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Efficacy of Online Shame-Based Acceptance and Commitment Group Therapy on Marital Adjustment in Women Experiencing Infertility and Moderate-to-Severe Depression

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Abstract

Background: *Infertility poses a profound psychological and social challenge for Iranian women, significantly impairing their mental health and marital adjustment. This study aimed to investigate the efficacy of an online shame-based acceptance and commitment therapy (ACT) group intervention on marital adjustment and its components among women experiencing infertility and moderate-to-severe depression.*

Methods: *A randomized controlled clinical trial with a pretest-posttest design, including a control group and follow-up phase, was conducted. The study population comprised infertile women attending infertility treatment centers in Tehran in 2023. A purposive sample of 40 infertile women was randomly allocated to intervention and control groups (20 participants each). Data were collected using a demographic questionnaire, the Dyadic Adjustment Scale (DAS), and the Beck Depression Inventory-II (BDI-II). The intervention consisted of 10 weekly online ACT sessions based on the 10-session shame-focused ACT protocol by McKay et al. (2020). Data were analyzed using repeated-measures analysis of variance in SPSS version 25.*

Results: *The results demonstrated that online shame-based ACT group therapy significantly improved overall marital adjustment and its components—satisfaction, cohesion, consensus, and affection- in women experiencing infertility and moderate-to-severe depression. (P-value<0.05). These improvements were sustained at follow-up.*

Conclusion: *Online shame-based ACT group therapy proved effective in enhancing marital adjustment among women experiencing infertility and moderate-to-severe depression. It is recommended as a complementary intervention alongside other mental health services to improve the quality of marital relationships in this population.*

Keywords: Acceptance and commitment therapy, Marital adjustment, Infertility, Depression.
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Introduction

Infertility, defined as the inability to conceive after one year of unprotected intercourse, represents a profoundly stressful psychological experience with significant implications for women's mental health[1,2]. Depression in infertile women is frequently accompanied by emotions such as shame, guilt, and social isolation. Shame, in particular, emerges as a pivotal factor, driving women toward social withdrawal and negative self-judgment, often leading them to perceive themselves as "defective" or "incomplete" [3]. Shame specifically mediates the infertility-marital discord link by fostering self-blame and social withdrawal, which erode open communication and intimacy in couples. A recent meta-analysis of 28 studies confirmed that infertility-related shame significantly predicts lower marital satisfaction (r=-0.42, P-value<0.001), partially mediating the pathway through avoidance behaviors. This mechanism underscores shame as a key therapeutic target in infertile populations.

These emotional experiences not only impair psychological well-being but also adversely affect marital adjustment. Marital adjustment, defined as the capacity of couples to achieve harmony and resolve conflicts in their shared life, is often diminished among infertile couples [4]. Research indicates that infertile women exhibit lower marital adjustment scores compared to their fertile counterparts, a phenomenon associated with heightened marital tension and reduced sexual satisfaction[5]. In traditional societies, cultural pressures surrounding procreation exacerbate these challenges. Infertile women frequently encounter social stigma and familial expectations, which contribute to diminished quality of life and an increased risk of divorce[6]. Depression stemming from infertility can create a bidirectional relationship, further undermining marital adjustment. For instance, a study conducted in Iran revealed that women experiencing infertility and moderate-to-severe depression report lower levels of marital satisfaction and quality of life[7]. Consequently, implementing psychological interventions to enhance marital adjustment among infertile couples is of paramount importance.

To date, various therapeutic approaches, including cognitive-behavioral therapy, mindfulness-based therapy, short-term psychodynamic therapy, and in-person group interventions, have been employed to enhance the relationships of infertile women. By targeting negative thoughts and maladaptive cognitive patterns, these approaches have proven effective in reducing stress and improving certain aspects of quality of life, such as mental health[8]. While mindfulness-based therapies effectively reduce anxiety and enhance self-awareness, they rarely address specific dimensions of marital adjustment, particularly in spiritual-religious and social contexts[9]. Short-term psychodynamic therapy, which focuses on unconscious conflicts, has been effective for some women but is limited by the need for multiple in-person sessions, high costs, and restricted access in underserved regions[10]. In-person

group interventions, despite their efficacy in reducing social isolation, face barriers such as geographical constraints, travel costs, and social stigma associated with infertility[11,12]. These limitations, coupled with the need for accessible and culturally tailored interventions in Iran, underscore the importance of innovative approaches like online shame-based acceptance and commitment therapy (ACT) group interventions. In Iran, cultural imperatives tying women's identity to motherhood amplify infertility stigma, leading to familial blame and social exclusion beyond typical global experiences of grief and loss. Globally, infertility stress often centers on personal distress, whereas Iranian contexts uniquely intensify marital discord through societal expectations of procreation and gender roles.

