

The Impact of Web-Based Cognitive-Behavioral Therapy on Pain Self-Efficacy in Patients with Rheumatoid Arthritis

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ABSTRACT

Objective: This study aims to assess the effectiveness of web-based cognitive-behavioral therapy (CBT) in enhancing pain self-efficacy among patients diagnosed with rheumatoid arthritis (RA), a chronic condition characterized by significant pain and functional limitations.

Methods and Materials: Employing a quasi-experimental design, the study recruited adult RA patients aged 30-60 years from specialized clinics in Mashhad, Iran. Participants were randomly assigned to either the intervention group, which received web-based CBT sessions focused on managing pain and improving self-efficacy, or the control group, which received no such intervention. The intervention consisted of eight sessions designed to educate patients on pain management, cognitive restructuring, and coping strategies. Data on pain self-efficacy were collected at three points: pre-intervention, immediately post-intervention, and at a follow-up session using the Pain Self-Efficacy Questionnaire (PSEQ). Data were analyzed with analysis of variance with repeated measurements and post-hoc tests using SPSS-22.

Findings: Statistical analysis revealed significant improvements in pain self-efficacy scores in the intervention group compared to the control group at post-test and follow-up stages ($p < 0.001$).

Conclusion: Web-based cognitive-behavioral therapy significantly improves pain self-efficacy in patients with rheumatoid arthritis, providing a feasible and effective approach to managing chronic pain and enhancing patients' beliefs in their ability to control pain.

Keywords: Web-Based Cognitive-Behavioral Therapy, Pain Self-Efficacy, Rheumatoid Arthritis.

1. Introduction

In chronic pain disorders such as rheumatoid arthritis, there are often negative outcomes in terms of both physical and mental health. The psychological effects on rheumatoid arthritis have been made apparent in various studies, in that patients report a decrease in quality of life due to physical factors such as pain and psychological factors such as negative mood (Ferwerda et al., 2018).

Among a wide range of biopsychosocial factors that contribute to the experience and impact of pain and disability in rheumatoid arthritis, psychological factors have received significant attention (Meade et al., 2018). One of these positive variables, known as pain coping resources, is pain self-efficacy (Ensandoost et al., 2021). Self-efficacy is a broad and extensive concept, referring to individuals' beliefs in their ability to perform specific tasks and achieve desired outcomes, while self-efficacy in the sense of mastery in a specific domain or task, rather than mastery in a general sense, has been considered (Sayed Alitabar & Goli, 2023). Pain self-efficacy is one of the cognitive-social factors that significantly affects the amount and quality of pain experience in patients. Pain self-efficacy refers to the individual's confidence in their ability to maintain function despite the presence of pain, and its role in improving cognitive disabilities related to pain has been confirmed (Sahraee Darian et al., 2017; Skidmore et al., 2015); because individuals with low self-efficacy, instead of solving the problem and dealing appropriately, avoid it, give up on challenges; they do not show much resistance and perseverance and do not deal realistically with issues and problems that arise (Parsakia et al., 2024). Living with chronic pain causes periodic psychological stresses that often accompany double suffering in patients, and with the reduction of emotional abilities and emotional reserve, it leads to the weakening of the patient's morale and the emergence of learned helplessness (Skidmore et al., 2015).

Research has shown that cognitive-behavioral interventions can improve the physical and mental functioning of patients (Hosseini & Robati 2021). Cognitive-behavioral therapy is a combination treatment based on behavior therapy and primarily cognitive therapy, creating a new attitude towards humans and the basis of pathology. This approach, in fact, means the foundations and cognitive perspectives within the framework of behaviorism, meaning that it is measurable and evaluable, and using this possibility, the patient can measure their condition compared to the past. While the cognitive-behavioral perspective is recognized as

