying dysfunctional thoughts and maladaptive behaviors related to pain can improve the pain experience and its consequences (Williams et al., 2012). Standard CBT protocols for chronic pain typically include the following components: psychoeducation about the biopsychosocial nature of pain, cognitive restructuring to challenge catastrophic thoughts, gradual behavioral activation, stress-coping skills training, relaxation techniques, and relapse prevention (Norell et al., 2016). Extensive empirical evidence supports the effectiveness of CBT in managing chronic pain. A comprehensive meta-analysis by Yang et al. (2022) showed that, compared with control groups (waiting list/usual care), CBT significantly improved disability, pain intensity, fear avoidance, and self-efficacy in patients with chronic low back pain. In addition, another systematic review and meta-analysis by Zhang et al. (2026) showed that combining CBT with exercise produced small to moderate improvements in pain intensity and functional disability, and these improvements were maintained at 3- and 6-month follow-ups. However, despite strong evidence regarding the overall effectiveness of CBT, the precise mechanisms of change and the factors that predict treatment response remain incompletely understood (Fordham et al., 2021). In other words, we know that CBT is effective, but exactly how is this effectiveness achieved? Mediation studies have attempted to answer this question. Murillo et al. (2022), in a meta-analysis of 13 mediation studies, showed that reductions in pain catastrophizing and pain-related fear, as well as increases in self-efficacy, significantly mediated the effects of CBT on disability, but not on pain intensity. This finding supports the notion that CBT operates primarily by changing individuals' cognitive appraisals of pain and their perceived ability to cope with it. In addition, recent research has shown that the relationship between cognitive changes and treatment outcomes may be bidirectional. Burns et al. (2020), in a randomized controlled trial, showed that changes in catastrophizing and self-efficacy at midtreatment predicted outcomes at the end of treatment; conversely, early changes in outcomes also predicted subsequent changes in cognitive variables. This finding indicates a complex reciprocal relationship between cognition and behavior. Another important finding is that targeting self-efficacy may be more important than traditional cognitive restructuring. Van der et al. (2021),

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in a longitudinal study of 524 patients with chronic low back pain, showed that the relative contribution of self-efficacy to predicting posttreatment functional disability was 5.67 times greater than that of catastrophizing and 9.75 times greater than that of fear of movement. This finding has important clinical implications. The present study was designed to address existing research gaps and was guided by the following main question: Is Cognitive-Behavioral Therapy effective in increasing pain management self-efficacy and reducing chronic pain-related worry in patients with chronic pain? The research hypotheses were: (1) Cognitive-Behavioral Therapy significantly increases pain management self-efficacy in patients with chronic pain; and (2) Cognitive-Behavioral Therapy significantly reduces the level of chronic pain-related worry in patients with chronic pain.

Materials and Methods

The present study was a randomized clinical trial with a pretest-posttest design and a control group. This design is considered a type of quasi-experimental design with a control group and is regarded as the gold standard for evaluating the effectiveness of standardized psychological interventions. The statistical population consisted of all patients with chronic pain (with a minimum pain duration of 6 months) who visited pain clinics and specialized treatment centers in Shiraz from October 2025 to March 2026. The sample size was estimated at 30 patients (15 in the experimental group and 15 in the control group) based on similar studies (e.g., Murillo et al., 2022), with statistical power of .80 and a significance level of .05. Convenience sampling was used, after which participants were randomly assigned to the two groups using a random number table.

The inclusion criteria were as follows:

(a) a diagnosis of chronic pain (at least 6 months of pain history) by a specialist physician; (b) age between 18 and 65 years; (c) a pretest score below 40 on the Pain Self-Efficacy Questionnaire (PSEQ); (d) a pretest score above 35 on the Chronic Worry Scale (CWS), indicating high worry; (e) no concurrent receipt of other psychotherapy; (f) ability to participate in group sessions for 10 weeks; and (g) written informed consent to participate in the study.

The exclusion criteria were as follows:

(a) absence from more than two intervention sessions; (b) presence of a severe psychiatric disorder, such as psychosis, bipolar I disorder with active symptoms, or major depressive disorder with

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suicidal ideation; (c) initiation of a new pharmacological treatment for pain during the intervention period; and (d) diagnosis of a malignant disease or active autoimmune disease during the study period.

Instruments

The Pain Self-Efficacy Questionnaire (PSEQ) was developed by Nicholas (1989) to assess an individual's belief in their ability to perform daily activities and tasks despite the presence of pain. The questionnaire consists of 10 items (e.g., "I can do most of my daily activities despite the pain"), with responses scored on a 7-point Likert scale ranging from 0 (not at all confident) to 6 (completely confident). Total scores range from 0 to 60, with higher scores indicating greater self-efficacy in pain management. Psychometric properties: A study by Costa, Asghari, and Nicholas (2017), using item response theory in 1,511 patients with chronic pain, showed that all PSEQ items had excellent psychometric performance. Cronbach's alpha coefficients for the questionnaire have ranged from .85 to .95 across different studies. In the present study, the test-retest reliability coefficient was .87 and Cronbach's alpha coefficient was .89.

