Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v30i1.2550

THE EFFECT OF ACCEPTANCE AND COMMITMENT THERAPY ON ALEXITHYMIA, RUMINATION, AND LONELINESS DURING BREAST CANCER TREATMENT

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Abstract
This study aimed to determine the effectiveness of acceptance and commitment therapy on alexithymia, rumination, and loneliness in breast cancer patients. A quasi-experimental pre-test and post-test were conducted in 2021 with experimentation, control, and follow-up groups. This study included women with breast cancer who had been treated in public hospitals in Tehran's District 2 for at least two years and had been referred to them. To determine the effectiveness of the experiment and control groups, 30 participants were randomly selected by purposive sampling. The Toronto alexithymia scale, the Nolan, Hoxma, & Murrow (1991) rumination scale, and the Russell UCLA Loneliness Scale (1996) were used to evaluate subjects before and after the intervention. Group acceptance and commitment therapy was administered to the experimental group in eight sessions of 90 minutes once a week. The data was analyzed two months after the last treatment session using covariance analysis. Based on the analysis of covariance, it was demonstrated that alexithymia and rumination significantly differed between the experimental and control groups. However, there was no significant difference between the experimental and control groups in loneliness (P>0.05). Despite the effectiveness of acceptance and commitment therapy in treating alexithymia and rumination in women with breast cancer, this intervention could not affect the feeling of loneliness among these women.

Keywords: Acceptance and commitment therapy, alexithymia, rumination, loneliness, Breast Cancer

Introduction
There are many diseases that threaten human societies today. One of them is cancer, where cells grow abnormally and spread uncontrollably [1]. Furthermore, breast cancer occurs more commonly in Persian women than in women in western countries, and it is the second leading cause of cancer-related death in Iranian women. As a result of chemotherapy, which often has side effects, these patients have experienced a double problem affecting their quality of life [2]. Breast cancer causes physical and psychological problems, including fatigue and pain, as well as psycho-social issues

which reduce the quality of life for patients [3]. Psychological problems linked to cancer include alexithymia, rumination, and loneliness. Alexithymia relates to an inability to regulate emotional information cognitively. People with alexithymia have trouble regulating their emotions. However, it makes it more likely that the person will engage in unhealthy behaviors, such as alcohol and drug abuse, poor nutrition, and inactivity, because it removes the ability to deal with stressful situations adaptively. Meanwhile, alexithymia is related to diseases such as cancer, diabetes, high blood pressure, pain, cardiovascular conditions [4]. People with alexithymia struggle with symbolic thinking, emotion recognition, verbal description, feelings, desires, and feedback, according to Sifneos during research. They often display a dry, formal face without emotional effects and have difficulty distinguishing between physical sensations and emotional states. They also have difficulty remembering dreams [5]. Rumination is associated with alexithymia, the inability to recognize and regulate emotions in breast cancer patients. Individuals suffering from cancer anxiety react differently, causing them to ruminate and develop ineffective attitudes, such as the inevitable death of themselves, which can be harmful to their mental health [6]. As a result of ruminating, the mind enters a state of involuntarily focused attention and diverts attention away from the intended topic or objective [7]. The act of ruminating causes patients to become hopeless about the future and negative about themselves as well as affect their mood and motivation. Following the appearance of cancer symptoms, cancer patients may focus on this axis and see the disease as punishment for themselves. In a study by Taylor, rumination is significantly more common in breast cancer patients than it is in healthy women. Women who have breast cancer become impatient as they worry about mortality, and they believe they can't control their lives. Rumination is one of the factors contributing to cancer etiology because patients who ruminate about the disease have ineffective attitudes and wrong beliefs about cancer [8]. Experiencing loneliness in social relationships can be a difficult and depressing experience, and this can lead to mental preoccupation, fatigue, discouragement, and social avoidance [9]. Cancer patients have to endure chronic pain alone. The feeling of loneliness indicates the shortcomings of psychological and societal interpersonal relationships, since no one understands their feelings and sufferings. Loneliness is divided into emotional loneliness and social loneliness. Having a feeling of emotional loneliness is caused by being rejected by your friends and family. Social loneliness is caused by not having common activities with others due to not belonging to a particular group. Loneliness causes low self-esteem, depression and unhappiness. According to a review of available evidence regarding loneliness in some groups, loneliness is one of the causes of depression, suicide, and severe despair. Loneliness is a causal cognitive factor affecting health and well-being, so it will affect mental health in a serious way. Physically and mentally, the disease will perform better if it does not feel lonely [10]. There is no doubt that neglecting the mental health of people with breast cancer will result in their treatment failing. Psychological treatments are undeniably and essential for reducing cancer side effects and problems. The improvement of existing treatments has been significantly enhanced by three-generation behavioral therapy. It has changed people's perception of psychological suffering and pain, making them accept it as an undeniable and active reality. Rather than modifying existing problems, these treatments aim to change how people function so they can design their lives based on what's meaningful to them. Acceptance and commitment are two of the most widely used and effective treatments in this area. During acceptance and commitment therapy (ACT), it is assumed that people find their feelings, emotions, and inner thoughts irritating and constantly try to alter them or get rid of them. Despite their best efforts, these efforts are ineffective and intensify the feelings, emotions and thoughts that a person tries to avoid [11]. A commitment-based treatment focuses on patients' acceptance and does not attempt to reduce unpleasant events or change their shape, especially when they cause psychological harm. A committed activity encourages a person to do the best he can [12]. Acceptance and commitment-based treatment is based on Relational Frame Theory (RFT), which is based on functional contextualism. With this treatment, the individual accepts the suffering that life is inevitable and lives a full, rich, meaningful life [13]. Through acceptance and commitment, a cognitive behavioral therapy considered the "third wave," emotional distress is directly addressed, as unpleasant thoughts and emotions are