ACT, a third-wave therapeutic approach, is grounded in six core principles: acceptance, cognitive defusion, being present, self-as-context, values, and committed action[13]. Through experiential techniques, metaphors, and value-driven activities, ACT fosters psychological flexibility, enabling individuals to adapt to psychological challenges associated with infertility[14]. Online ACT group therapy leverages digital technology to deliver interventions in a safe, non-judgmental, and cost-effective environment[15]. This approach is particularly vital in the post-pandemic era and in underserved regions with limited access to psychological services. Online ACT group therapy creates a space for sharing experiences, reducing social isolation and infertility-related stigma, and enhancing marital relationships across emotional, social, and spiritual-religious dimensions[16]. Recent studies indicate that online ACT interventions yield lasting improvements in mental health, particularly for populations with complex psychological challenges, such as infertile women[8]. For instance, these interventions bolster coping skills like mindfulness and self-compassion, helping women better manage negative emotions such as shame and stress stemming from infertility[17]. Moreover, the accessibility of online sessions, reduced logistical barriers (e.g., travel and costs), and the opportunity to connect with others in a secure setting make this approach ideal for infertile women[18]. These features are especially significant in the Iranian cultural context, where infertile women face substantial social pressures and stigma.

Infertility, with an estimated prevalence of 10–15% in Iran, represents a significant psychological and social challenge, exacerbated by cultural pressures surrounding the maternal role[19]. Investigating the effectiveness of online shame-based ACT group intervention on marital adjustment and its components in women experiencing infertility and moderate-to-severe depression is critical, as this population faces unique psychological and social challenges that diminish marital adjustment across various dimensions. The lack of targeted digital interventions in Iran, particularly those addressing shame, creates a substantial research and practical gap. Online ACT group therapy, by fostering a space for accepting difficult emotions and reinforcing personal values, can mitigate these adverse effects[8]. The findings of this study could inform the development of mental health policies and the design of intervention programs at a national level, particularly within the Iranian cultural context, where strong expectations of motherhood intensify psychological and social pressures. Furthermore, given the growing use of digital technologies in mental health care, this study could serve as a model for future interventions aimed at improving marital adjustment among infertile women across multiple dimensions, underscoring its significance. The aim of this study was to examine the effectiveness of online shame-based ACT group therapy on enhancing marital adjustment and its components in women experiencing infertility and moderate-to-severe depression.

Although prior studies have shown ACT's efficacy in reducing distress among infertile women, they predominantly employed in-person formats and rarely targeted shame as a mediator of marital discord, leaving a gap in accessible, shame-focused digital interventions tailored to Iran's cultural stigma. Existing research also lacks randomized trials examining marital adjustment components in depressed infertile populations via online delivery. Addressing these gaps through a culturally sensitive, online shame-based ACT protocol strengthens the study by enhancing scalability, reducing access barriers, and providing targeted therapeutic mechanisms for a high-stigma context. Thus, the present research sought to address the question: Does online shame-based ACT group therapy effectively improve marital adjustment and its components in women experiencing infertility and moderate-to-severe depression?

Materials and Methods

This study was a randomized controlled trial (RCT) with a pretest-posttest design and a follow-up phase. The trial was registered with the Iranian Registry of Clinical Trials under code IRCT20230502058049N1. The study population consisted of infertile women in Tehran who sought infertility treatment at infertility clinics and obstetrics/gynecology practices in 2023. Using purposive sampling, 40 infertile women were selected and randomly assigned to either the shame-based ACT intervention group (n=20) or the control group (n=20). Assuming a statistical power of 0.80, a significance level of 0.05, and an effect size of 0.6, the G*Power formula indicated that a sample size of 40 participants (20 per group) was sufficient to detect significant differences[20]. This sample size aligns with recommended standards for small to medium clinical trials [21]. Randomization was performed using the random allocation function in SPSS version 25 (IBM Corp., Armonk, NY, USA), with a simple random sampling method without stratification or blocking. The participant selection process was conducted as follows: The principal investigator (first author) personally visited several reputable infertility treatment centers in Tehran. With prior coordination and permission from center managers and attending gynecologists, medical records of patients were reviewed. Initially, women whose medical histories and preliminary reports indicated infertility lasting more than one year were identified as potential candidates. Subsequently, the investigator met with each potential participant in person, thoroughly explaining the study objectives, procedures, potential benefits and limitations, and participants' rights. Informed consent forms were then provided.