The Chronic Worry Scale (CWS) was developed by Simpson et al. (2018) to assess specific and recurrent worries related to chronic pain. The scale consists of 12 items divided into three four-item subscales: (1) worry about worsening pain (e.g., "I worry that I will wake up with worse pain tomorrow morning"), (2) worry about occupational and financial future (e.g., "I worry that I will not be able to keep my job because of my pain"), and (3) worry about others' judgments (e.g., "I worry that others will think my symptoms are not real"). Responses are scored on a 5-point Likert scale ranging from 1 (never) to 5 (always). Total scores range from 12 to 60, with higher scores indicating greater chronic pain-related worry. Psychometric properties: Simpson et al. (2018) confirmed the three-factor structure of the scale using confirmatory factor analysis and reported excellent internal consistency (Cronbach's alpha = .92) and good test-retest reliability (r = .85). The convergent validity of the CWS showed a correlation coefficient of .76 with the Pain Catastrophizing Scale (PCS) and .69 with the Penn State Worry Questionnaire (PSWQ), indicating good convergent validity. In the present study, Cronbach's alpha coefficient was .93.

The experimental group received 10 90-minute sessions of Cognitive-Behavioral Therapy in a group format. The session content was developed based on a standard CBT protocol for chronic pain management (Ade et al., 2014). A summary of the session content is presented in Table 1.

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Table 1

Summary of Cognitive-Behavioral Therapy Session Content

Session	Session Title	Main Session Content
1	Psychoeducation	Introduction to the biopsychosocial model of pain; distinction between acute and chronic pain
2	ABC Model	Teaching the relationship between thoughts, emotions, and behaviors; identification of automatic thoughts
3	Cognitive Restructuring	Identification of cognitive distortions; challenging catastrophic thoughts
4	Self-Efficacy and Goal Setting	Introduction to the concept of self-efficacy; setting SMART goals
5	Behavioral Activation	Training in activity pacing; breaking the cycle of overactivity and failure
6	Relaxation	Diaphragmatic breathing, progressive muscle relaxation, and guided imagery
7	Worry Management	Worry time technique, thought stopping, and acceptance of worry-provoking thoughts
8	Problem Solving	Six-step problem-solving model; application to pain-related challenges
9	Relapse Prevention	Identification of high-risk situations; development of an action plan
10	Summary and Consolidation	Review of achievements; planning for booster sessions

The control group was placed on a waiting list throughout the study and received no specific psychological intervention. To comply with research ethics, participants in the control group were assured that they could receive 10 CBT sessions free of charge after completion of the study.

Procedure

The researchers, in coordination with the selected pain clinics, published a call for participation in the study. Eligible applicants first underwent a diagnostic interview. Written informed consent was then obtained from all participants. A pretest was administered to both groups. The experimental group then underwent the CBT intervention for 10 weeks. Immediately after completion of the tenth session, a posttest was administered to both groups.

Data Analysis

The data were analyzed using SPSS version 26. A significance level of .05 was set for all tests. First, the assumptions of normality (Shapiro-Wilk test), homogeneity of variances (Levene's test), and homogeneity of regression slopes were examined. Subsequently, given the presence of two dependent variables (self-efficacy and worry) and the need to control for pretest scores, multivariate analysis of covariance (MANCOVA) was used.

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Results

Sample Demographic Characteristics

Of the 30 participants in this study, 20 (66.7%) were women and 10 (33.3%) were men. The mean age of the participants was 42.4 years (standard deviation = 10.2, range = 23-64 years). Regarding the type of chronic pain, 15 participants (50%) had chronic low back pain, 8 (26.7%) had fibromyalgia, 5 (16.7%) had neuropathic pain, and 2 (6.7%) had knee osteoarthritis. The mean duration of chronic pain was 8.4 years (standard deviation = 5.3). Statistical tests showed no significant differences between the two groups in any demographic variables ($p > .05$).

The mean and standard deviation of pain management self-efficacy and worry scores in the two groups at the pretest and posttest stages are presented in Table 2.

Table 2

Descriptive Indices of Self-Efficacy and Worry Scores in the Experimental and Control Groups

Variable	Stage	Experimental Group / Mean (Standard Deviation)	Control Group / Mean (Standard Deviation)
Self-Efficacy	Pretest	28.4 (6.7)	29.1 (7.2)
Self-Efficacy	Posttest	45.7 (8.3)	30.2 (7.8)
Worry	Pretest	46.3 (6.5)	45.9 (7.1)
Worry	Posttest	28.6 (7.4)	44.2 (6.8)

As shown in Table 2, there was no significant difference between the two groups at the pretest stage. At the posttest stage, the experimental group showed substantial improvement in both variables: the mean self-efficacy score increased from 28.4 to 45.7 (a 60.9% increase), while the mean worry score decreased from 46.3 to 28.6 (a 38.2% decrease). In contrast, the control group showed minimal changes.