a new approach, it has attracted a lot of research attention, and the majority of research on therapeutic methods has been devoted to this style of therapy (Goldin et al., 2012). On the other hand, offering interventions online will allow for broader implementation and reduce travel burdens for patients. Different results have been reported using web-based interventions in improving the psychological and physical functioning of patients with chronic pain (Ferwerda et al., 2018) Although these effects are promising, many questions remain about the importance of therapist guidance, customization to patient individual characteristics, attrition rates, and other issues. Internet-based cognitive-behavioral interventions with therapist guidance, designed individually for patients with rheumatoid arthritis with chronic pain, have not been reported. The advantages of internet-based therapy, including increased flexibility in terms of location and time, may make these treatments feasible for widespread implementation (Lindgaard et al., 2020; Lundström et al., 2022; Luyster et al., 2020). Although sufficient evidence about the cost-effectiveness of internet-based treatment is not yet available, preliminary results indicate that such interventions are a method for improving mental health and are cost-effective, especially when guidance is provided by a psychologist (Matsumoto et al., 2022; Milgrom et al., 2021; Wisman et al., 2023). In this direction, many studies have referred to the effectiveness of cognitive-behavioral therapy and online intervention on many psychological variables (Azimi et al., 2017; Ferwerda et al., 2018; Han & Kim, 2022; Kalmbach et al., 2020; Lindgaard et al., 2020; Lundström et al., 2022; Luyster et al., 2020; Matsumoto et al., 2022; Milgrom et al., 2021; Wisman et al., 2023). However, to date, no research has simultaneously addressed web-based cognitive-behavioral therapy on pain self-efficacy in patients with rheumatoid arthritis. Therefore, the present study was conducted with the aim of examining the effect of web-based cognitive-behavioral therapy on pain self-efficacy in patients with rheumatoid arthritis.

2. Methods and Materials

2.1. Study Design and Participants

The present study was semi-experimental (quasi-experimental) with both test and control groups, employing a pre-test – post-test design. The study population consisted of all adults aged 30 to 60 years with rheumatoid arthritis visiting the clinics of Dr. Joukar, a rheumatology subspecialist, and Dr. Akbari, a rheumatology subspecialist, in the city of Mashhad. The research was conducted in the

timeframe from the beginning of April 2022 to the end of October 2022. A total of 36 adults aged 30 to 60 years with rheumatoid arthritis visiting the clinics of Dr. Joukar and Dr. Akbari in Mashhad were selected from the research population based on the entry criteria. After consultation with the esteemed advisor and considering the probability of attrition, 21 individuals were assigned to the intervention group and 15 to the control group. Inclusion criteria were: age 30-60 years, diagnosed with rheumatoid arthritis by a rheumatology specialist, at least two years since the diagnosis of rheumatoid arthritis, not suffering from any known mental disorders such as depression, possessing at least basic literacy, and willingness and consent to participate in the training course. Exclusion criteria included: unwillingness to continue cooperation, absence in more than two training sessions, needing changes in medical treatment plan, hospitalization during the research, or death during the research.

2.2. Measures

2.2.1. Pain Self-Efficacy

Pain Self-Efficacy Questionnaire (PSEQ) is a ten-item questionnaire based on Bandura's theory about self-efficacy and was created by Nicholas in 1980 to assess patients' belief in their ability to carry out various activities despite the presence of pain (Nicholas, 2007). Responses to this questionnaire are on a 7-point Likert scale from 0 to 6. The score range of this questionnaire is from 0 to 60, with higher scores indicating a stronger belief in performing daily activities despite the presence of pain, and a score of zero or close to zero indicating a weak belief in performing daily activities in the presence of pain and suffering from the disease. The internal consistency of this questionnaire is excellent, as Asghari and Nicholas reported a Cronbach's alpha of 0.92 (Nicholas & Asghari, 2006). In the research by Poladi Reyshahri and colleagues, the Cronbach's alpha of this questionnaire was reported as 0.81, and its reliability with the retest method was reported as 0.77 (Barzegari Sultan Ahmadi, 2021; Ensandoost et al., 2021). In the present study, the reliability of the questionnaire using the Cronbach's alpha coefficient was obtained as 0.87.

2.3. Intervention

2.3.1. Cognitive-Behavioral Therapy Sessions for Patients with Rheumatoid Arthritis

In each session, the goal of the meeting was first stated, followed by topics relevant to that session, which were then explored through questions and answers and sharing opinions among group members, with discussion and exchange of ideas. At the end of each session, the contents were summarized, and then a summary of the session's contents and a task for the next session were provided via the WhatsApp virtual network. To reduce the duration of the sessions, tasks were reviewed and feedback was given virtually and privately. This intervention was designed based on the intervention by Keefe and colleagues (1990) on patients with rheumatoid arthritis and was tailored according to the research variables (Keefe et al., 1990).

First Session: An introductory session including a welcome, motivation building, an overview of the session structure and main group rules, session count, session duration. Expectations from them in therapeutic sessions are stated. Efforts are made to get acquainted with each other. A brief overview of the literature related to rheumatoid arthritis is given with the collaboration of group members. Positive and negative thoughts and feelings of the group members about rheumatoid arthritis and the physical damage resulting from it are discussed.