The structured clinical interview was conducted using the Structured Clinical Interview for DSM-5-Clinician Version (SCID-5-CV) to confirm the diagnosis of major depressive disorder according to DSM-5 criteria. This ensured that all participants met formal diagnostic thresholds for moderate-to-severe depression prior to inclusion. Inclusion criteria were: (1) scoring 20 or higher on the Beck Depression Inventory-II

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(BDI-II; Beck et al., 1996), (2) infertility duration exceeding one year, (3) marriage duration exceeding two years, (4) age range of 20–40 years, (5) minimum high school education, (6) no history of substance abuse based on patient self-report, (7) at least three months since last psychotherapy and (8) Participants were screened for marital adjustment using the Dyadic Adjustment Scale (DAS) during the initial in-person clinical interview; those scoring below 101 (indicating maladjustment). This ensured all selected women exhibited clinically relevant marital difficulties prior to randomization. Exclusion criteria included: (1) receiving concurrent psychiatric or psychological services during the intervention, (2) failure to complete study questionnaires, (3) absence from more than three therapy sessions, (4) non-compliance with therapy assignments, and (5) occurrence of unforeseen life events.

Participant selection involved a structured clinical interview, and individuals with comorbid mental disorders alongside major depressive disorder were excluded. Additionally, the BDI-II[22] was administered to confirm depression diagnosis. According to Beck et al. [22] and Wang and Gorenstein[23], BDI-II scores are categorized as follows: 0-13 (no or minimal depression), 14-19 (mild depression), 20-28 (moderate depression), and 29-63 (severe depression). In this study, a score range of 20-63 was considered, and infertile women scoring 20 or higher were included. Prior to the study, participants were provided with an informed consent form, and confidentiality was ensured by assigning each participant a unique code. Before the sessions began, participants were briefed on study participation guidelines, therapy session protocols, and the overall structure and process of the therapy. Participants were also informed of their right to withdraw from the study at any time if they chose to discontinue treatment.

To conduct the study, sample screening commenced after obtaining ethical approval. During the initial screening and selection process, the researcher met with each participant in person, explained the study's objectives and procedures, and provided information about the research. A structured clinical interview, along with the BDI-II and the DAS, was used to assess depression and marital adjustment levels in infertile women, ensuring compliance with inclusion criteria. Participants completed written informed consent forms and were randomly assigned to either the experimental or control group. For the intervention group, session scheduling was determined through consultation with participants and the therapist, resulting in 10 weekly two-hour sessions conducted via Google Meet. Prior to the official start of therapy, the researcher held an online trial session for each participant to familiarize them with Google Meet, the session environment, and the rules governing each session. In cases of justified absences, a recorded audio summary of the session, along with worksheets and exercises, was sent to the participant. All participants joined a Telegram group for sharing feedback, submitting assignments, and distributing worksheets. Session reminders were sent via SMS the day before each meeting. Each session began with a review of the previous session's exercises and worksheets, followed by participants sharing their lived experiences since the last session, then proceeded with the session's content, and concluded with a review of that session's exercises and worksheets, which were shared in the Telegram group. At the end of the 10th therapy session, posttest questionnaires were sent to participants for completion and return. The therapy sessions ran from early November to early January.

During the one-month interval between the 10th session and the follow-up (11th) session, participants could contact the researcher online if needed or share questions in the therapy group. The control group, which received no intervention, also completed posttest questionnaires during this period. After one month, the 11th session (follow-up) was held for the intervention group to prevent relapse, reviewing newly acquired skills, and follow-up questionnaires were completed by both groups. Following the follow-up session, participants were offered optional online contact with the researcher for six months as a gesture of appreciation. Approximately two and a half months after the therapy and follow-up sessions concluded, the control group received the same online shame-based ACT, adhering to the same protocols and standards, to uphold ethical principles. Obtaining informed consent, ensuring confidentiality of participant information, and fostering a trusting environment were among the ethical considerations prioritized by the researcher. A double-blind method was employed, whereby the data analyst was external to the therapy team, and the sessions were conducted by a specialist independent of the research team. The ACT sessions were delivered by a licensed clinical psychologist holding a Ph.D. in Clinical Psychology, with specialized certification in ACT through a 120-hour training program accredited by the Association for Contextual Behavioral Science (ACBS). The therapist has over 8 years of clinical experience in delivering ACT-based interventions, including group protocols for chronic stress and emotional disorders, ensuring high fidelity to the shame-focused protocol. The principal researcher was responsible for study design, obtaining ethical approval, participant recruitment and screening, data collection, randomization, and statistical analysis. She also coordinated online sessions, monitored protocol fidelity, and ensured blinding of the data analyst. The ACT intervention sessions were delivered by an independent certified therapist to minimize bias. The other researchers provided scientific supervision, methodological oversight, and final validation of the results.

