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Original Article

Comparing the Effectiveness of Expressive Writing and Relaxation on Mental Health and Treatment Success in Women Undergoing Assisted Reproductive Technology: A Randomized Controlled Trial

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Abstract

Objective: Infertility and its treatments can lead to mood disorders such as depression, anxiety, stress. This study aimed to compare the effects of relaxation and expressive writing on depression, anxiety, stress, and treatment success in women utilizing assisted reproductive technology methods.

Materials and methods: In this parallel randomized clinical controlled trial, 90 infertile women undergoing assisted reproductive technology were involved. Participants were randomly assigned to three groups: writing (n=30), relaxation (n=30), and control (n=30). The writing and relaxation groups received either expressive writing or relaxation interventions, while the control group only received routine treatment. The primary outcomes measured in the study were depression, anxiety, and stress, with treatment success as the secondary outcome. All participants completed the Depression, Anxiety, and Stress Scale at the beginning of the treatment cycle and again before ovarian puncture. Statistical analysis was performed using the Chi-squared, Kruskal-Wallis, and Wilcoxon tests. A p-value<0.05 was considered statistically significant.

Results: The results showed that mean differences in depression (P=0.001) and stress scores (P=0.011) before and after intervention in the writing group were significantly higher than in the control group. Additionally, only the writing group experienced a significant decrease in depression (P=0.016). However, there was no significant difference in other measured outcomes among the three groups.

Conclusion: It is recommended to conduct more well-designed studies to further investigate the effects of expressive writing and relaxation techniques.

Keywords: Anxiety; Depression; Infertility; Relaxation; Stress; Writing

Introduction

Infertility is a global problem and one of the most important reproductive health issues. In addition to being a medical condition, infertility is also recognized as a social and emotional issue (1). In most cultures, reproduction and having children are the main goals of marriage and family formation (2),

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so not being able to have children can cause a psychological crisis (3). The problem of infertility is increasing and affects 15% of reproductive-aged couples worldwide (4). In Iran, the prevalence of infertility is about 13.2% (5). Infertility causes numerous physical, psychological, social and economic problems for couples struggling with it (6). The initial emotional response to infertility and its treatments are often worry or depression. Women tend to experience more severe related to infertility than men, leading to feelings of shame, a disorder in feminine identity (7), and a sense of deficiency and inadequacy after receiving a diagnosis. As a result, anxiety and depression are the most common mood disorders observed in individuals dealing with infertility (8). Being exposed to assisted reproductive treatments is also a factor in creating psychological, mental (9), emotional, physical, and economic pressures (10). These pressures can affect one's ability to cope with difficult life events. In addition, the negative psychological effects that occur after treatment may reduce the effectiveness of treatment (11, 12). Infertile women may experience depression and anxiety due to multiple treatment failures (6, 13, 14). Currently, the use of non-drug stress reduction methods such as relaxation, mental imagery, music therapy, biofeedback and yoga can be helpful in this field. These methods follow the theory of psychoneuroimmunology, which emphasizes the active involvement of individuals (15). Some studies have shown that using complementary treatment methods that are low-risk, inexpensive and easy can help reduce stress and increase the chance of pregnancy in women (16), as well as reduce distress and increase the probability of pregnancy (17). One of these techniques is expressive writing (EW). EW is a type of psychological intervention that was first proposed by Pennebaker and Beall in 1986 (18). Expressing feelings through writing about a traumatic event has proven to be an effective intervention for reducing mental distress and improving physical health (19, 20). In recent years, expressive writing intervention (EWI) has generated the interest of many researchers and its use for various purposes is on the rise. Several studies indicate that EW, whether done alone or in conjunction with other therapeutic techniques, has a positive impact on both the physical and mental well-being of individuals (21, 22). Relaxation is another complementary method used in studies related to stress control. By focusing on concentration of attention during relaxation, a wide range of physical and psychological signs and symptoms, including anxiety, pain, depression and self-confidence are affected and stress is also reduced (23). The objective physiological consequences of relaxation include a reduction in blood pressure and pulse, as well as decrease in sodium and fluid retention, leading to normalized levels of glucose and insulin. According to Benson, de-stressing is a crucial component of meditation, and the four main elements that contribute to stress relief are a calm environment, a comfortable position, mental devices such as words to focus on, and a passive attitude (24). Relaxation during pregnancy, when done regularly, has been shown to have a positive impact on stress, anxiety, depression (resulting from emotional and physical changes), blood pressure, and heart rate (25). In a study by Karami et al., relaxation was found to reduce depression, anxiety, and stress in infertile women (26). Additionally, in Valiani et al.'s study on the effects of relaxation on pregnancy outcomes, it was noted that stress levels decreased, and treatment success rates increased (2).

