

The Effect of the 'Empowerment Program for Infertile Women' Developed Based on the Uncertainty in Illness Theory on the Levels of Coping with Uncertainty and Stress in Women with Infertility: A Randomized Controlled Trial (RCT)

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Abstract

Purpose of the research: This randomized controlled trial aimed to determine the effect of the "Empowerment Program for Infertile Women," developed based on the Theory of Uncertainty in Illness, on the levels of coping with uncertainty and stress in women diagnosed with infertility.

Methods: The study was conducted as a double-blind, pretest-posttest, control group experimental design. It was carried out between January and June 2022 with 35 infertile women in the intervention group and 35 in the control group, all diagnosed with infertility and meeting the inclusion criteria, who applied to the gynecology outpatient clinic of Ondokuz Mayıs University Faculty of Medicine Hospital. Data were collected using the Personal Information Form developed by the researcher based on the literature, the Mishel Uncertainty in Illness Scale–Community Form (MUIS-C), and the Coping with Infertility Stress Scale (CISS). After the pretest was administered to both groups, the intervention group received a four-week face-to-face education program. Three months after the completion of the Empowerment Program for Infertile Women, posttests were administered to both groups.

Results: The mean age of women in the intervention group was 29.6 ± 5.0 , and 28.9 ± 4.0 in the control group. According to the pretest-posttest results of the control group, the changes in scores related to coping with infertility stress and uncertainty due to infertility were not statistically significant. After the intervention, the mean total score on the Coping with Infertility Stress Scale in the intervention group was 50.3 ± 7.4 , min-max = (34–71), indicating an increase compared to the pre-intervention score. The mean total score on the Mishel Uncertainty in Illness Scale–Community Form was 51.5 ± 20.4 , min-max = (27–100), indicating a decrease compared to the pre-intervention score. Statistically significant differences were found in both within-group and between-group comparisons of the total scores for both scales in the intervention group ($p < 0.001$).

Conclusion: The results of the study indicated that the Empowerment Program for Infertile Women, developed based on the Theory of Uncertainty in Illness, positively affected the levels of coping with uncertainty and stress in women with infertility.

Keywords: Theory of Uncertainty in Illness, Infertility, Infertility Stress, Uncertainty, Structured Education Program

Özet

Amaç: Bu araştırma “Hastalıkta Belirsizlik Teorisine Dayalı Olarak Geliştirilen ‘İnfertil Kadınları Güçlendirme Programının’ İnfertilitesi Olan Kadınların Belirsizlik ve Stresle Başa Çıkma Düzeylerine Etkisini belirlemek amacıyla yapılmış bir randomize kontrollü çalışmadır.

Yöntem: Araştırma çift kör randomize, öntest-sontest kontrol gruplu, deneysel modele uygun olarak yapılmıştır. Araştırma Ondokuz Mayıs Üniversitesi Tıp Fakültesi Hastanesi kadın doğum polikliniğine başvuran infertilite tanısı almış ve araştırma kriterlerine uyan deney grubunda 35, kontrol grubunda 35 infertil kadınlarla Ocak-Haziran 2022 tarihleri arasında yapılmıştır. Araştırmanın öntest-sontest verileri için araştırmacı tarafından literatür doğrultusunda geliştirilen kişisel bigi formu, Mishel Hastalıkta Belirsizlik Ölçeği-Toplum Formu (MHBÖ-T) ve İnfertilite Stresi ile Başa Çıkma Ölçeği (İSBÇÖ) kullanılmıştır. Deney ve kontrol grubuna öntest uygulamasının ardından, deney grubuna 4 hafta süren yüz yüze eğitim uygulaması yapılmıştır. İnfertil Kadınları Güçlendirme Programının bitiminden 3 ay sonra deney ve kontrol gruplarına son testler uygulanmıştır.

