



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

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ABSTRACT

The aim of this study was to determine the impact of web-based cognitive-behavioral therapy on chronic pain in patients with rheumatoid arthritis. The present study was an applied-semi-experimental research with a test and control group, utilizing a pretest-posttest design. All adults aged 30 to 60 years suffering from rheumatoid arthritis and visiting the clinics of two rheumatology subspecialists in the city of Mashhad constituted the research population. Considering the possibility of attrition, 21 individuals were allocated to the intervention group and 15 to the control group. After the research sample was determined in both the test and control groups, questionnaires on personal characteristics and chronic pain acceptance were completed by them, followed by the implementation of a cognitive-behavioral therapy training program for the intervention group in 8 sessions of 60 minutes each, web-based and through Skyroom. The control group did not receive any specific training. After the intervention ended, the questionnaires were completed again. Two months after the intervention, the questionnaires were filled out again by the groups for follow-up and to assess the persistence of the effect. Data were analyzed using SPSS V26 and EXCEL V2019 software. Based on the findings, web-based cognitive-behavioral therapy affects the acceptance of chronic pain in patients with rheumatoid arthritis. Therefore, considering the results of this research and other studies on the effectiveness of cognitive-behavioral group therapy in chronic physical diseases, in addition to medical treatments, the use of online psychological interventions can be beneficial and productive in increasing the acceptance of chronic pain and improving various functional dimensions of these patients.

Keywords: Cognitive-behavioral therapy, Web-based, Chronic pain acceptance, Rheumatoid arthritis

1. Introduction

Rheumatoid arthritis is defined as a systemic autoimmune disease associated with a chronic inflammatory process that can damage joints and extra-

articular organs, including the heart, kidneys, lungs, digestive system, eyes, skin, and nervous system (1, 2). This disease primarily affects the joints as a chronic, autoimmune, and inflammatory condition. The clinical manifestations of rheumatoid arthritis include joint pain,

stiffness, swelling, as well as joint destruction and systemic manifestations. Rheumatoid arthritis may lead to progressive damage and disability of the joints. Risk factors for rheumatoid arthritis are genetic and non-genetic, including smoking, changes in microbiota, female gender, Western diet, and ethnic factors (3). The Global Burden of Disease Study in 2019 showed a global prevalence of 0.22%, with 0.31% in women and 0.13% in men (4). Some mechanisms leading to its persistence are still unknown, but it has been indicated that biological, social, psychological, and physical factors are associated with the persistence of symptoms such as pain, disability, or disease activity in rheumatoid arthritis (5, 6). The disease is characterized by pain, stiffness, muscle weakness, fatigue, and joint swelling (7). For patients with rheumatoid arthritis, pain is the most significant problem and their first priority when seeking medical care (8). A study by Studenic et al. (2012) on patients with rheumatoid arthritis showed that pain is the most significant independent determinant of the patient's perception of disease activity in their body, while physicians or assessors often focus on joint inflammation (9). According to a study by Koop et al. (2015), most patients reporting pain have the least signs of inflammation and active disease. In these patients, pain often remains despite the improvement of inflammation and may even gradually increase (10). Meanwhile, pain acceptance is not about ignoring pain or increasing behavioral activity to control pain, but rather a behavioral change that entails better daily functioning despite the presence of pain (11). According to research, pain acceptance leads to increased resilience and quality of life for patients (12, 13).

Research has shown that cognitive-behavioral therapy can improve the physical and psychological functioning of patients (14). Cognitive-behavioral therapy is a composite treatment based on behavioral therapy and primarily cognitive therapy, creating a new perspective on humans and the basis of pathology. This approach essentially means the foundations and perspectives of cognition within a behavioral framework, meaning that it is observable and evaluable, allowing patients to assess their situation relative to the past. While the cognitive-behavioral perspective is recognized as a new approach, it has attracted considerable research attention, with the majority of research on therapeutic methods dedicated to this treatment style (15). Psychological treatments, especially face-to-face cognitive-behavioral therapy, can reduce symptom severity and improve quality of life by targeting unhelpful beliefs and