accepted. ACT helps people experience their negative and unpleasant emotions, and by accepting those emotions, they can manage their emotions rather than suppressing and denying them. It aims to increase psychological flexibility. ACT treatment increases psychological relationships between thoughts and emotions rather than changing thoughts and cognitions. As part of the central process of treatment, acceptance and commitment are passed, including acceptance versus avoidance, breakdown versus cognitive fusion, self as context vs. self-conceptualized, communication with the present versus the predominance of the past and conceptualized future, specification of values versus lack of clarity and committed action vs. passive action. Accordingly, the purpose of this study is to evaluate the effectiveness of acceptance and commitment-based therapy on emotional dyslexia, ruminating, and loneliness in breast cancer patients.

Materials and methods

As part of the semi-experimental study, a control group is provided and a two-month follow-up is conducted after the pre-test and post-test. Statistically, women underwent surgery and chemotherapy in Tehran's 2nd region, and they had been diagnosed with breast cancer at least two years ago. We used a purposeful sampling method for the sampling. Using a random selection procedure, 30 people were randomly selected into experimental and control groups. Patients for the study must have been diagnosed with breast cancer (according to a specialist doctor) at least two years after the disease occurred (based on the patient's file), be between 30 and 60 years old, have at least a diploma in education, and have expressed an intention to participate in the program during the initial interview. The study excluded patients with chronic physical diseases such as diabetes, hypertension, etc., as well as those taking other psychological courses simultaneously, suffering from chronic psychiatric diseases, and undergoing chemotherapy. An acceptance and commitment-based treatment program was implemented in this study for 8 weeks, one day per week, for a total of 12 hours, on the experimental group for an 8-session training program based on acceptance and commitment. A 8-session treatment protocol based on acceptance and commitment was developed based on Hayes, Strossal, and Wilson's [14].

Alexithymia scale

In order to measure alexithymia, the Persian version of the Toronto Ataxia Scale was used, which includes 20 items and three subscales: difficulty identifying emotions, difficulty describing emotions, and difficulty thinking objectively. For alexithymia, a total score is calculated by adding the sum of three subscales on a Likert spectrum from 1 to 5. It was reported in Basharat et al, research that a Cronbach's alpha coefficient of 0.85 was a good indicator of scale consistency for total emotional dyslexia, difficulty identifying emotions (0.82), difficulty describing emotions (0.75), and external orientation in thinking (0.72) [15]. Cronbach's alpha was used to determine the reliability of this scale by Seo et al [16]. The results of Kooiman et al, found that the whole test had a test-retest reliability of 0.74, while the three subscales for difficulty identifying emotions (0.71), difficulty describing emotions (068), and external orientation (0.66) [17]. As well, Parker et al. used it in conjunction with Bar-on's emotional intelligence questionnaire to measure construct validity, and the result was 0.72 [18].

Rumination scale

Using the Persian version of the Nolen-Hoeksema [19] rumination scale, translated by Bagherinezhad et al.,[20] we evaluated rumination. Each of the 11 statements on this scale contains 11 statements and evaluates negative mood reactions. According to the Likert scale, 22 statements are graded from 1 never to 4 most of the time. Based on empirical evidence, Lumminet determined that the scale was reliable and valid with a Cronbach's alpha value of 0.92 and a correlation coefficient of 0.67. Bagherinejad et al. reported a reliability coefficient of 0.90 for the Cronbach's alpha method and 0.92 and 0.89 for the dimensions of the scale [20].

Loneliness scale

An adapted version of the UCLA loneliness questionnaire containing 20 questions with ten positive and ten negative responses was used to measure loneliness. There are four options for answering the question, and the continuum includes disagree, intermediate, agree, and completely agree, with scores ranging from 4, 3, 2, 1, and 5. Items 1, 5, 6, 9, 10, 15, 16, 19, and 20 are graded reversed as well [21].