With these interpretations in mind, it is important to address psychological disorders that may arise during infertility treatment. Additionally, the side effects and the dependencies that can result from sedative drugs must be considered. On the other hand, preventing tension and stress that may occur during infertility and assisted reproductive methods, such as In vitro fertilization, is crucial for the successful treatment and persistence of psychological symptoms even after achieving pregnancy. Therefore, this study was conducted to compare the effects of Benson relaxation and expressive writing on depression, anxiety, stress, and the success of treatment for women undergoing assisted reproductive treatment (ART).

Materials and methods

Study design and subjects: The present study was a parallel-group randomized trial which conducted on 90 women undergoing ART at an infertility center in Tehran, Iran. The study took place from June 2020 to June 2021. The study was designed to compare the effectiveness of expressive writing and relaxation on mental health, as well as treatment success among infertile women undergoing ART. This was done in order to enhance our understanding of the benefits of these interventions for women undergoing infertility treatments. Data was collected from all eligible participants, including Iranian women who were able

to read and write. Inclusion criteria for the study included women aged 18 years and above, candidates for IVF or intracytoplasmic sperm injection (ICSI) treatment, and access to networking tools such as WhatsApp. The authors utilized artificial intelligence to edit the English language text.

The following candidates were not included in the study: those with endometriosis or uterine causes of infertility, individuals undergoing psychological treatments, those being considered for genetic diagnosis treatment prior to implantation, and those with physical and mental health issues other than infertility as documented in the case records.

Sampling and data collection: The sampling method used was consecutive, and 90 participants were randomly assigned into three groups through blocking. To create the blocks, an equal number of participants were assigned to each group until the block reached the desired size. A statistician generated a list of all possible blocks with a size of 6 (a multiple of the number of study groups) was using Excel software. After removing duplicate blocks 25 blocks of 6 were selected using a random number table. Participants were then allocated to the EWI, Benson's muscle relaxation (BMR), and control (C) groups based on the selected blocks and their arrangement within each block. Sampling was conducted from June 2020 to June 2021.

Interventions: We asked women to express themselves through writing for 30 minutes once a day. Each day, starting in the morning at home, from the beginning of the treatment cycle until the day of ovum retrieval. They were instructed to write aimlessly until three pages were filled. They were also told not to worry about writing style or grammar, but instead to focus on completing the task of writing three pages. The main goal of the intervention was to help women express themselves in order to overcome worries and anxiety (27-30).

We taught BMR to the women in the research environment with the help of an audio file. Then we asked them to perform the intervention once a day from the beginning of the treatment cycle until the day of ovum retrieval, using the audio file (2, 26, 31). Additionally, the researcher reminded the participants to do their daily exercises and to complete the follow-up questionnaire by text message or phone call. They were instructed to send it via WhatsApp virtual network before the ovum retrieval.

Outcome measures: The primary outcomes measured in the study were depression, anxiety, and stress, with treatment success as the secondary outcome.

1. Psychological health: We used the 42-items Depression. Anxiety and Stress Scale (DASS-42). The questionnaire contains 3 sub-scales, each including 14 items. Each item is rated on a 4-point Likert scale (0 to 3) giving a score ranging from 0 to 42, with higher scores indicating the worth conditions. The cutoff point for depression is 10, anxiety is 8, and stress is 15 (32)**.** We used the Iranian version of the questionnaire. The psychometric properties of the Iranian version are well documented (33).

2. Treatment success: The number of ovum (obtained in the process of ovarian puncture), and the number of embryos formed (obtained from the medical records) were considered as treatment outcomes.