Table 1 presents a summary of the shame-based ACT protocol by McKay et al.[24] implemented over 10 weekly 120-minute sessions.

Table 1. Summary of the shame-focused acceptance and commitment therapy protocol

Session	Title	Objectives	Exercises and techniques
1	Defectiveness and shame	Identifying the defectiveness and shame schema, and understanding how defectiveness and shame fuel depression.	Establishing group rules, session objectives, and structure by the therapist; participant introductions; introduction to ACT and mindfulness practices; psychoeducation on shame and depression.

2	Assessment and evaluation	Assessing and self-evaluating thoughts and emotions associated with defectiveness and shame; identifying life domains affected by defectiveness, shame, and depression.	Reviewing the Shame Questionnaire and the Center for Epidemiologic Studies Depression Scale (CES-D); mindfulness breathing space exercise.
3	Identifying coping behaviors related to defectiveness and shame	Identifying coping styles driven by the defectiveness and shame schema, including common strategies across three domains: overcompensation, surrender, and avoidance.	Weekly practice of identifying triggers of defectiveness and shame in various areas and completing related worksheets; identifying consequences of coping behaviors and documenting them; mindfulness body scan exercise.
4	From avoidance to commitment	Exploring the consequences of coping behaviors and learning how to accept emotions instead of avoiding them, while responding in new ways.	Creative hopelessness technique; weekly practice of reviewing the list of consequences of coping behaviors, generating alternative responses, and mindfulness of focused attention.
5	Mindfulness	Recognizing triggers of defectiveness and shame; using mindfulness to notice shame-related thoughts and emotions without acting on them.	Weekly mindfulness practices including breathing space, body scan, focused attention, and mindful daily activities (e.g., mindful walking, eating, showering). Completing the Defectiveness Response Profile worksheet and daily event-trigger logs.
6	Values	Defining and clarifying personal values; forming value-based intentions; planning to pursue value-directed paths.	Completing the Values Clarification worksheet; updating the weekly values worksheet; worksheets on triggers and intentions; Values Path worksheet; mindfulness exercises.
7	Cognitive defusion	Learning techniques to observe thoughts and understanding how defusion (disengaging from distressing thoughts) can be beneficial.	Defusion techniques such as labeling the mind, worry time, categorizing thoughts, thanking the mind, thought labeling, repeating thoughts in a silly voice, and "thoughts on clouds" exercise.
8	Avoidance and exposure	Learning to accept emotional pain and strengthening exposure practices.	Exposure exercises including carrying the "defectiveness card," "hungry tiger" exercise, dropping the rope, and practicing self-as-context (observer self).
9	Facing shame and sadness	Understanding why exposure is helpful; teaching the four components of emotion and strategies for emotional exposure.	Imaginal exposure exercises.
10	Self-compassion	Learning a new, non-critical way of relating to oneself (cultivating positive and accepting thoughts and emotions).	Self-compassion practices including writing a letter to oneself and creating a self-compassion mantra.

For data collection, the following questionnaires were administered:

1. Beck Depression Inventory-II (BDI-II): The BDI-II is a self-report instrument designed to measure the severity of depression and its symptoms. It consists of 21 items rated on a four-point Likert scale (0 to 3), where a score of 0 indicates the lowest severity and 3 indicates the highest severity of depressive symptoms. The total score ranges from 0 to 63. According to the standard cut-offs, scores of 0-13 indicate minimal depression, 14-19 mild depression, 20–28 moderate depression, and 29–63 severe depression[22]. In an Iranian sample of 94 participants, the BDI-II demonstrated strong reliability with a Cronbach's alpha of 0.91, split-half reliability of 0.89, and test–retest reliability of 0.94[25]. In the present study, the reliability of this scale was calculated using Cronbach's alpha, yielding a coefficient of 0.76.

2. Dyadic Adjustment Scale (DAS): The DAS, developed by Spanier[26], is a 32-item instrument designed to assess marital adjustment. It measures four dimensions of marital relationships: dyadic satisfaction, dyadic cohesion, dyadic consensus, and affectional expression. The total score ranges from 0 to 150. Based on Spanier's criteria, scores below 101 indicate marital maladjustment and relational difficulties. Spanier reported high reliability for the DAS, with an overall Cronbach's alpha of 0.96. The internal consistency of the subscales has been reported as good to excellent, with Cronbach's alpha coefficients of 0.94 for dyadic satisfaction and 0.90 for dyadic cohesion[26]. The scale has demonstrated discriminant validity by differentiating between married and divorced couples[27].In addition, Holist and Miller reported Cronbach's alpha values ranging between 0.80 and 0.90[28]. Concurrent validity with the Locke-Wallace Marital Adjustment Test was reported as 0.90[29]. In the present study, the reliability of the DAS was calculated using Cronbach's alpha, yielding a coefficient of 0.83.