The validity of the test was reported by the test-retest method by Russell (0.89). The reliability of this scale was also reported by Russell and Caroline during research by using the test-retest method of 0.94. Their correlation with the original scale was 0.91 [22]. Davarpanah converted this scale into a Persian and reported an alpha coefficient of 0.78 [23].

Statistical analysis of data

Using descriptive statistics and covariance analysis methods, SPSS-16 software was used to analyze the raw data. Kolmogorov-Smirnov's one-sample test was used to determine whether the observed distribution is normal. Further, inferential statistics tests (ANCOVA), Analysis of Covariance, Split Plot, including Repeated Measurement Variance Analysis and Between Subject Variance Analysis, and Wilks Lambda tests were performed.

Results

Description of demographics

Based on age, 15 experimental patients and 15 control patients were divided into two groups for descriptive statistics (mean and standard deviation) (**Table 1**). In the experimental group, the mean and standard deviation of the age of the patients were 55.02 and 2.33, respectively. In the control group, they were 53.80 and 2.81, respectively.

Table 1**.** The mean and standard deviation of the patients' ages in the study groups

Groups of study	Mean	Standard deviation
Experimental	55.02	2.33
Control	53.80	2.81
Sum	54.40	2.61

Kolmogorov-Smirnov test

Using the Kolmogorov-Smirnov test, **Table 2** presents the results obtained to verify the assumption of normality. Therefore, since the P value is not significant, it implies that the distribution of the data in the variables mentioned is normal, so the assumption of normality of data for all variables is confirmed since the P value (P>0.05) is non-significant.

Table 2. Test of Kolmogorov-Smirnov to ensure that data distributions are normal

Variables	KS statistic value	P value
Alexithymia	0.094	0.200
Rumination	0.118	0.198
Loneliness	0.123	0.196

A summary of the alexithymia scores of breast cancer patient’s pre-test, post-test, and 2 months later is presented in **Table 3** and **Figure 1**. According to the results of the study, patients in the experimental group had significantly lower mean emotional ataxia both after the post-test and two months after the post-test, while patients in the control group did not experience any significant changes.

Table 3. Statistical analysis of alexithymia in the studied groups at pre-test, post-test, and after 2 months of follow-up

Test	Experimental		Control	
	mean	Standard deviation	**mean**	**Standard deviation**
Pre-test	65.00	6.536	63.60	8.838
Post-test	57.93	6.250	62.80	9.496
After two months	58.20	6.689	63.13	9.441

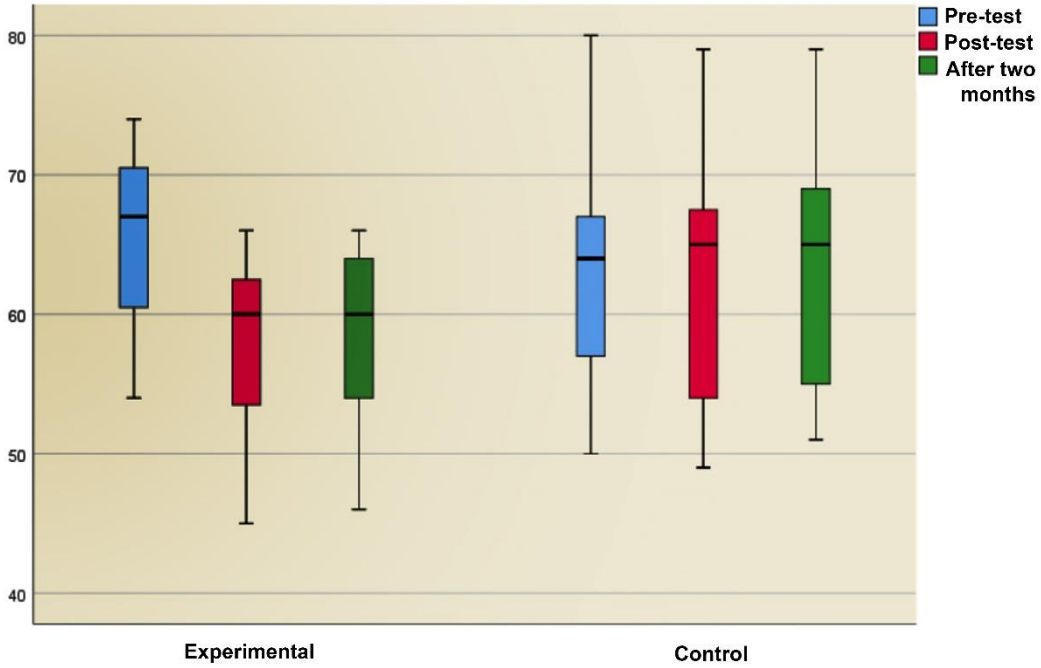


Figure 1. Experimental and control groups' alexithymia means at pre-test, post-test, and after 2 months of follow-up