Bulgular: Deney grubundaki kadınların yaş ortalamasının 29.6 ± 5.0 olduğu, kontrol grubundaki kadınların yaş ortalamasının 28.9 ± 4.0 olduğu belirlenmiştir. Kontrol grubunun öntest-sontest sonuçlarına göre infertilite stresi ile başa çıkma ve infertiliteye bağlı yaşanan belirsizlik puanlarının istatistiksel olarak anlamlı olmadığı belirlenmiştir. Girişim sonrasında deney grubundaki kadınların İnfertilite stresi ile başa çıkma ölçeği toplam puan ortalamasının 50.3 ± 7.4 , min-max = (34-71) olduğu ve girişim öncesine göre puan ortalamasının arttığı belirlenmiştir. Mishel hastalıkta belirsizlik ölçeği-toplum formu toplam puan ortalamasının 51.5 ± 20.4 , min-max = (27-100) olduğu ve girişim öncesine göre puan ortalamasının azaldığı belirlenmiştir. Deney grubundaki kadınların her iki ölçek için hem grup içi hem de gruplararası toplam puanları bakımından istatistiksel olarak anlamlı farklılık olduğu saptanmıştır ($p<0,001$).

Sonuç: Araştırmanın sonucunda hastalıkta belirsizlik teorisine dayalı olarak geliştirilen infertil kadınları güçlendirme programının infertilitesi olan kadınların belirsizlik ve stresle başa çıkma düzeylerini olumlu yönde etkilediği bulunmuştur.

Anahtar Sözcükler: Hastalıkta Belirsizlik Teorisi, İnfertilite, İnfertilite Stresi, Belirsizlik, Planlı Eğitim Programı

Introduction

Infertility is a global health issue affecting millions of people of reproductive age worldwide. Globally, 186 million individuals are affected by infertility¹. In Turkey, as of 2018, it is reported that 12% of women have experienced infertility at least once². The World Health Organization (WHO) defines infertility as a disease of the female or male reproductive system resulting in the inability to achieve pregnancy after 12 months or more of regular, unprotected sexual intercourse¹.

The reproductive instinct, one of the fundamental human instincts, leads nearly all couples to plan for having children; however, this desire can sometimes be hindered by infertility³. Couples encountering issues related to reproductive potential are adversely affected and may experience a sudden and unexpected life crisis^{4,5}. Couples facing infertility may experience feelings of disappointment, guilt, and mutual blame, which can lead to a gradual weakening of marital bonds. Infertility also impacts individuals' social relationships with family, friends, and others, as well as their sexual lives³. Although infertility is not a life-threatening health problem, it negatively affects the mental health and quality of life of the couples it impacts and threatens healthy living⁶. Studies show that infertile couples experience issues such as depression, anxiety disorders, sexual problems, marital discord, decreased self-esteem, and social isolation more frequently than fertile couples^{7,8}. Infertility affects couples in many ways; however, it has been observed that women feel greater pressure and experience psychological problems at higher rates³. Studies have shown that infertile women experience emotions such as anxiety, fatigue, helplessness, depression, worry, hopelessness, stigma, social isolation, and feelings of exclusion at more pronounced levels^{9,10}. It has been identified that conditions such as loss of self-esteem, hopelessness, anger, guilt, and difficulties in relationships experienced by infertile individuals exacerbate family stress and crises¹¹. Infertility treatment represents a prolonged, emotionally stressful, and financially burdensome process for couples, which challenges their coping mechanisms and can negatively impact their marital relationships. During the diagnosis and treatment process, infertile women may experience feelings of loss of control, guilt, diminished perceptions of femininity, and disruptions in self-perception due to the long and painful nature of the treatment and the potential for unsuccessful outcomes^{3,6,12,13}. The dimensions of unpredictability, negativity, uncontrollability, and uncertainty associated with infertility are reported to be significant sources of stress for individuals. Applying coping theories to infertility requires a thorough understanding of the circumstances under which infertility is perceived as more stressful, the factors that facilitate or hinder the adjustment of individuals and couples diagnosed with infertility, and which therapeutic interventions are most beneficial for reducing stress. To address such situations stemming from the uncertainty of the condition, certain theories and models can be employed to empower individuals in all aspects¹⁴. Mishel's Uncertainty in Illness Theory conceptualizes the uncertainty experienced by