ineffective coping behaviors (14, 16). However, questions remain about optimal use of time, adherence to treatment, and long-term outcomes. In resource-limited healthcare services, cognitive-behavioral therapy delivered via telephone and web-based methods likely provides an important way to improve access, with the advantage of accessibility at a suitable time and place for the participant, at a pace that suits individual conditions, without the extra time and cost of travel (17, 18). Benefits of web-delivered therapy include anonymity, convenience, and service provision to those unable to access in-person treatments (19). In this direction, many studies have pointed to the effectiveness of cognitive-behavioral therapy and online intervention on many psychological variables (17, 20-23). However, no study has simultaneously addressed web-based cognitive-behavioral therapy on chronic pain in patients with rheumatoid arthritis. Therefore, the present study was conducted with the aim of examining the impact of web-based cognitive-behavioral therapy on chronic pain in patients with rheumatoid arthritis.

2. Methods and Materials

2.1. Study Design and Participants

The present study was a semi-experimental (quasi-experimental) type with a test and control group, utilizing a pre-test - post-test design. All adults aged 30 to 60 years suffering from rheumatoid arthritis and visiting the clinics of Dr. Jokar, a rheumatology subspecialist, and Dr. Akhbari, a rheumatology subspecialist, in the city of Mashhad were included. The research was conducted in the time frame from March 21, 2022, to October 22, 2022. A total of 36 adults aged 30 to 60 years suffering from rheumatoid arthritis and visiting the clinics of Dr. Jokar and Dr. Akhbari in the city of Mashhad were selected from the research population based on entry criteria. With the consultation of the esteemed supervisor and considering the possibility of attrition, 21 individuals were allocated to the intervention group and 15 to the control group. Entry criteria included: aged between 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 recognized psychological disorder such as depression, having at least basic literacy, and willingness and consent to participate in the educational course. Exit criteria included: unwillingness to continue cooperation, absence in more than two sessions of the educational meetings, needing changes in the medical

treatment plan, being hospitalized during the research, or death during the research.

2.2. Measures

2.2.1. Chronic Pain Acceptance Questionnaire (CPAQ)

The Chronic Pain Acceptance Questionnaire, developed by McCracken and Vowles (2004), is widely used in research related to chronic pain. This questionnaire consists of 20 items scored on a 7-point scale. The Chronic Pain Acceptance Questionnaire includes two subscales: activity engagement and pain willingness. 11 items of this questionnaire are scored directly, and 9 items are scored inversely for activity engagement (24). The Cronbach's alpha reliability of this questionnaire was reported by Cascarilla (2009) to be 0.79 for activity engagement and 0.75 for pain willingness (25). In Iran, in a pilot study, the internal consistency using Cronbach's alpha method for this questionnaire was found to be 0.74 (26). The reliability of

the questionnaire in the current study was obtained as 0.605 using the Cronbach's alpha method.

2.3. Intervention

2.3.1. Cognitive-Behavioral Therapy

In each session, the goal of the meeting was first stated, followed by topics related to that session, discussed through questions and answers and expressing members' opinions, with discussion and exchange of views on the materials. At the end of each session, the materials were summarized, and then a summary of the session's contents and an assignment for the next session were provided through the WhatsApp social network. To reduce the duration of sessions, assignments were reviewed and feedback was provided virtually and privately. This intervention was designed based on the intervention by Keefe et al. (1990) on patients with rheumatoid arthritis and tailored according to the research variables (27).