As shown in **Table 4**, Wilks Lambda statistical characteristics were used to investigate the effect of groups on breast cancer patients' alexithymia and the effects of the group were significant (P>0.01). As a result, the covariance analysis test should be used. Therefore, the above results indicate that the experimental and control groups differ significantly in the patients' alexia at least at the post-test or after 2 months of follow-up. Consequently, repeated measurement variance analysis and intergroup test are possible. **Table 5** shows the results of repeated measurement variance analysis and intergroup test.

Table 4. An investigation of the effects of groups on alexithymia in women with breast cancer

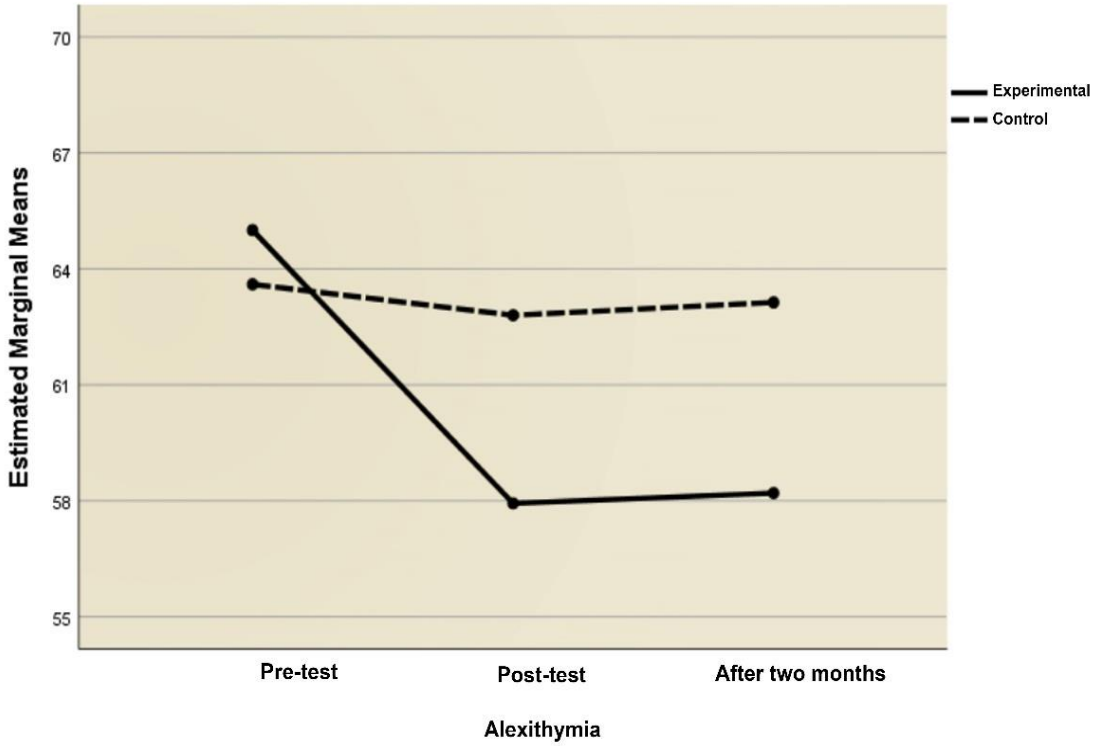
	Effects	Statistical value	F value	P value
Group	**Pillais Trace**	0.564	17.461	0.01**
	Wilks Lambda	0.436	17.461	0.01**
	Hotelling's Trace	1.293	17.461	0.01**
	Root Mean Square Error	1.293	17.461	0.01**

Table 5. The results of repeated measurement analysis and intergroup comparison of alexithymia scores in experimental and control groups of patients with breast cancer

Variables	Situation	degree of freedom	mean square	F value	Significance level
Alexithymia	**Repeated measurement**	1	198.017	43.80	0.01**
	Membership in a group	1	150.417	33.408	0.01**

As a result of the repeated measurement test and the intergroup test (P>0.01), there is a statistically significant difference between the averages of alexithymia in breast cancer patients in the experimental and control groups. Furthermore, the averages of emotional dyslexia of patients in the experimental group after the test and after 2 months of follow-up showed a significant and significant decrease compared with their pre-test averages. The control group, however, did not demonstrate any significant changes in alexithymia in the pre-test, post-test, or after 2 months.