Assessment of Statistical Assumptions

The results of the Shapiro-Wilk test showed that the score distributions were normal in both groups and for both variables ($p < .05$). Levene's test results showed that the variances of self-efficacy scores ($F = 1.24$, $p = .27$) and worry scores ($F = 0.89$, $p = .35$) were homogeneous between the two groups. The results of the pretest × group interaction for self-efficacy ($F = 0.67$, $p = .42$) and worry ($F = 0.45$, $p = .51$) were not significant, indicating that the assumption of homogeneity of regression slopes was met.

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Multivariate Analysis of Covariance (MANCOVA)

The MANCOVA results showed that the effect of group (experimental vs. control) on the linear combination of the dependent variables, after controlling for pretest scores, was significant (Pillai's Trace = 0.85, $F = 78.34$, $p < .001$). The eta squared for the group effect was .85, indicating a very large effect size.

The results of the between-subjects tests are presented in Table 3.

Table 3

Results of Analysis of Covariance (ANCOVA) Comparing Mean Self-Efficacy and Worry Scores Between the Two Groups

Dependent Variable	Source of Variation	Sum of Squares	*df*	Mean Square	*F*	p-value	Partial η²
Self-Efficacy	Pretest	245.3	1	245.3	12.45	.002	.31
Self-Efficacy	Group	1820.6	1	1820.6	92.40	> .001	.62
Self-Efficacy	Error	531.8	27	19.7	-	-	-
Worry	Pretest	231.2	1	231.2	6.89	.014	.20
Worry	Group	3250.4	1	3250.4	96.80	> .001	.58
Worry	Error	906.7	27	33.6	-	-	-

As shown in Table 3, after controlling for pretest scores, there was a significant difference between the two groups in both variables:

1. Pain management self-efficacy: The adjusted mean self-efficacy score in the experimental group (46.1) was significantly higher than that in the control group (29.9). The eta squared indicates that 62% of the variance in self-efficacy after the intervention was explained by group membership, representing a large effect size.

2. Chronic pain-related worry: The adjusted mean worry score in the experimental group (27.8) was significantly lower than that in the control group (45.1). The eta squared indicates that 58% of the variance in worry after the intervention was explained by group membership, again representing a large effect size.

Discussion

The present study was conducted to examine the effectiveness of Cognitive-Behavioral Therapy on two important psychological variables in patients with chronic pain: pain management self-efficacy and pain-specific worry. The findings clearly showed that CBT significantly increased self-efficacy and reduced chronic pain-related worry compared with the control group. These findings are consistent with a substantial body of international evidence.

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Pain management self-efficacy: The significant increase in self-efficacy in the CBT group is consistent with the findings of the meta-analysis by Yang et al. (2022), which showed that CBT significantly improves self-efficacy in patients with chronic low back pain. In addition, the findings of van Hooff et al. (2021), which showed that self-efficacy is the strongest predictor of posttreatment functional disability, further underscore the clinical importance of this finding. Three possible mechanisms underlying the increase in self-efficacy are: (1) mastery experiences through gradual behavioral activation, (2) cognitive restructuring and challenging catastrophic thoughts, and (3) observational learning through witnessing the success of other group members.

Chronic pain-related worry: The substantial reduction in worry in the experimental group is another important finding. Chronic worry is one of the main factors contributing to the transition from acute to chronic pain and the exacerbation of disability (Aldrich et al., 2019). The findings of the present study suggest that CBT reduces pain-specific worry by targeting several components: (1) cognitive restructuring to challenge worry-provoking thoughts, (2) the worry time technique to disrupt the pattern of chronic worry, (3) problem solving to transform passive worry into active engagement, and (4) relaxation to reduce physiological arousal. The use of the specialized CWS rather than a general worry scale provided greater sensitivity to changes in pain-related worries.

The findings of this study support the fear-avoidance model (Waddell et al., 1993), which predicts that catastrophic interpretations of pain lead to fear of movement and ultimately to activity avoidance and disability. The present study showed that CBT can interrupt this vicious cycle by reducing chronic pain-related worry.

The present study showed that Cognitive-Behavioral Therapy significantly increased pain management self-efficacy and reduced chronic pain-related worry in patients with chronic pain, with large effect sizes. These findings are consistent with established international meta-analyses and have important clinical implications for chronic pain management in Iran. Health policymakers, pain clinic managers, and clinical psychologists are recommended to integrate evidence-based CBT as an essential component of comprehensive chronic pain management programs.

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Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by the ethics committee of Islamic Azad University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

All authors contributed to the study conception and design, material preparation, data collection, and analysis. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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