individuals and their families during illness as a cognitive stressor^{15,16}. This uncertainty manifests in individuals as a sense of meaninglessness and inadequacy. In this process, the role of nurses, who provide both essential patient care and psychosocial support while maintaining close contact with patients, becomes increasingly significant in identifying uncertainty and facilitating coping mechanisms^{17,18}. The primary objectives of psychological counseling for infertility include providing coping strategies to individuals and couples diagnosed with infertility, emotionally preparing them for the treatment process, enabling them to explore their options, facilitating decision-making, and identifying the effects of infertility on individuals and their close social environment¹⁹.

Providing a safe environment for individuals and couples undergoing infertility treatment to express themselves is of great importance. Such an environment allows them to make sense of the emotional and physical changes experienced during the process, address infertility collaboratively, and cope with the challenges they face while making decisions about their future. Therefore, providing professional support to couples who lack sufficient resources to cope with infertility is crucial. In Turkey, there appears to be a significant gap in offering qualified services tailored to infertile couples in this field¹⁹. In Turkey, no study has been identified that examines the impact of nursing interventions developed based on the Uncertainty in Illness Theory (UIT) on coping with uncertainty and infertility-related stress. The Empowering Women with Infertility Program (EWIP) will be tested for the first time as an innovative approach in this study. This research was conducted to determine the effect of the Empowering Women with Infertility Program (EWIP), developed based on the Uncertainty in Illness Theory, on helping women with infertility cope with uncertainty and infertility-related stress.

Research Questions

- Does the Empowering Women with Infertility Program have an effect on the level of uncertainty experienced by women regarding infertility?
- Does the Empowering Women with Infertility Program have an effect on the coping levels of women with the stress associated with infertility?

Research Hypotheses

- **H₀ Hypothesis:** The Empowering Women with Infertility Program, developed based on the Uncertainty in Illness Theory, does not affect the levels of uncertainty or the ability to cope with infertility-related stress among infertile women in the experimental and control groups.
- **H_{1a} Hypothesis:** The Empowering Women with Infertility Program, developed based on the Uncertainty in Illness Theory, will increase the coping scale scores for infertility-

related stress among infertile women in the experimental group compared to those in the control group.

- **H_{1b} Hypothesis:** The Empowering Women with Infertility Program, developed based on the Uncertainty in Illness Theory, will decrease the Mishel Uncertainty in Illness Scale scores among infertile women in the experimental group compared to those in the control group.
- **H_{1c} Hypothesis:** Among women in the experimental group, the mean pre-test scores and post-test scores on the Coping with Infertility Stress Scale and the Mishel Uncertainty in Illness Scale – Community Form will differ.

Materials and Methods

Type of Research: This study was designed as a randomized controlled double-blind experimental model (blind for independent statisticians and participants) with pre-test and post-test control groups.

Location and Time of the Study: The study was conducted between January and June 2022 with women diagnosed with infertility who met the research criteria at the gynecology outpatient clinic of Ondokuz Mayıs University Faculty of Medicine Hospital.

Population and Sample of the Study: The population of the study consisted of women who applied to the gynecology outpatient clinic of Ondokuz Mayıs University Hospital for infertility treatment.

Sample of the Study: The sample size was determined using a sample size calculator. The mean score of the Mishel Uncertainty in Illness Scale (63.99 ± 11.52) in the study conducted with individuals with chronic illnesses was considered as the reference²⁰, the sample size was calculated with a 5% margin of error, a 95% confidence level, and 80% statistical power. The required sample size was determined to be 32 participants for the experimental group and 32 participants for the control group. Considering the possibility of participant attrition, a reserve of at least 10% was added, resulting in a sample size of 35 participants per group, totaling 70 participants. Randomization was conducted using the Research Randomizer website (<https://www.randomizer.org/>). Based on the generated sequence, women in the experimental and control groups were assigned accordingly.

Variables of the Study: Dependent Variables: The levels of uncertainty and infertility-related stress experienced by women in the study and their coping abilities. **Independent Variables:**

The socio-demographic characteristics of infertile women in the study and the interventions conducted as part of the Empowering Women with Infertility Program.