After data collection, the results were analyzed at both descriptive and inferential statistical levels. At the descriptive level, the mean and standard deviation were calculated. At the inferential level, to examine group differences across multiple measurement points, repeated measures analysis of variance (ANOVA) was conducted using SPSS version 25.

Results

The demographic characteristics of the participants in the two groups are presented in Table 2.

The distribution of frequencies, percentages, and the results of chi-square and independent t-tests for comparing the study groups based on demographic characteristics (Table 2) indicate that there were no statistically significant differences between the groups in terms of gender (χ^2=1.33, P-value=0.51), age (T=0.15, P-value=0.89), duration of marriage (T=0.11, P-value=0.91), or duration of infertility (T=0.39, P-value=0.70).

Table 3 reports the mean and standard deviation of the study groups for quality of life and its subcomponents.

Table 2. Demographic variables of the study participants by group

Demographic variable	Group	Online ACT Frequency (%)	Control Frequency (%)	Chi-square results
Education	Bachelor's	12 (60)	12 (60)	χ^2=1.33, P-value=0.51
	Master's	5 (25)	7 (35)	
	Ph.D.	3 (15)	1 (5)	
Demographic variable	**Mean±SD (Online ACT)**	**Mean±SD (Control)**	**Independent t-test results**	
Age	34.15±4.29	34.35±3.87	T=0.15, P-value=0.89, 95% CI [−2.92, 3.32]	
Duration of marriage	7.80±7.67	7.90±2.67	T=0.11, P-value=0.91, 95% CI [−3.18, 3.48]	
Duration of infertility	5.70±2.45	6.00±2.36	T=0.39, P-value=0.70, 95% CI [−1.29, 1.89]	

Table 3. Mean and standard deviation of the study groups for marital adjustment and its components

Variable	Group	Pre-test mean	Pre-test SD	Post-test mean	Post-test SD	Follow-up mean	Follow-up SD
Satisfaction	Online ACT	34.95	2.46	40.45	0.94	40.65	1.14
	Control	34.4	2.44	33.75	2.47	33.35	2.32
Consensus	Online ACT	14.2	3.02	20.1	1.07	20.4	1.14
	Control	13.75	3.06	13.5	2.87	14.3	2.94
Cohesion	Online ACT	24.5	5.36	42.25	6.09	42.15	6.01
	Control	24.5	5.52	24.2	6.35	24.55	6.38
Affection	Online ACT	3.75	2.22	10.05	1.19	10.25	1.16
	Control	4.1	2.2	4.15	2.11	4.45	1.96
Marital adjustment	Online ACT	77.4	11.94	112.85	7.86	113.45	8
	Control	76.75	11.4	75.6	11.94	76.65	11.7

As indicated by the results in Table 3, the mean scores for marital adjustment and its components (satisfaction, cohesion, consensus, and affection) in the online ACT group showed a substantial increase in the post-test and follow-up phases compared to the pre-test, whereas the control group exhibited minimal changes. The standard deviation in the online ACT group decreased in the post-test and follow-up phases, indicating greater consistency in responses. These findings suggest the effectiveness of online ACT group therapy in improving marital adjustment.

The results of the Kolmogorov-Smirnov test, conducted to assess the normality of the marital adjustment data, revealed that in both the online ACT and control groups, all components (satisfaction, cohesion, consensus, and affection) and the overall marital adjustment score exhibited a normal distribution in the pre-test, post-test, and follow-up phases (P-value≥0.05). The Levene's test results for assessing the homogeneity of variances in marital adjustment and its components showed that variances were homogeneous across all components. For satisfaction, the Levene statistic was 0.10 with P-value=0.76; for cohesion, 0.01 with P-value=0.9; for consensus, 0.15 with P-value=0.7; for affection, 0.07 with P-value=0.79; and for the overall marital adjustment score, 0.06 with P-value=0.98. P-values greater than 0.05 across all components (with Df_1=1 and Df_2=38) indicate homogeneity of variances between the groups.

The results of the independent samples t-test, conducted to examine the equality of means between the experimental and control groups in the pre-test phase for marital adjustment and its components, showed no significant differences. For satisfaction, the mean difference was 0.55, with a t-statistic of 0.71, degrees of freedom of 38, and a significance level of P-value=0.48. For cohesion, the mean difference was 0.45, t=0.47, with P-value=0.64; for consensus, the mean difference was 0, t=0, with P-value=1; for affection, the mean difference was -0.35, t=-0.5, with P-value=0.62; and for the overall marital adjustment score, the mean difference was 0.65, t=0.18, with P-value=0.86. P-values greater than 0.05 indicate no significant differences between the means of the two groups across all variables.