Ethical consideration: This study was approved by the Research Ethics Committee of Iran University of Medical Sciences, with approval ID IR.IUMS.REC.1398.1263, and approval date of 2020-02-29. The provisions of the Declaration of Helsinki were followed. Women participated voluntarily and had the right to withdraw from the study at any time without any consequences. Informed consent was obtained from all participants after they were informed about the study objectives and methods. The confidentiality of participants' data and information sources was assured. Additionally, the principles of the COPE publication ethics committee were adhered to in this study. The study was registered in IRCT, with the registration ID IRCT20110629006917N5, 06/09/2021.

Statistical Analyses: Statistical analysis was conducted using SPSS version 16 software (SPSS Inc., Chicago, IL, USA). Continuous variables were presented as mean and standard deviation (M ± SD), while categorical variables were shown as number and percentage (n %). To compare means across various groups, the Chi-squared, Kruskal-Wallis, and Wilcoxon test were used. A p-value<0.05 was considered statistically significant.

Results

Ninety women were included in the study, with 30 women in each group. The study flow diagram is presented in Figure 1, and the demographic characteristics of the study samples are shown in Table 1. No significant differences were observed in the demographic characteristics of women in the three groups.

The results of the Wilcoxon test showed a significant difference in depression within the EWI group (P=0.016), indicating that the intervention effectively reduced depression in this group.

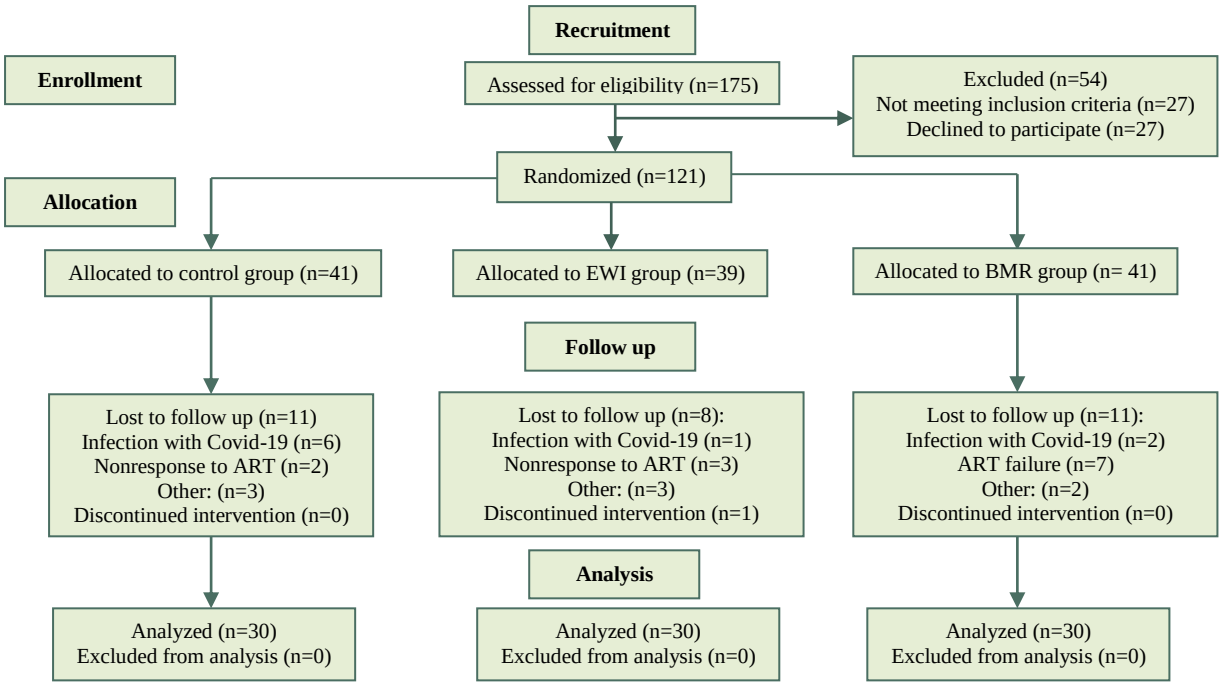

Figure 1: CONSORT 2010 Flow Diagram

The results of the Wilcoxon test showed a significant difference in depression within the EWI group (P=0.016), indicating that the intervention effectively reduced depression in this group. However, no significant differences were found in depression scores within the BMR group (P=0.567), or the control groups (P=0.063). Also, there was no significant difference in women's anxiety levels at follow-up assessments compared to their baseline anxiety scores in all groups. In terms of stress, women in the EWI group did not show statistically significant decreases in stress levels while there was an increase in stress scores among the BMR and control groups.