Data Collection Process and Tools: For the pre-test and post-test data of the study, the Personal Information Form, developed by the researcher based on the literature, the Coping with Infertility Stress Scale (CISS) and the Mishel Uncertainty in Illness Scale - Community Form (MUIS-C) were used.

- **Personal Information Form:** This form consists of questions covering the socio-demographic and obstetric characteristics of the participants^{21,22}.
- **Coping with Infertility Stress Scale (CISS):** The scale was developed by Schmidt in 1996 and consists of 19 items across four sub-dimensions. Items 1 to 17 are rated on a 4-point Likert scale: 1 = Did not use, 2 = Used occasionally, 3 = Used frequently, 4 = Used very frequently. Items 18 and 19 are classified as 1 = Did not share with anyone, 2 = Shared with close ones, 3 = Shared with. The sub-dimensions of the scale are: 1. Active-avoidance coping method, 2. Active-confrontation coping method, 3. Passive-avoidance coping method, 4. Meaning-based coping method. The Cronbach's alpha value for the scale was found to be 0.59 for women²². In this study, the Cronbach's alpha value was determined to be 0.86.
- **Mishel Uncertainty in Illness Scale - Community Form (MUIS-C):** The scale, developed by Merle Mishel in 1986 and validated for Turkish by²⁰, assesses the uncertainty experienced by individuals with chronic illnesses during periods when they are not hospitalized. The Turkish version of the scale consists of 20 items. It is evaluated based on three sub-dimensions—perception of the current situation, perception of understanding, and uncertainty—as well as a total score. The Cronbach's alpha value was found to be 0.79 in the study by²⁰. In this study, the Cronbach's alpha value was determined to be 0.88.

Ethical Approval: Ethical approval for the study was obtained from the Ethics Committee for Social and Human Sciences of Ondokuz Mayıs University (Decision No: 2020/901). Permission to conduct the study was also granted by Ondokuz Mayıs University Faculty of Medicine Hospital (Decision No: E-15374210-044-22023).

Empowering Women with Infertility Program (EWIP): The purpose of the Empowering Women with Infertility Program (EWIP) developed for infertile women, is: According to UIT,

it aims to enable participating infertile women to reassess the framework of stimuli within their cognitive schema by providing the support of structuring elements, to reevaluate the thought of uncertainty, to learn ways of coping with stress to facilitate dealing with infertility-related stress, and to ease their struggle with stress and uncertainty. The content of the Empowering Women with Infertility Program (EWIP) was developed based on a problem-centered core educational approach. The needs analysis for the program was conducted by the researcher through a review of national and international studies, a pilot study with infertile women, and the theoretical framework of UIT. The Empowering Women with Infertility Program consists of 20 sessions conducted over a total of 4 weeks, with 1-hour sessions held 5 days a week. Each training session focuses on various subtopics under main themes, utilizing techniques such as face-to-face interviews, active listening, slide presentations, direct explanation with models, brainstorming, discussions, and question-and-answer methods. Data Analysis: The data were analyzed using IBM SPSS V23. The results are presented as mean \pm standard deviation and median (minimum – maximum) for quantitative data, and as frequency (percentage) for categorical data. The significance level was set at $p < 0.050$.

Results

Table 1. Comparison of Socio-demographic Characteristics of Infertile Women in the Experimental and Control Groups (n=70)

| | Experimental Group | | Control Group | | Test Statistic | p |
|---------------------------|--------------------|------------------|---------------|------------------|----------------|-----------|
| | X±SD | (min-max) | X±SD | (min-max) | | |
| Age | 29.6 ± 4.9 | 28 (22 - 41) | 28.9 ± 3.9 | 29 (22 - 39) | 569 | 0.846**** |
| Years of Marriage | 5.9 ± 4.8 | 4 (2 - 21) | 5.6 ± 3.4 | 5 (2 - 16) | 654 | 0.623**** |
| | n (%) | | n (%) | | | |
| Education Level | | | | | | |
| Primary School | 1 (2.9) | | 0 (0.0) | | | |
| Middle School | 5 (14.3) | | 2 (5.7) | | | |
| High School | 19 (54.3) | | 23 (65.7) | | 2.667 | 0.446* |
| University and above | 10 (28.6) | | 10 (28.6) | | | |
| Employment Status | | | | | | |
| Employed | 10 (28.6) | | 8 (22.9) | | 0.075 | 0.784** |
| Not Employed | 25 (71.4) | | 27 (77.1) | | | |
| Income Status | | | | | | |
| Income less than expenses | 18 (51.4) | | 21 (60.0) | | | |