The results of Mauchly's test of sphericity, conducted to assess the equality of covariances for marital adjustment and its components, indicated that covariances were not equal. For satisfaction, Mauchly's statistic was 0.31, chi-square=43.79, with 2 degrees of freedom and P-value=0.0001; for cohesion, Mauchly's statistic was 0.43, chi-square=31.36, with P-value=0.0001; for consensus, Mauchly's statistic was 0.21, chi-square=58.03, with P-value=0.0001; for affection, Mauchly's statistic was 0.42, chi-square=32.16, with P-value=0.0001; and for the overall marital adjustment score, Mauchly's statistic was 0.26, chi-square=49.13, with P-value=0.0001. P-values less than 0.05 indicate significant differences in covariances. Therefore, one of the corrections, Greenhouse-Geisser, Huynh-Feldt, or lower-bound correction, must be applied. For this purpose, the Greenhouse-Geisser correction, one of the most commonly used adjustments, was employed in this section for marital adjustment and its components, including satisfaction, cohesion, consensus, and affection.

Table 4. Results of between-group and within-group effects for marital adjustment and its components

Variable	Source	Sum of squares	Df	Mean square	F	P	η^2	Test power
Satisfaction	Between-group	705.68	1	705.68	67.04	0.0001	0.64	1
	Within-group	150.62	1.18	127.56	65.36	0.0001	0.63	1
	Interaction	279.15	1.18	236.42	121.14	0.0001	0.76	1
Cohesion	Between-group	576.41	1	576.41	34.71	0.0001	0.48	1
	Within-group	262.32	1.27	206.13	113.66	0.0001	0.76	1
	Interaction	233.32	1.27	183.34	101.1	0.0001	0.76	1
Consensus	Between-group	4236.41	1	4236.41	41.99	0.0001	0.52	1
	Within-group	2059.52	1.12	1844.95	354.77	0.0001	0.90	1
	Interaction	2119.22	1.12	1898.43	365.05	0.0001	0.91	1
Affection	Between-group	429.41	1	429.41	45.79	0.0001	0.55	1
	Within-group	291.65	1.27	230.5	281.52	0.0001	0.88	1
	Interaction	256.32	1.27	202.58	247.42	0.0001	0.76	1
Marital adjustment	Between-group	18600.3	1	18600.3	57.81	0.0001	0.6	1
	Within-group	8238.72	1.15	7146.93	480.17	0.0001	0.93	1
	Interaction	8821.95	1.15	7652.87	514.16	0.0001	0.93	1

As demonstrated by the results in Table 4, there is a significant difference between participants in the experimental and control groups in the variable of quality of life and its components, including satisfaction, cohesion, consensus, and affection, with this difference favoring the experimental group. The partial eta squared values indicate that for marital adjustment and its components, satisfaction, cohesion, consensus, and affection,0.63, 0.76, 0.90, 0.88, and 0.93 of the variance in the scores of these variables, respectively, are explained by the within-group factor. Regarding the interaction effect between the within-group factor for marital adjustment and its components across time and the experimental and control groups, the results were significant. Since the main within-group effect was significant, pairwise comparisons of the measurement phases in the experimental group were subsequently examined in Table 5 using the Bonferroni test.

Table 5. Results of Bonferroni post-hoc test for pairwise comparison of marital adjustment and its components in the experimental group

Dependent variable	Comparison of measurement phases	Mean difference (i–j)	SE	P-value	95% CI for difference
Satisfaction	Pre-test vs. Post-test	−5.50*	0.51	<0.001	[−6.95, −4.05]
	Pre-test vs. Follow-up	−5.70*	0.49	<0.001	[−7.09, −4.31]
	Post-test vs. Follow-up	0.20	0.12	0.31	[−0.15, 0.55]
Cohesion	Pre-test vs. Post-test	−5.90*	0.52	<0.001	[−7.38, −4.42]
	Pre-test vs. Follow-up	−6.20*	0.54	<0.001	[−7.74, −4.66]
	Post-test vs. Follow-up	−0.30	0.16	0.25	[−0.74, 0.14]
Consensus	Pre-test vs. Post-test	−17.75*	0.81	<0.001	[−20.22, −15.28]
	Pre-test vs. Follow-up	−17.65*	0.82	<0.001	[−20.16, −15.14]
	Post-test vs. Follow-up	0.10	0.18	1.00	[−0.40, 0.60]
Affection	Pre-test vs. Post-test	−6.30*	0.36	<0.001	[−7.38, −5.22]
	Pre-test vs. Follow-up	−6.50*	0.35	<0.001	[−7.56, −5.44]
	Post-test vs. Follow-up	−0.20	0.09	0.12	[−0.45, 0.05]
Marital adjustment (total)	Pre-test vs. Post-test	−35.45*	1.43	<0.001	[−39.78, −31.12]
	Pre-test vs. Follow-up	−36.05*	1.49	<0.001	[−40.54, −31.56]
	Post-test vs. Follow-up	−0.60	0.28	0.15	[−1.39, 0.19]