Second Session: Efforts are made to unite group members to break down resistances and encourage self-disclosure by recalling the ethical rules of the group such as confidentiality and respecting the rights of group members. Discussion about cognitive-behavioral therapy and the interaction between thoughts, feelings, and behavior through the ABC sequence related to the disease. Teaching the gate control theory of pain and how thoughts and feelings can intensify pain. Assignment: Drawing a table of activating situation/thought/feeling/intensity (preferably related to disease symptoms).

Third Session: Analyzing activating events, beliefs, and emotional reactions from the therapists' viewpoint. Helping to identify negative thoughts and replacing them with adaptive thoughts. Discussion on cognitive distortions and focusing on catastrophizing (rumination, magnification, helplessness) and its effect on pain perception. Assignment for the next session: Identifying negative thoughts and catastrophizing.

Fourth Session: Questioning negative thoughts and fundamental beliefs and completing the ABC sequence by

adding component D to the sequence to challenge and question these thoughts (such as cognitive distortions, especially catastrophizing) and replacing them with effective coping mechanisms. Teaching techniques and effective coping mechanisms such as distraction and practicing positive self-talks and thought stopping, and reviewing the impacts. Assignment: Drawing a cost-benefit table for these inefficient beliefs.

Fifth Session: Ensuring that the ABCD sequence has been correctly taught. Teaching the concept of pain self-efficacy and its sources. Group discussion and sharing of successful personal experiences of the group - having a role model - verbal encouragement - positive interpretation of emotions. Assignment: Writing or talking about a traumatic event and expressing the experienced emotion and providing a positive interpretation of it - recording successes in controlling symptoms and signs of the disease, especially pain.

Sixth Session: Accepting chronic pain and adapting to it. Stress and its types. Assessing types of stress based on the Lazarus and Folkman model. Effective stress coping techniques.

Seventh Session: Teaching Greenberg's stress model. Education about lifestyle and how it affects reducing disease symptoms and improving quality of life. Changing daily activity patterns like regular walking, healthy eating in rheumatoid arthritis...

Eighth Session: Scientific training on progressive relaxation with guided imagery. Goals and planning for enjoyable activities. Assignment: Preparing a list of enjoyable activities and planning their implementation. Behavioral contracting and positive reinforcement. Providing strategies for maintaining and retaining the skills taught in the sessions.

2.4. Data analysis

Data were analyzed with analysis of variance with repeated measurements and post-hoc tests using SPSS-22.

3. Findings and Results

Table 1

Descriptive Statistics of Pain Self-Efficacy in Patients Under Study at Pre-test, Post-test, and Follow-up Stages

Stage	Group	Mean	Standard Deviation
Pre-test	Control	13.62	3.664
	Intervention	13.69	5.329
Post-test	Control	14.15	3.078

Based on the demographic characteristics results, in both the control and intervention groups, 76.9% were female. The number of married individuals was equal in both groups, at 84.6%. In the control group, 7.7% were single, and in the intervention group, 15.4% were single. Additionally, in the control group, one person, equivalent to 7.7%, was widowed. In the control group, 30.8% had primary education, 23.1% had middle school and high school education, 15.4% had a bachelor's degree, and 7.7% had a master's degree or higher. In contrast, in the intervention group, 7.7% had primary education, 15.4% middle school, 30.8% high school, 23.1% bachelor's degree, and master's degree or higher. In the control group, 61.5% were homemakers, 23.1% were employees, and 15.4% were self-employed. In the intervention group, 38.5% were homemakers, 7.7% were laborers and retired, 23.1% were employees, and self-employed. More than half (53.8%) of the control group had no physical activity, while in the intervention group, only 15.4% had no physical activity. Also, none of the individuals in the control group had high physical activity, while in the intervention group, 7.7% of individuals had high physical activity. In the control group, only one person (7.7%) did not use painkillers, and the rest used painkillers. Likewise, all individuals in the intervention group used painkillers. In the control group, 30.8% and in the intervention group, 23.1% used tobacco. According to the chi-square values and p-values greater than 5%, it is observed that the distribution of all variables in both the control and intervention groups was statistically the same and not significantly different. The mean age of patients in the control and intervention groups was 46.92 ± 9.604 and 45.31 ± 9.331 , respectively. The mean body mass index (BMI) in the control and intervention groups was 27.15 ± 4.094 and 24.92 ± 4.102 , respectively. The BMI in the control group ranged from 23 to 39, and in the intervention group from 18 to 34. The mean duration of disease diagnosis in the control and intervention groups was 11.00 ± 8.083 and 11.55 ± 8.286 , respectively. A p-value greater than 5% indicates that the average age, body mass index, and time of disease diagnosis in the control and intervention groups were not statistically significantly different.