| | | | | |
|---|-----------|-----------|-------|---------|
| Income equal to expenses | 15 (42.9) | 13 (37.1) | 0.707 | 0.702* |
| Income greater than expenses | 2 (5.7) | 1 (2.9) | | |
| Family Type | | | | |
| Nuclear Family | 27 (77.1) | 30 (85.7) | 0.378 | 0.539** |
| Extended Family | 8 (22.9) | 5 (14.3) | | |
| Spousal Support | | | | |
| Available | 27 (77.1) | 29 (82.9) | 0.089 | 0.765** |
| Not Available | 8 (22.9) | 6 (17.1) | | |
| Family Support | | | | |
| Available | 25 (71.4) | 26 (74.3) | 0.0 | 1.000** |
| Not Available | 10 (28.6) | 9 (25.7) | | |
| Healthcare Professional Support | | | | |
| Available | 11 (31.4) | 3 (8.6) | 4.375 | 0.036** |
| Not Available | 24 (68.6) | 32 (91.4) | | |
| Status of Starting Infertility Treatment | | | | |
| Yes | 25 (71.4) | 28 (80.0) | 0.311 | 0.577** |
| No | 10 (28.6) | 7 (20.0) | | |

****Pearson Chi-Square Test, **Yates Corrected Chi-Square Test, ***Fisher's Chi-Square Test, ****Mann-Whitney U Test, ---: Could not be calculated due to insufficient observations.**

The average age of women in the experimental group was found to be 29.6 ± 4.9 , with 54.3% being high school graduates, 71.4% not employed, 51.4% having an income less than their expenses, and 22.9% living in extended families. In the control group, the average age of women was found to be 28.9 ± 3.9 , with 65.7% being high school graduates, 77.1% not employed, 60.0% having an income less than their expenses, and 14.3% living in extended families. No statistical difference was found between the women in the experimental and control groups in terms of age, education level, employment status, perception of monthly income, and type of family they live in ($p > 0.05$).

In the experimental group, 77.1% of women received spousal support, 71.4% received family support, and 31.9% received healthcare professional support for infertility treatment. In the control group, 82.9% of women received spousal support, 74.3% received family support, and 8.6% received healthcare professional support for infertility treatment. It was found that women in the experimental group benefited from healthcare professional support at a higher rate than women in the control group, and this difference was statistically significant ($p < 0.05$).

No statistically significant difference was found between the women in the experimental and control groups in terms of social support other than healthcare professional support ($p>0.05$) (Table 1).

Table 2. Comparison of Pre-test and Post-test Scores of the Coping with Infertility Stress Scale CISS and Its Subdimensions between the Experimental and Control Groups.