Table 1

Cognitive-Behavioral Therapy Sessions for Patients with Rheumatoid Arthritis

Session	Description
First Session	Introductory session including welcome, motivation building, overview of session structure and main group rules, number of sessions, session duration, setting expectations for therapeutic sessions, efforts to get to know each other, and a brief overview of rheumatoid arthritis literature in collaboration with group members. Discussion on positive and negative thoughts and feelings about rheumatoid arthritis and its physical damages.
Second Session	Efforts to unify group members to break resistances and self-disclosure through reminding of the group's ethical rules like confidentiality, respect for members' rights, discussion on cognitive-behavioral therapy, and the interaction between thoughts, feelings, and behavior through the ABC sequence relevant to the disease, teaching the gate control theory of pain and how thoughts and feelings intensify pain. Homework: Drawing a table of activating situation/thought/feeling/intensity (preferably related to disease symptoms).
Third Session	Analysis of activating events, beliefs, and emotional reactions from the therapists' perspective, help in identifying negative thoughts and replacing them with adaptive thoughts, discussion on cognitive distortions focusing on catastrophizing (rumination, magnification, helplessness) and its effect on pain perception. Homework for the next session: Identifying negative thoughts and catastrophizing.
Fourth Session	Challenging negative thoughts and fundamental beliefs and completing the ABC sequence by adding a D component to challenge these thoughts (like cognitive distortions, especially catastrophizing) and replacing them with effective coping strategies, teaching effective coping techniques such as distraction, practicing positive self-talk, and thought stopping, examining the effects. Homework: Drawing a cost-benefit table for these inefficient beliefs.
Fifth Session	Ensuring 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 - having a role model, verbal encouragement, positive interpretation of emotions. Homework: Writing or discussing a traumatic event and expressing the experienced emotion and providing a positive interpretation of it – recording successes in controlling disease symptoms, especially pain.
Sixth Session	Acceptance of chronic pain and adaptation to it, stress and its types, evaluating different types of stress based on the Lazarus and Folkman model, effective stress coping techniques.
Seventh Session	Teaching the Greenberg model of stress, education on lifestyle and its impact on reducing disease symptoms and improving quality of life, changing daily activity patterns like regular walking, healthy eating in rheumatoid arthritis...
Eighth Session	Scientific teaching of progressive relaxation with guided imagery, goals, and planning for enjoyable activities. Homework: Preparing a list of enjoyable activities and planning their execution, behavioral contracting, and positive reinforcement, presenting strategies for maintaining skills taught in sessions.

2.4. Data Analysis

The results were analyzed using the repeated measures analysis of variance method.

3. Findings and Results

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, equating to 7.7%, was widowed. In the control group, 30.8% had primary education, 23.1% had middle school and diploma education, 15.4% had a bachelor's degree, and 7.7% had a master's degree or higher. Whereas in the intervention group, 7.7% had primary education, 15.4% had middle school education, 30.8% had a diploma, 23.1% had a bachelor's degree, and a 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 were 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 levels of physical activity, while in the intervention group, 7.7% of individuals had high levels of physical activity. In the

control group, only one person (7.7%) did not use painkillers, while the rest did. Also, all individuals in the intervention group used painkillers. In the control group, 30.8%, and in the intervention group, 23.1% used tobacco products. According to the chi-square values and a p-value greater than 5%, it is observed that the distribution of all variables in both the control and intervention groups was statistically the same, and there were no significant differences. 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 mean age, body mass index (BMI), and disease diagnosis duration in the control and intervention groups did not statistically differ significantly.

Table 2

Descriptive Statistics of Research Variables by Test Type and Groups

Variable	Stage	Control		Experimental	
		Mean	SD	Mean	SD
Acceptance of Pain	Pre-test	19.92	4.051	22.85	3.211
	Post-test	24.54	2.787	42.15	2.996
	Follow-up	24.31	2.689	40.23	2.891
Involving in Activity	Pre-test	17.46	1.713	17.38	2.631
	Post-test	19.85	0.801	32.92	3.427
	Follow-up	19.54	2.727	30.77	2.948
Total	Pre-test	37.38	4.77	40.23	5.069
	Post-test	44.38	3.124	75.08	5.204
	Follow-up	43.85	3.602	71	4.32

Table 2 shows that the mean chronic pain acceptance in the intervention group after cognitive-behavioral therapy was significantly higher than in the control group. This condition also persists in the follow-up phase.

To determine the effectiveness of web-based cognitive-behavioral therapy on chronic pain acceptance in patients with rheumatoid arthritis, repeated measures analysis was used. The null hypothesis in this test considered no effect of cognitive-behavioral therapy on chronic pain acceptance in the experimental groups.

The data analysis included the Mauchly's Test of Sphericity ($F=0.962$, $Sig.=0.640$), indicating no violation of the sphericity assumption. The Box's Test of Equality of Covariance Matrices yielded Box's $M=12.94$ with a significance of $Sig.=0.084$, suggesting homogeneity of covariance matrices. The Kolmogorov-Smirnov test for normality in the control group showed significance levels of $Sig.=0.200$ for both pre-test and post-test, but $Sig.=0.005$ for the follow-up, indicating a deviation from normal distribution at follow-up. The intervention group

maintained normal distribution across all stages (Sig.=0.119 for pre-test, Sig.=0.200 for post-test, and Sig.=0.132 for follow-up). Levene's Test for Equality of

Variances showed homogeneity of variances at pre-test (L=0.018, Sig.=0.895) and follow-up (L=0.004, Sig.=0.950), but not at post-test (L=5.041, Sig.=0.034).