Follow-up	Intervention	41.85	4.670
	Control	14.23	2.048
	Intervention	35.62	4.976

To determine the effectiveness of web-based cognitive-behavioral therapy on pain self-efficacy in patients with rheumatoid arthritis, repeated measures analysis was used.

The null hypothesis in this test considered the lack of effect of cognitive-behavioral therapy on pain self-efficacy in the experimental groups.

Table 2

Statistical Output of the Effectiveness of Web-Based Cognitive Behavioral Therapy on Pain Self-Efficacy

Effects	Source	Sum of Squares	Degrees of Freedom	Mean Square	F	p-value	Partial Eta Squared
Within Group	Time	2966.385	2	1483.192	203.768	<0.001	.895
	Time*Group	2722.231	2	1361.115	186.996	<0.001	.886
Between Group	Group	5234.885	1	5234.885	143.548	<0.001	0.857
Sphericity Test	F= 0.822	Sig.= 0.105					
Homogeneity of Covariance	Box's M=23.35	Sig.= 0.003					
Normality Test (Control Group)	Pre-test:	Post-test:	Follow-up:				
	K.S=0.162, Sig.=0.200	K.S=0.108, Sig.=0.200	K.S=0.237, Sig.=0.044				
Normality Test (Experimental Group)	Pre-test:	Post-test:	Follow-up:				
	K.S=0.256, Sig.=0.020	K.S=0.179, Sig.=0.200	K.S=0.112, Sig.=0.200				
Homogeneity of Variance Test	Pre-test:	Post-test:	Follow-up:				
	L=0.055, Sig.=0.817	L=0.580, Sig.=0.454	L=5.609, Sig.=0.026				

Based on the within-group effects test in Table 2, cognitive-behavioral therapy led to significant changes in pain self-efficacy during the treatment period ($F = 203.768$; $p < 0.001$). Also, a significant difference was observed in the trend of pain self-efficacy between patients in the control and intervention groups ($F = 213.334$; $p < 0.001$). The partial eta squared value indicates that the treatment period explains

89.5% of the changes related to pain self-efficacy in patients. According to the results of the between-group effects test in both the control and intervention groups, the mean pain self-efficacy in patients was significantly different from each other ($F = 143.548$; $p < 0.001$). According to the partial eta squared value, the treatment method explains 85.7% of the changes related to pain self-efficacy in patients.

Table 3

Statistical Output of Pairwise Comparisons

Stage	Control Mean±SD	Experimental Mean±SD	t-Statistic	p-value
Pre-test	13.62±3.664	13.69±5.329	-0.043	0.966
Post-test	14.15±3.078	41.85±4.670	-17.85	<0.001
Follow-up	14.23±2.048	35.62±4.976	-14.33	<0.001

Table 3 shows the test of pairwise comparisons of the experimental groups (post-hoc test). It is observed that in both the post-test and follow-up phases, pain self-efficacy in patients undergoing cognitive-behavioral therapy (intervention group) was significantly higher compared to the control.

4. Discussion and Conclusion

The present study investigated the effect of web-based cognitive-behavioral therapy on pain self-efficacy in patients with rheumatoid arthritis. The results of the analysis showed that pain self-efficacy in the post-test was higher in the experimental group undergoing web-based cognitive-behavioral therapy compared to the control group, which did not receive any intervention. This means that web-based

cognitive-behavioral therapy has an effect on pain self-efficacy in patients with rheumatoid arthritis.

These findings are consistent with the prior results (Azimi et al., 2017; Ferwerda et al., 2018; Han & Kim, 2022; Kalmbach et al., 2020; Lindegaard et al., 2020; Lundström et al., 2022; Luyster et al., 2020; Matsumoto et al., 2022; Milgrom et al., 2021; Wisman et al., 2023).