It can be concluded from Table 5 that patients with breast cancer in the experimental group receiving treatment based on acceptance and commitment, compared to patients in the control group who were not receiving treatment, scored lower on the alexithymia test at the post-test and after two months. As a result, it has been confirmed that acceptance and commitment treatment is effective in treating alexithymia in breast cancer patients (**Figure 2**).



.Figure 2Alexithymia in experimental and control groups compared at pre-test, post-test, and after 2 months of follow-up

A summary of the average rumination of breast cancer patients at pre-test, post-test, and two months after treatment is provided in **Table 6**. A significant decrease in average rumination is observed in the experimental group after two months of follow-up, but there is no significant change observed in the control group after post-test (**Figure 3**).

Table 6**.** Statistical analysis of rumination in the studied groups at pre-test, post-test, and after 2 months of follow-up

Test	**Experimental**		**Control**	
	mean	Standard deviation	**mean**	**Standard deviation**
Pre-test	59.07	9.633	53.40	11.407
Post-test	48.60	6.185	52.80	10.685
After two months	48.67	6.433	53.80	9.252

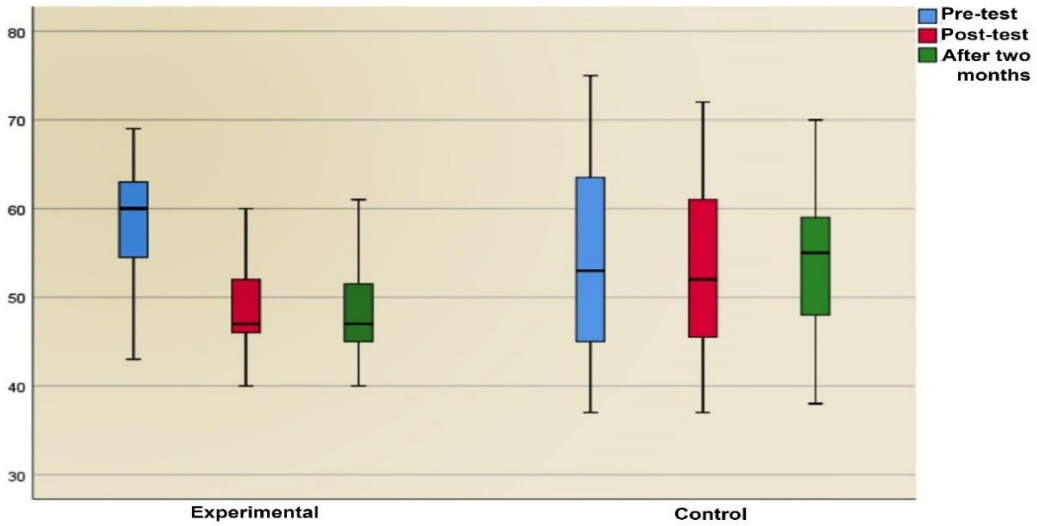


Figure 3**.** Experimental and control groups' rumination means at pre-test, post-test, and after 2 months of follow-up

Additionally, Wilks' Lambda statistics characteristic was used in order to check the appropriateness of using analysis of variance of repeated measurements (**Table 7**). It is evident from the data that the group affects the rumination of breast cancer patients in a significant way (P>0.01). Hence, the covariance analysis is appropriate. Basically, the results above indicate that there is a significant difference in patients' rumination between the two control groups and the test group, at least after the post-test or at least after 2 months of follow-up, so the repeated measurement analysis of variance and between-group analysis can be used. **Table 8** shows the results of repeated measurement analysis and intergroup testing.

Table 7**.** An investigation of the effects of groups on rumination in women with breast cancer

	Effects	Statistical value	F value	P value
Group	**Pillais Trace**	0.666	26.949	0.01**
	Wilks Lambda	0.334	26.949	0.01**
	Hotelling's Trace	1.996	26.949	0.01**
	Root Mean Square Error	1.996	26.949	0.01**

Table 8**.** The results of repeated measurement analysis and intergroup comparison of rumination scores in experimental and control groups of patients with breast cancer.

Variables	Situation	degree of freedom	mean square	F value	Significance level
Alexithymia	**Repeated measurement**	1	375.000	40.138	0.01**
	Membership in a group	1	437.400	46.817	0.01**

A significant difference (P>0.01) exists between the rumination averages of breast cancer patients in the experimental and control groups in repeated measurement tests and intergroup tests. The results of **Table 6** indicate that after the test and 2 months of follow-up, the rumination averages of the patients in the test group decreased significantly and significantly compared to their pre-test rumination averages. Nevertheless, rumination averages in the control group remain unchanged after 2 months of follow-up, pre-test, and post-test. Using the results of **Table 8**, we can conclude that the experimental group of breast cancer patients undergoing treatment based on acceptance and commitment had a lower rumination score in the post-test as compared to the control group, which had no treatment. After 2 months, patients have been followed up. Women with breast cancer can, therefore, benefit from treatment based on acceptance and commitment to rumination (**Figure 4**).