| | Experimental Group | | Control Group | | Test Statistic | p |
|----------------------------------|----------------------|-----------------|----------------------|-----------------|----------------|-------------------|
| | Mean \pm Stan.dev. | Mean(min-maks.) | Mean \pm Stan.dev. | Mean(min-maks.) | | |
| Infertility Stress Coping | | | | | | |
| Scale Total Score | | | | | | |
| Pre-test*** | 43.0 \pm 8.9 | 43 (23 - 71) | 48.0 \pm 9.7 | 46 (26 - 74) | -2.246 | 0.028** |
| Post-test**** | 50.3 \pm 7.4 | 50 (34 - 71) | 48.6 \pm 9.6 | 48 (29 - 74) | 0.836 | 0.406** |
| Active-Disregard Coping | | | | | | |
| Method | | | | | | |
| Pre-test | 11.1 \pm 4.3 | 11 (4 - 16) | 10.8 \pm 3.7 | 10 (4 - 16) | 585.5 | 0.748* |
| Post-test | 8.1 \pm 2.9 | 8 (4 - 16) | 10.9 \pm 3.6 | 11 (4 - 16) | 901 | 0.001* |
| Active-Fighting Coping | | | | | | |
| Method | | | | | | |
| Pre-test | 14.5 \pm 3.5 | 14 (8 - 23) | 18.9 \pm 4.9 | 20 (8 - 26) | 923.5 | 0.001* |
| Post-test | 21.7 \pm 4.0 | 22 (14 - 26) | 18.7 \pm 4.7 | 19 (9 - 26) | 405.5 | 0.014* |
| Passive-Disregard Coping | | | | | | |
| Method | | | | | | |
| Pre-test | 8.8 \pm 2.9 | 9 (3 - 12) | 9.6 \pm 2.8 | 12 (3 - 12) | 726.5 | 0.163* |
| Post-test | 6.0 \pm 2.1 | 6 (3 - 12) | 9.4 \pm 2.8 | 9 (3 - 12) | 1006 | <0.001* |
| Meaning-based Coping | | | | | | |
| Method | | | | | | |
| Pre-test | 8.7 \pm 3.8 | 7 (5 - 20) | 8.8 \pm 3.4 | 10 (5 - 20) | 642 | 0.724* |
| Post-test | 14.5 \pm 3.4 | 15 (9 - 20) | 9.5 \pm 3.5 | 10 (5 - 20) | 187.5 | <0.001* |

Mann-Whitney U Test, **Independent Samples t Test, ***Pre-test (Before Intervention), *Post-test (After Intervention)******

The pre-intervention average score of the **Coping with Infertility Stress Scale** for the experimental group was 43.0 ± 8.9 , while the control group had an average score of 48.0 ± 9.7 . It was found that the control group had a higher pre-test score before the intervention, and the difference was statistically significant ($p<0.05$). After the intervention, the average total score of the **Coping with Infertility Stress Scale** for the experimental group was 50.3 ± 7.4 , while

the control group had an average score of 48.6 ± 9.6 . It was found that the experimental group had a higher post-test score, but no statistically significant difference was found ($p > 0.05$).

After the intervention, the average score of the active-disregard coping subdimension for the experimental group was 8.1 ± 2.9 , while the control group had an average score of 10.9 ± 3.6 . It was found that the control group had a higher post-test score, and a statistically significant difference was observed between the post-test scores of the active-disregard coping subdimension between the groups ($p < 0.001$). After the intervention, the average score of the active-fighting coping subdimension for the experimental group was 21.7 ± 4.0 , while the control group had an average score of 18.7 ± 4.7 . It was found that the experimental group had a higher post-test score, and a statistically significant difference was observed between the post-test scores of the active-fighting coping subdimension between the groups ($p < 0.05$).

After the intervention, the average score of the passive-disregard coping subdimension for the experimental group was 6.0 ± 2.1 , while the control group had an average score of 9.4 ± 2.8 . It was found that the control group had a higher post-test score, and a statistically significant difference was observed between the post-test scores of the passive-disregard coping subdimension between the groups ($p < 0.001$). After the intervention, the average score of the meaning-based coping subdimension for the experimental group was 14.5 ± 3.4 , while the control group had an average score of 9.5 ± 3.5 . It was found that the experimental group had a higher post-test score, and a statistically significant difference was observed between the post-test scores of the meaning-based coping subdimension between the groups ($p < 0.001$). (Table 2).