Table 1: The characteristics of the participants

Variables		Control (n=30)	EWI (n=30)	BMR (n=30)	P-value
Age (years)	<30	5 (16.6)	5 (16.6)	6 (20.1)	0.406
	30-39	14 (46.7)	17 (56.6)	17 (56.6)	
	≥40	11 (36.7)	8 (26.8)	7 (23.3)	
	Mean ± SD	36.67 ± 5.77	36.63 ± 5.46	35.03 ± 6.07	
Infertility Duration (years)	<5	13 (43.4)	14 (46.7)	13 (43.4)	0.417
	5-9	14 (46.6)	9 (30)	10 (33.3)	
	≥10	3 (10)	7 (23.3)	7 (23.3)	
	Mean ± SD	5.71 ± 4.50	6.41 ± 5.02	6.06 ± 3.88	
Infertility cause	Unknown	3 (10)	1 (3.4)	3 (10)	0.333
	Female factor	11 (36.6)	10 (33.4)	12 (40)	
	Male factor	6 (20)	14 (46.6)	10 (33.3)	
	Female & male factor	10 (33.3)	5 (16.6)	5 (16.6)	
Educational level	Diploma or lower	17 (56.6)	12 (40)	19 (63.3)	0.175
	University	13 (43.4)	18 (60)	11 (36.7)	
Employment status	Housewife	22 (73.3)	27 (90)	21 (70)	0.136
	Employed	8 (26.7)	3 (10)	9 (30)	
Economic status	Unfavorable	4 (13.4)	7 (23.3)	7 (23.3)	0.410
	Intermediate	23 (76.6)	16 (53.4)	18 (60)	
	Favorable	3 (10)	7 (23.3)	5 (16.7)	

Data are presented as Mean ± SD or n (%). EWI: Expressive writing intervention, BMR: Benson's muscle relaxation.

Table 2: Comparison means of depression, anxiety, stress, and treatment outcomes within and among groups

Variables		Control (n=30)	EWI (n=30)	BMR (n=30)	P-value
Depression	Before	9.30 ± 9.69	9.96 ± 9.27	7.90 ±6.40	0.827
	After	12.76 ±12.31	7.50 ± 8.47	8.66 ± 8.26	0.327
	P-value	0.063	0.016	0.567	
Anxiety	Before	7.50 ±7.81	5.86± 6.48	5.96 ±5.50	0.699
	After	9.53 ± 8.68	6.53 (8.51	6.56 ±5.89	0.343
	P-value	0.072	0.939	0.665	
Stress	Before	13.56 ± 10.93	11.96 ± 9.29	10.80 ± 6.41	0.869
	After	16.33 ±11.75	10.86 ± 8.52	11.53 ± 8.13	0.141
	P-value	0.024	0.117	0.732	
Ovum	After	5.24 ± 4.65	7.40 ± 7.22	8.07 ± 6.66	0.310
Embryo	After	2.93 ± 3.33	3.77 ± 2.83	4.07 ± 4.05	0.272

Data are presented as Mean ± SD. EWI: Expressive writing intervention, BMR: Benson's muscle relaxation.

The increase in stress among the control group was statistically significant (P=0.024). Detailed results can be found in Table 2.

The results of the Kruskal-Wallis test showed that at baseline, there were no significant differences among the study groups in terms of depression. Similarly, there did not significant differences between the study groups after the intervention. The findings regarding anxiety indicated that there were no significant differences among the study groups either at baseline or after the intervention. However, stress was not significantly differed among the study groups at baseline. After the intervention, although stress was reduced slightly in the intervention groups and increased in the control group, no significant differences were observed among the study groups. In terms of treatment success, there were no significant differences among the study groups in the number of ovum and the number of embryos formed. The results are shown in Table 2.