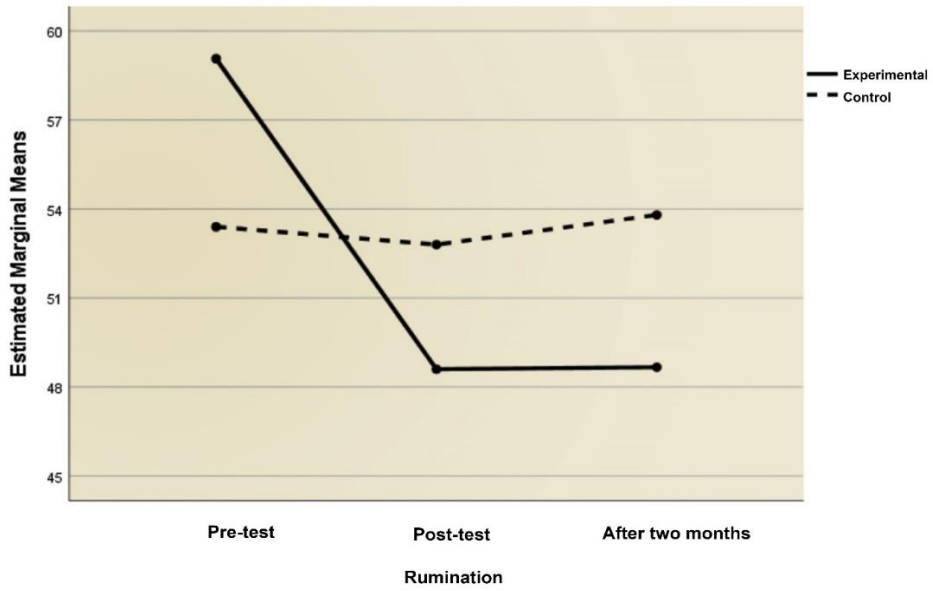


Figure 4**.** Rumination in experimental and control groups compared at pre-test, post-test, and after 2 months of follow-up

The study groups were compared based on their average feelings of loneliness in pre-test, post-test, and after 2 months of follow-up (**Figure 5**). A significant decrease in the feeling of loneliness among patients in the experimental group is observed after the post-test and two months of follow-up, but no significant change is observed in the control group (**Table 9**). To check whether repeated measurement variance analysis is appropriate, Wilks' lambda statistical characteristic was used, and the results are presented in **Table 10**.

Table 9**.** Statistical analysis of loneliness in the studied groups at pre-test, post-test, and after 2 months of follow-up

Test	**Experimental**		**Control**	
	mean	Standard deviation	**mean**	**Standard deviation**
Pre-test	53.08	2.100	51.85	2.544
Post-test	51.92	1.706	52.31	2.323
After two months	52.15	2.672	52.15	2.444

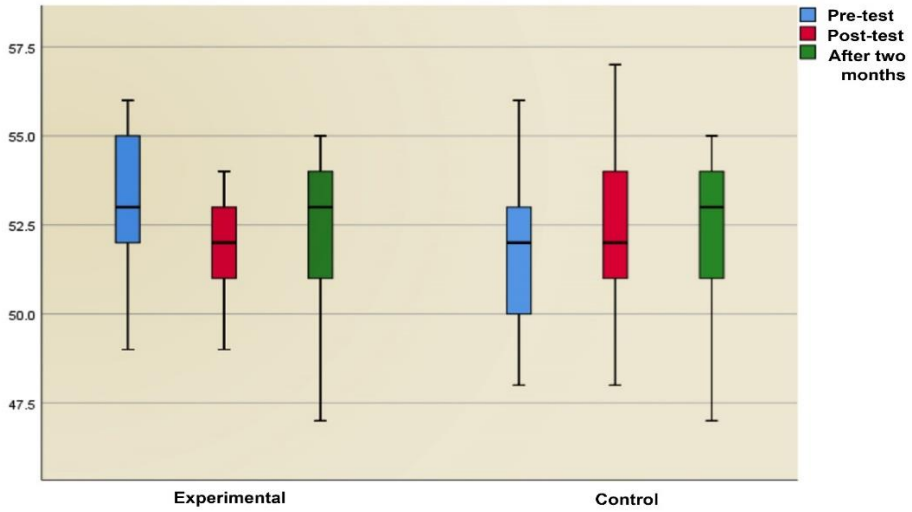


Figure 5**.** Experimental and control groups' loneliness means at pre-test, post-test, and after 2 months of follow-up

The effect of the group on the loneliness of breast cancer patients is not significant ($p<0.05$). Therefore, no significant difference has been found in the feeling of loneliness of patients between the test and control groups after 2 months, so further investigation needs to be conducted using the analysis of variance of repeated measurements and a between-group test. **Table 11** summarizes the results of the repeated measurement analysis and intergroup test.