The results of Table 5 indicate that in the online ACT group, there is a significant difference between the mean scores for satisfaction, cohesion, consensus, affection, and the overall marital adjustment score in the pre-test compared to the post-test, and in the pre-test compared to the follow-up (P-value<0.05). However, no significant difference was observed between the post-test and follow-up phases (P-value>0.05). This suggests that the scores of the experimental group members for satisfaction, cohesion, consensus, affection, and the overall marital adjustment score showed a significant increase in the post-test phase, and this increase was maintained in the follow-up phase.

Discussion

The purpose of this study was to investigate the effectiveness of online ACT group intervention focused on shame in improving marital adjustment and its components among women experiencing infertility and moderate-to-severe depression. This study sought to address whether this intervention could enhance marital adjustment and its components (satisfaction, cohesion, consensus, affection) in

this population. The findings demonstrated that online ACT group therapy significantly improved marital adjustment and its components in the experimental group compared to the control group. These effects remained stable at the one-month follow-up.

The findings of this study align with previous research. For instance, Balsom et al.[8] demonstrated that ACT, by reducing psychological distress and enhancing psychological flexibility, improves marital adjustment in infertile women across emotional, psychological, and social dimensions, which is consistent with the current study's results in enhancing marital adjustment in these dimensions. Yazdani et al. confirmed the effectiveness of ACT group therapy in reducing psychological stress and improving marital adjustment[30]. However, no identical study was found that specifically examined online shame-focused ACT group intervention on marital adjustment in infertile women with moderate-to-severe depression. Existing research on online group therapy interventions for infertile individuals has primarily focused on reducing overall stress, anxiety, or general psychological distress (e.g., the Infertility ACT program by Balsom et al.[8], which was delivered online but not necessarily in a group format and did not specifically target shame), with less attention paid to marital adjustment and its components (satisfaction, cohesion, consensus, and affectional expression). Furthermore, most of these interventions have been conducted in-person or without a particular emphasis on shame as a key mediator. In comparison with these prior studies, the current protocol—through its explicit focus on shame (a factor particularly salient in the Iranian cultural context, where women's identity is strongly linked to motherhood) and its fully online group delivery—demonstrated significant and sustained improvements across all components of marital adjustment. This difference may stem from the greater accessibility of the online intervention, the reduction of logistical and stigma-related barriers, and the safe group environment for sharing shame-related experiences, which are less prominent in in-person or individual interventions.

The improvement in marital adjustment and its components among women experiencing infertility and moderate-to-severe depression can be explained based on the theoretical foundations of ACT and the content of the intervention sessions. ACT is grounded in six core principles: acceptance, cognitive defusion, being present, self-as-context, values, and committed action, which were applied in this study to enhance marital adjustment[13]. These principles fostered psychological flexibility, enabling women to better cope with the psychological challenges of infertility, such as feelings of inadequacy and social pressures[14].

Regarding the effectiveness of online ACT group therapy in increasing the affection component, sessions five, eight, and nine, which focused on teaching emotional exposure and mindfulness, reduced emotional distress. Exposure exercises, such as carrying a defect card and letting go of the rope, helped women confront difficult emotions like shame and sadness related to infertility instead of avoiding them. The principle of acceptance in ACT encourages individuals to experience emotions without judgment, which reduces the intensity of negative emotions[13]. The non-judgmental group environment also strengthened emotional support and increased a sense of belonging, consistent with Boivin et al., who highlighted the role of social support in reducing emotional distress[16].

For the effectiveness of online ACT group therapy in increasing the overall marital adjustment score, a combination of all sessions and the theoretical principles of ACT was influential. Acceptance, cognitive defusion, values, and self-compassion helped women cope with negative emotions and move toward a value-driven life. Online group therapy, by reducing logistical barriers and fostering a sense of belonging, enhanced the intervention's effectiveness[11]. Psychological flexibility, the core of ACT, enabled women to adapt to the multifaceted challenges of infertility and improve marital adjustment across various dimensions[8].