Table 3

Results of Analysis of Variance

Effect	Source	SS	Df	MS	F	p	Partial Eta ²
Within-Group	Time	6843.487	2	3421.744	287.914	<0.001	0.923
	Time*Group	2987.385	2	1493.692	125.683	<0.001	0.840
Between-Group	Group	7981.038	1	7981.038	230.052	<0.001	0.906

According to the within-group effects test in [Table 3](#), chronic pain acceptance in patients has significantly changed over the course of the study (F= 287.914; p<0.001). Also, a significant difference was observed between the trend of chronic pain acceptance in patients in the control and intervention groups (F=125.683; p<0.001). The partial eta squared value indicates that the treatment period explains 92.3% of the changes related to chronic

pain acceptance in patients. The results of the between-group effects test show that the mean chronic pain acceptance in both the control and intervention groups significantly differed from each other (F=230.052; p<0.001). The partial eta squared value showed that the treatment method explains 90.6% of the changes related to chronic pain acceptance in patients.

Table 4

Adjusted Means Comparison

Stage	Control	Intervention	t	p
Pre-test	37.38±4.77	40.23±5.069	-1.474	0.153
Post-test	44.38±3.124	75.08±5.204	-18.23	<0.001
Follow-up	43.85±3.602	71±4.32	-17.40	<0.001

[Table 4](#) presents the paired comparisons test between the experimental groups. It is observed that at both the post-test and follow-up stages, chronic pain acceptance in patients undergoing cognitive-behavioral therapy (intervention group) was significantly higher than in the control.

4. Discussion and Conclusion

The present research investigated the impact of web-based cognitive-behavioral therapy on the acceptance of chronic pain in patients with rheumatoid arthritis. The findings analysis revealed that the acceptance of chronic pain in the post-test was increased in the experimental group undergoing web-based cognitive-behavioral therapy

compared to the control group, which received no intervention. This means that web-based cognitive-behavioral therapy affects the acceptance of chronic pain in patients with rheumatoid arthritis.

These results are similar to the findings of previous studies (17, 18, 28, 29).

Psychological interventions are beneficial for many patients with rheumatoid arthritis, especially when these interventions lead to increased levels of physical activity (26). Psychological and medical outcomes are influenced by patients' beliefs about symptoms, causes, effects, and outcomes, duration, control, or treatment of their diseases. One of the beneficial potentials of computer-based

approaches is the use of programs that allow for individual customization, for example, instructions are modified based on users' responses. However, the sequence of therapeutic protocols is maintained, and the review of topics, if necessary, is done in the shortest time and with reduced costs, which this method of timely and targeted cognitive-behavioral therapy can lead to improved outcomes in individuals with chronic physical diseases (30).

In explaining the above hypothesis, it can be stated that because chronic pain acceptance means that despite the presence of pain in their life, the person engages in activities related to their life values and avoids any attempts to deny, avoid, or manage pain. Efforts towards pain management primarily include attempts to control experiences, behaviors, thoughts, and feelings related to pain through medicinal, physical, behavioral, and psychological ways. These efforts are often successful and reduce the distress and disability of those suffering from chronic pain (31). On the other hand, fear is an important factor in the pain experience. Catastrophizing pain is an exaggerated and negative orientation towards actual or anticipated pain experiences that increases the intensity of pain, distress, and disability in patients with chronic musculoskeletal pain (30). Therefore, in cognitive-behavioral therapy, patients' fears were discussed and efforts were made to correct fear-inducing beliefs.