Table 10**.** An investigation of the effects of groups on loneliness in women with breast cancer

	Effects	Statistical value	F value	P value
Group	**Pillais Trace**	0.134	1.779	0.191
	Wilks Lambda	0.886	1.779	0.191
	Hotelling's Trace	0.155	1.779	0.191
	Root Mean Square Error	0.155	1.779	0.191

Table 11**.** The results of repeated measurement analysis and intergroup comparison of loneliness scores in experimental and control groups of patients with breast cancer

Variables	Situation	degree of freedom	mean square	F value	Significance level
Alexithymia	**Repeated measurement**	1	1.121	0.322	0.576
	Membership in a group	1	4.923	1.286	0.268

According to the repeated measurement test and the intergroup test, there is no statistically significant difference between breast cancer patients in experimental and control groups in their feelings of loneliness. As a result, **Table 9** shows that the mean loneliness of patients in the experimental group after the test and after two months of follow-up shows no significant and significant change in comparison to their mean loneliness before the test (**Figure 6**). Using the results of **Table 11**, it is clear that patients in the experimental group receiving treatment based on acceptance and commitment had a significant change in the way they felt lonely compared to patients in the control group not receiving treatment. In other words, breast cancer patients' feelings of loneliness have not been reduced by treatment based on acceptance and commitment.

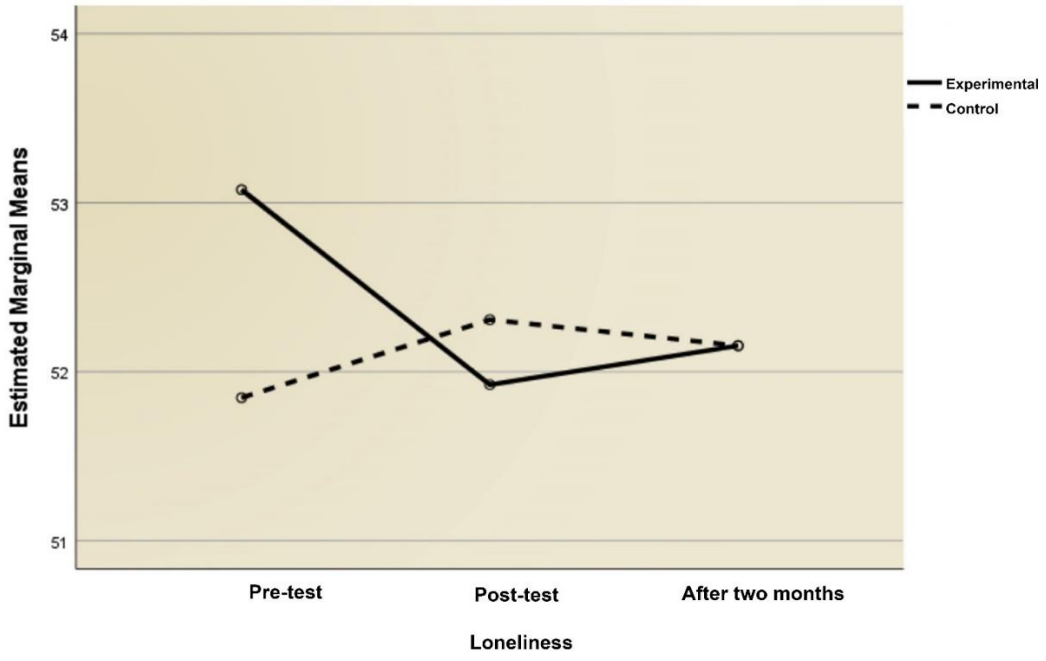


Figure 6**.** Loneliness in experimental and control groups compared at pre-test, post-test, and after 2 months of follow-up