ACT, with its emphasis on accepting negative emotions, mindfulness, and commitment to shared values, improves marital adjustment. The protocol by McKay et al.[24] focuses on reducing the impact of defect and shame schemas, encouraging couples to identify and accept negative emotions such as shame and depression. This approach, through mindfulness exercises, cognitive defusion, and emotional exposure, helps couples move away from emotional avoidance and adopt responses based on values like intimacy and collaboration. The study results showed that the online ACT group significantly increased mean marital adjustment scores in the post-test and follow-up, demonstrating greater response stability. This reflects the positive impact of ACT in strengthening emotional connections and marital functioning.

ACT enhances marital satisfaction by teaching emotional acceptance and focusing on shared values. The protocol by McKay et al.[24] uses mindfulness exercises and cognitive defusion techniques to enable couples to manage conflicts without judgment. This process reduces defensive reactions and increases mutual understanding. Techniques like emotional exposure help couples confront emotional issues rather than avoid them, leading to greater relationship satisfaction. Table 5 results indicate a significant increase in satisfaction in the online ACT group.

ACT improves marital cohesion through enhanced mindfulness and commitment to shared values. The protocol by McKay et al.[24], using exercises like breathing space and focused attention, helps couples identify shame triggers and respond empathetically without defensiveness. This fosters a sense of unity and collaboration in the relationship. Table 5 results show a significant increase in cohesion in the online ACT group during the post-test and follow-up.

ACT enhances marital consensus by teaching acceptance and defusion from negative thoughts. The protocol by McKay et al.[24], with techniques like mind naming and thought labeling, encourages couples to move away from negative judgments and focus on shared values. This aids in resolving conflicts and reaching mutual cohesion. Table 5 results indicate a significant increase in consensus in the online ACT group during the post-test and follow-up.

ACT increases marital affection by fostering self-compassion and emotional acceptance. The protocol by McKay et al.[24], through exercises like writing a letter to oneself and creating a self-compassion mantra, encourages couples to express affection and reduce self- and partner-criticism. This

strengthens emotional intimacy. Table 5 results show a significant increase in affection in the online ACT group during the post-test and follow-up.

This study demonstrated that online ACT group therapy focused on shame significantly improved marital adjustment and its physical, psychological, emotional, spiritual-religious, economic, sexual, and social components in women experiencing infertility and moderate-to-severe depression. These effects remained stable one month post-intervention. The use of digital technology in this intervention facilitated access to psychological services in Iran's cultural context, where infertile women face social stigma and cultural pressures. This study underscores the importance of digital interventions targeting shame to improve marital adjustment in infertile women. However, limitations such as a small sample size and short-term follow-up restrict the generalizability of the results. Future research should involve larger samples and longer follow-ups (e.g., six months or one year). Additionally, comparing ACT with other interventions, such as cognitive-behavioral therapy, could clarify its relative effectiveness. Practically, developing training programs for mental health professionals in online ACT and establishing digital support groups could enhance access to such interventions in Iran. This study provides a model for digital interventions that can improve marital adjustment in infertile women and reduce their psychological burden.

The findings suggest that integrating online shame-based ACT into Iran's public health clinics could provide a scalable, cost-effective intervention for infertile women with depression, addressing a critical gap in culturally sensitive mental health services. Policymakers should prioritize training primary care providers in brief ACT protocols and establishing telehealth platforms within existing maternal health networks. This integration would reduce stigma-related barriers, enhance marital adjustment, and align with national priorities for reproductive mental health. Future policy frameworks should include reimbursement mechanisms for digital psychological services to ensure equitable access across urban and rural regions.

This study provides preliminary evidence that online shame-based ACT group intervention significantly enhances marital adjustment and its components among women experiencing infertility and moderate-to-severe depression, with effects sustained at one-month follow-up. Despite the small sample size limiting generalizability, the findings highlight the potential of digital, shame-focused ACT as a culturally relevant intervention in Iran's high-stigma context. Future research with larger samples and longer follow-ups is needed to confirm these results. We call for the development and evaluation of culturally adapted ACT protocols in other Middle Eastern contexts to address shared sociocultural challenges in infertility-related mental health.

Ethical Considerations

This article is derived from a doctoral dissertation in psychology at Shiraz University and holds an ethics code with the identifier SPE/IR.US.PSYEDU.REC.1402.006 from the university's Research Ethics Committee. Ethical considerations included obtaining ethics approval from the committee, securing participants' consent for questionnaire distribution and training implementation, adhering to scientific integrity and honesty, obtaining informed consent for participation, ensuring anonymity of scales and participants, and maintaining confidentiality of their information.

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Conflict of Interest

The authors declare no conflict of interest regarding the results of this study.

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