On the other hand, since patients with a positive attitude have the necessary empowerment for stress relief and decision-making regarding their disease management and generally believe in their capabilities. Therefore, when an individual accepts the pain caused by the disease (30). In cognitive-behavioral therapy, efforts were also made to correct defective cognitions and change them to effective and positive cognitions about themselves and their capabilities in patients. Therefore, patients could more easily accept their disease and, instead of thinking about futile thoughts, take necessary actions towards managing the disease and reducing its controllable symptoms, which leads to increased pain tolerance and pain reduction. Moreover, by correcting incorrect beliefs, the psychological pressure caused by the disease in them is also reduced. As a result, they are prepared to face stress and negative emotions and can successfully confront obstacles and problems, and consequently, the individual's tolerance from this type of confrontation is affected. On the other hand, increasing the level of self-management capability leads to pain acceptance and coping with stress in the disease and a positive view of the disease and the ability to make logical

decisions for treating and controlling the disease. Through cognitive-behavioral therapy techniques, the possibility of the patient's constructive interaction with the environment and society around them, the patient's emotional perception of others, and physical adaptability are provided. Therefore, in these conditions, the individual reaches pain acceptance.

It is observed that web-based cognitive-behavioral therapy methods help better control individuals' reactions to life's stressful events and effectively cope with stressors by changing cognitive processes through cognitive reconstruction and targeting maladaptive thoughts and behaviors, altering individuals' interpretations and biases in information processing and beliefs about their disease. Therefore, it aids in enhancing disease acceptance and perception. Also, it leads to effective coping with conditions and their adaptation in accepting pain caused by the disease, thereby reducing or changing the patient's perception of catastrophizing pain (31).

Overall, according to the results of studies, web-based cognitive-behavioral therapy interventions for chronic pain have shown greater effectiveness compared to control conditions and comparable efficacy with other behavioral treatments (14, 17, 19). By identifying patient characteristics and change processes that are better associated with intervention outcomes, it was addressed that first, identifying patient characteristics associated with outcomes of web-based behavioral treatments for pain management can help tailor treatment. Matching patients with specific cognitive-behavioral intervention methods with their characteristics, needs, and conditions can increase satisfaction, reduce patients' psychological burden, and may increase the likelihood of long-term outcomes (19). Second, improving psychological/social functioning/processes during the web-based cognitive-behavioral intervention can clarify the pathways through which these interventions lead to improved outcomes. Since these pathways can differ among different patient groups, identifying patient characteristics related to these psychological and social mechanisms can provide further insights into strategies for optimizing intervention outcomes for patients with different characteristics (17). Indeed, the mentioned method, by providing therapeutic services for strengthening impaired domains or replacing new patterns to compensate for the occurred disorder using cognitive assessment of a situation, which plays an important role in determining the severity of psychological stress and its acceptance by the patient, attempts to improve cognitive defects and functions such as memory, executive

function, social perception, focus, and acceptance, and tries to enhance cognitive functions, also, causes a change in the patient's negative evaluations of a stressful situation, therefore, the patient more easily reaches the acceptance of the disease and the pain resulting from it.

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. On the other hand, although the tools used in this research were validated in terms of psychometric indices, the use of scales with different cultural foundations somewhat affects the internal validity of the research. Due to methodological limitations, the sample studied in this research consists of patients based on the statistical population, which also threatens the external validity of the research, and the generalization of results to other individuals should be done with caution. It is suggested that for the generalizability of the findings of this research to be examinable and comparable, other researches should be conducted in other cities and the results compared. Furthermore, it is suggested that hospital authorities, in relation to the recognition and education of cognitive-behavioral therapy, try to use experienced psychology experts to convey therapeutic techniques to patients and their families.

Authors' Contributions

Rahil Omidvar: Contributed to the conceptualization of the study and the design of the research protocol. Participated in data collection and coordination of the intervention sessions. Involved in data analysis and interpretation. Contributed to manuscript drafting and revision.

Mahdi Nayyeri: Provided leadership in the design and implementation of the study, particularly in selecting web-based cognitive-behavioral therapy as the intervention. Supervised data collection and analysis. Played a major role in interpreting the findings and drafting the manuscript.

Saeed Teimoori: Contributed to the recruitment of participants and data collection. Assisted in the coordination of the intervention sessions and follow-up assessments. Participated in data analysis and interpretation. Also contributed to manuscript writing and revision.

Overall, all authors have contributed significantly to different phases of the research, from conceptualization to data analysis, interpretation, and manuscript preparation.

Their collaborative efforts have ensured a comprehensive investigation into the impact of web-based cognitive-behavioral therapy on chronic pain acceptance in patients with rheumatoid arthritis, providing valuable insights into the potential benefits of online psychological interventions for this patient population.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethics Considerations

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

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