OShutse et al. (2018) have shown that patients with rheumatoid arthritis, due to the severity of pain, fatigue, mobility and functional problems, have more anxiety and consequently lower self-efficacy compared to the non-patient group. Additionally, the lack of participation and acceptance of responsibility by the patient in performing correct behaviors related to the disease and its complications is related to the patient's low level of self-efficacy (Oshotse et al., 2018). In the same vein, Liu and colleagues (2022) stated that one of the factors that can be effective in an individual's adaptation to pain in rheumatic diseases is self-efficacy. Patients with rheumatoid arthritis face considerable physical pains, which causes these individuals to typically experience a high level of stress and arousal. Explaining the above hypothesis, it can be said that since patient-managed behaviors have a strong relationship with pain self-efficacy. Therefore, cognitive-behavioral interventions addressed correcting faulty beliefs and cognitions in the realm of disease self-management (Liu et al., 2023). On the other hand, it can be said that one of the therapeutic methods that can be provided via computer and the internet is web-based cognitive-behavioral therapy. Given that this treatment is structured and implemented step by step, it can easily be converted into computer formats, offering new treatment options for individuals who do not have access to face-to-face treatments (Safaei & Atashpor, 2021). Techniques of web-based cognitive-behavioral therapy, due to their simplicity compared to many treatment methods and speeding up in training, by improving coping strategies and problem-solving in patients with cognitive-behavioral techniques and creating changes in beliefs associated with pain in patients in confronting painful situations, teaching how to react behaviorally to pain-inducing situations and identifying the relationship between maladaptive thoughts and replacing them with logical and efficient thoughts, cause an increase in awareness of self-management and coping with disease methods. Therefore, the patient can better manage stress within themselves, tolerate pain and psychological stress in difficult conditions, and as a result, the individual's belief in their capabilities and abilities to manage pain, the disease, and its arising problems increases

(Lindegaard et al., 2020; Lundström et al., 2022). Thus, it is natural for self-efficacy in patients with rheumatoid arthritis to increase by participating in intervention sessions.

In another expression, cognitive-behavioral theorists believe that human problems lie in the cognitive frameworks of their mind and, parallel to the irrationality of beliefs, one can expect that the individual's psychological issues would also increase. Because the event itself is not important; it's the individual's perception and evaluation that matter. If an individual holds beliefs such as "I am very unfortunate," they are likely to become prone to depression (Matsumoto et al., 2022; Milgrom et al., 2021). On the other hand, according to the cognitive-behavioral perspective by Beck, developing a healthy style of thinking can reduce distress or create a better sense of comfort and happiness (Ferwerda et al., 2018; Han & Kim, 2022). Beck also believed in the close relationship between cognition and behavior (Wisman et al., 2023), which with cognitive-behavioral therapy, incorrect cognitions can be corrected to influence behavior. By changing faulty cognitions, the individual will have more control over their self-management behavior concerning the disease, and as a result, with better behavior and performance in disease management, over time, they will believe in themselves and their abilities to manage pain and the disease. Therefore, it is natural for pain self-efficacy to improve after intervention sessions. On the other hand, web-based interventions have the potential to reduce the resources required for treating such patients because these approaches can significantly save therapists' time (Kalmbach et al., 2020; Lindegaard et al., 2020; Lundström et al., 2022). Furthermore, web-based treatments can be provided in various situations, as a therapeutic tool, computers, and the web do not disclose those seeking treatment, thereby preserving their privacy. Facilitating the storage and retrieval of information is another advantage of web-based cognitive-behavioral therapy. Moreover, the entry criterion for participating in web-based interventions is low, which is important because it allows for the early detection of patients' disorders and prevents the worsening and chronicity of their diseases. Such interventions also stimulate self-management in individuals and empower them, as the basic idea of most web-based interventions is that the patient plays a major role in their treatment, while the therapist is merely a supporter of the patient throughout the treatment stages (Matsumoto et al., 2022; Milgrom et al., 2021). It is observed that web-based cognitive-behavioral therapy techniques, by teaching various solutions for problem-solving and creating changes in beliefs associated

with patients' pain (such as feeling low self-efficacy), lead to optimal performance and mood in patients when facing painful situations. Also, teaching how to react behaviorally to pain-inducing situations, behavioral pain control, identifying the relationship between maladaptive thoughts with emotions and maladaptive behaviors, replacing them with logical and efficient thoughts, etc., included in the treatment program, results in higher awareness and self-management in patients, and consequently improves daily performance and reduces pain symptoms. Therefore, the patient is likely to believe in their ability to manage pain and the disease, and as a result, it is natural for pain self-efficacy in patients to increase.

5. Limitations & Suggestions

The limitations of the present study included the non-cooperation of some patients due to the severity of pain and fatigue caused by the disease. Moreover, although the tools used in this research were validated in terms of psychometric indicators, using scales with different cultural foundations somewhat affects the study's internal validity. Due to methodological limitations, the study sample is based on the statistical population, which also threatens the external validity of the research, and caution must be exercised in generalizing the results to other individuals. It is suggested that for the generalizability of the findings of this research to be examined and compared, further research should be conducted in other cities and the results compared. In addition, it is recommended that hospital authorities, regarding the recognition and education of cognitive-behavioral therapy, try to use experienced psychology experts to explain therapeutic techniques to patients and their families.

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Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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Authors' Contributions

All authors equally contributed in this article.

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