Discussion and conclusion

We conducted the present study to examine whether ACT-based treatment is effective for reducing ataxia, rumination, and loneliness in breast cancer survivors. Analysis of the research findings indicated that Alexithymia significantly differed between experimental and control groups at the post-test and follow-up test. As a result of these findings, it can be concluded that patients with breast cancer are less likely to develop ataxia if they receive treatment based on acceptance and commitment. As a result of the research, it was discovered that treatment based on acceptance and commitment to non-verbal communication in breast cancer patients was effective. These results are aligned with the results obtained from the studies of Feros et al, [24] and Rost et al, [25]. Therapy based on acceptance and commitment is mainly aimed at increasing psychological flexibility, or in other words to reduce experiential avoidance, among individuals. Patients with breast cancer have very disturbing thoughts (such as recurrence of the disease, the thought of their children becoming cancerous, anxiety due to body deformity, disruption of family roles, disruption of occupational and social functions). Some cancer patients do not even use the word cancer because they are so upset by the word because they are trying to control their feelings and thoughts. Being unable to control these disturbing thoughts and feelings creates unwanted and new effects, as well as increasing distance from things that matter, such as health, work, friends, and family. As part of this treatment, the person is encouraged to experience unpleasant thoughts and feelings only as they occur, and not to react to them. During the treatment, the client is taught that avoiding or controlling unwanted mental experiences (thoughts and feelings) is ineffective or has the opposite effect and makes them worse; thus, these experiences must be eliminated without any internal or external reaction. The reduction of symptoms is attributed to acceptance, which means facing pain on the way to achieving values rather than experiential avoidance. According to the analysis of research findings, there was a significant difference in rumination between experimental and control groups. These results are in agreement with the results obtained from the studies of Alighanavati et al, [26] and Cohen et al,[27] are in agreement. The research suggests that acceptance-based and commitment-based treatment targets client acceptance first. Psychology has several definitions of acceptance, but in this therapy, acceptance refers only to how someone responds to their inner experiences, not situations or activities. Acceptance involves allowing your inner experiences to happen without controlling them or regulating them. Though everyone does not like things, they can learn to live with them without constant conflict. Cognitive dissonance forms the second core of therapy. As a result of disruption, thoughts have less importance, meaning, and impact on behavior. With cognitive dissonance, rumination sufferers can experience their inner experiences as they are without adding verbal meanings. By reducing the meaning of unwanted and disturbing thoughts, cognitive breakdown is a powerful core therapy. Acceptance and commitment are the keys to dealing with negative thoughts and feelings towards cancer, instead of cognitive-behavioral therapy or cognitive restructuring. Through active engagement in the external world, the therapy increases the client's ability to connect with his or her experience in the present. By developing coping strategies and better defense mechanisms, mindfulness exercises can improve the psychological well-being of patients by creating visible changes in their lives and psychological functions. When people get cancer, they learn to reappraise it in a positive light. Through coping skills training, they develop optimism and self-confidence, see events as controllable, and use their information processing system more effectively. His ability to cope decreases when he blames himself for his lifestyle causing cancer. Mindfulness can help these patients experience emotions as they occur without judging them as good or bad. Increasing resilience and reducing rumination activate an area of the brain that creates positive emotions and improves the body's immune function. However, in the post-test and follow-up, the feeling of loneliness was not significantly different between experimental and control groups. The results of this study indicate that breast cancer patients who received treatment based on acceptance and commitment did not feel less lonely compared to those who received treatment based on commitment. Chiang et al,[28] research indicated a different result. In addition to the physical and mental changes, the patient's social interactions and intimate interactions with the surrounding people also change, and the patient feels disconnected from his

family and society. In acceptance-based behavioral therapies, clinical problems are conceptualized as behavioral problems. When a mother suffers from cancer, the whole family faces chaos. Psychological disorders have three basic problems: lack of awareness, avoiding internal experiences, and not performing important and valuable activities in one's life. The goal of intervention is to solve these problems. It can be concluded that acceptance of commitment has an effect on reducing emotional dyslexia (P>0.001) and rumination (P>0.001), but not on reducing loneliness (P<0.05). Even though the symptoms are not addressed directly in the acceptance and commitment treatment, it is believed that if the patient does not try to reduce his thoughts and feelings and abandons the fight with his thoughts and feelings, but instead moves toward the goals set in place, the sign will decrease automatically if the values move in the right direction. The treatment focuses on accepting and committing to feelings and events, regardless of whether they are pleasant or unpleasant, and accepting cancer as it is. This includes being in the present moment and mindfulness, giving importance to people's values, reducing cognitive impairment, self-transcendence, and other ACT techniques. In women with breast cancer, emotional ataxia and ruminating were reduced. Through the emphasis on acceptance and mindfulness on the one hand and commitment and behavior change on the other hand, treatment based on acceptance and commitment increases the psychological flexibility of patients. However, the results of this study showed that despite being implemented as a group therapy, the therapy based on acceptance and commitment did not reduce feelings of loneliness effectively. It is partly due to the fact that meetings are held online and do not focus on the unconscious layers of a person. In general, breast cancer patients should be treated with acceptance and change as part of this type of therapy.

Considerations of ethical

Research subjects' rights were respected, they participated in the test without any coercion from the researcher, and their personal information was kept confidential.

Conflicts of Interest

The authors have no conflicts of interest to declare.

Acknowledgment

This research was supported by…

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1. **International Journal of Environmental Research and Public Health**
2. **Journal of clinical psychology in medical Settings**
3. **International Clinical Neuroscience Journal**