Discussion

Infertile women undergoing ART may experience mental distress and could benefit from psychological interventions (29). Although EWI and BMR have shown promising results on various psychological outcomes, there are still controversies surrounding their effectiveness (29, 34). According to the results of the present study, there were no significant differences in terms of depression, anxiety, stress, or treatment success between the EWI, BMR, and control groups. However, depression significantly decreased in the EWI group compared to baseline. Conversely, stress significantly increased in the control group at follow-up compared to baseline. In contrast to the present study, there is evidence that EWI reduce the stress experienced by infertile couples undergoing treatment. However, further studies with larger sample sizes are recommended for generalization (29). Consistent with our results, a meta-analysis study showed that EWI had no significant long-term effects on depressive symptoms (35). Furthermore, in another study, the EWI did not show any significant effect on reducing anxiety, depressive symptoms, or physical symptoms (36). The study by Frederickson et al. also confirmed these results regarding anxiety, depression, and pregnancy rate among couples in ART treatment. They generally experienced a statistically significant increase in negative affect immediately after EWI (28). Our results regarding treatment outcomes, however, are similar to those reported by another study that also failed to find EWI as an effective intervention in increasing pregnancy rate (37). It appears that infertile women experience anxiety stemming from deeper psychological issues. Furthermore, the treatment process exhausts and increases anxiety in these individuals (38). On the other hand, various defense mechanisms or psychological dysfunction can hinder the outcomes of ART (39). The results of our study also showed that BMR did not have any significant effect on depression, anxiety, or stress as well as treatment outcomes. This is surprising, as some studies have found this intervention to be an effective way to decrease stress, anxiety, or depression in other study groups (40-42). It seems that women who undergo infertility treatments such as IVF, experience very high levels of mental stress that only increase over time (43). In Iranian culture, the primary and most anticipated social role for

married women is child bearing (44). Therefore, infertility has complex interactions with many factors and is more than just a medical issue within marital life (45). On the other hand, differences in the results of various studies may be influenced by lifestyle, attitude, and insight of subjects, as well as writing and relaxation methods, sample size, duration, and proper assignment completion. As the number of sessions increases and the topic of writing becomes more specific, this effect becomes more noticeable (36). Conducting the present research during the COVID-19 pandemic, which has increased depression, anxiety, and stress levels in people, especially those who need to visit medical centers, could be effective in achieving these results. Women undergoing ART during this pandemic, experienced higher level of psychological distress that was apparently correlated with overall infertility-related stress (46).

The present study contributes to the expanding literature on psychological interventions for women with infertility undergoing ART. This study has several strengths. First, the random allocation appeared to be successful in creating well-matched groups at baseline, thereby reducing the risk of selection bias. Second, the comparison of two interventions (EWI and BMR) with each other and a control group makes this study unique. To the best of our knowledge, this study is being conducted for the first time. Third, the convenience of completing the EWI at home, along with the ability to freely express feelings in writing without worrying about grammatical errors, and the lack of need to submit manuscripts to researchers, alleviated concerns about confidentiality issues. All factors mentioned contributed to the validity of intervention implementation by participants. Despite the methodological strengths, it is important to also consider several potential limitations.

First, the debriefing before the interventions may have had a therapeutic effect on all participants in the study groups, including those in the control group. Although the researcher did not engage in emotional expressions with the participants in the intervention groups, the perceived specific attention from her and the lack of blinding, especially during the follow-up process, could have affected the results (28). Second, the COVID-19 pandemic may impact the results, which raises questions about the generalizability of the findings. Therefore, the results should be interpreted with caution.

Conclusion

Our study did not show any statistically significant differences in terms of depression, anxiety, stress, and treatment outcomes among women undergoing ART. In light of these results and the limitations of our study, along with the fact that researchers have suggested interventions that are low-cost, low-burden, and easy to implement during ART treatments, it is necessary to conduct more well-designed studies to further investigate the effects of EWR and BMR while accounting for other potential confounding factors.

Conflict of Interests

Authors declare no conflict of interests.

Acknowledgments

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