Table 3. Comparison of the pre-test and post-test scores of the Mishel Uncertainty in Illness Scale - Community Form (MUIS-C) and its subdimensions between the experimental and control groups of infertile women.

| | Experimental Group | | Control Group | | Test Statistic | p |
|--|--------------------|-----------------|----------------|-----------------|----------------|-------------------|
| | Mean±Stan.dev. | Mean(min-maks.) | Mean±Stan.dev. | Mean(min-maks.) | | |
| Mishel Uncertainty in Illness Scale Total Score- Community Form | | | | | | |
| Pre-test *** | 84.9 ± 13.8 | 88 (46 - 100) | 84.9 ± 11.7 | 80 (61 - 100) | 594.5 | 0.832 |
| Post-test**** | 51.5 ± 20.4 | 42 (27 - 100) | 86.6 ± 10.3 | 87 (64 - 100) | 1117 | <0.001* |

| | | | | | | |
|--|-------------|--------------|------------|--------------|--------|---------|
| Perception of Current Situation | | | | | | |
| Pre-test | 48.3 ± 7.3 | 50 (28 - 55) | 47.5 ± 6.5 | 44 (33 - 55) | 539 | 0.383* |
| Post-test | 29.8 ± 10.9 | 24 (15 - 55) | 48.0 ± 6.0 | 48 (33 - 55) | 1111 | <0.001* |
| Perception of Comprehension | | | | | | |
| Pre-test | 15.8 ± 3.6 | 16 (8 - 20) | 16.7 ± 2.6 | 16 (11 - 20) | 678.5 | 0.424* |
| Post-test | 8.9 ± 4.4 | 8 (4 - 20) | 17.0 ± 2.6 | 18 (9 - 20) | 1127.5 | <0.001* |
| Uncertainty | | | | | | |
| Pre-test | 20.8 ± 3.9 | 20 (10 - 25) | 20.8 ± 3.7 | 20 (12 - 25) | 581.5 | 0.709* |
| Post-test | 12.8 ± 5.9 | 10 (5 - 25) | 21.6 ± 2.9 | 21 (15 - 25) | 1063 | <0.001* |

Mann-Whitney U test, **Paired sample t-test, ***Pre-test (Before intervention), *Post-test (After intervention)**

Before the intervention, the mean total score of the MUIS-C in the experimental group was 84.9 ± 13.8 , while in the control group, it was 84.9 ± 11.7 . It was determined that the pre-test mean scores of the groups were similar. No statistically significant difference was found between the pre-test mean total scores of the MUIS-C in the groups ($p > 0.05$). After the intervention, the mean total score of the MUIS-C in the experimental group was 51.5 ± 20.4 , while in the control group, it was 86.6 ± 10.3 . It was determined that the post-test score of the control group was higher. A statistically significant difference was found between the post-test mean total scores of the MUIS-C in the groups ($p < 0.001$).

After the intervention, the mean score of the Perception of Current Situation subdimension in the experimental group was 29.8 ± 10.9 , while in the control group, it was 48.0 ± 6.0 . It was determined that the post-test score of the experimental group was lower. A statistically significant difference was found between the post-test mean scores of the Perception of Current Situation subdimension in the groups ($p < 0.001$). After the intervention, the mean score of the Perception of Meaning subdimension in the experimental group was 8.9 ± 4.4 , while in the control group, it was 17.0 ± 2.6 . It was determined that the post-test score of the experimental group was lower. A statistically significant difference was found between the post-test mean scores of the Perception of Meaning subdimension in the groups ($p < 0.001$). After the intervention, the mean score of the Uncertainty subdimension in the experimental group was 12.8 ± 5.9 , while in the control group, it was 21.6 ± 2.9 . It was determined that the post-test score of the experimental group was lower. A statistically significant difference was found between the post-test mean scores of the Uncertainty subdimension in the groups ($p < 0.001$).

Table 4. Comparison of the Differences in Pre-test and Post-test Total and Subdimension Scores of the Scales Between Infertile Women in the Experimental and Control Groups

| | Experimental Group | | Control Group | | Test Sta. | p* |
|---|--------------------|-----------------|----------------|-----------------|-----------|------------------|
| | Mean±Stan.dev. | Mean(min-maks.) | Mean±Stan.dev. | Mean(min-maks.) | | |
| Difference in Total Score of the Coping with Infertility Stress Scale | -7,26 ± 7,92 | -6 (-32 - 7) | -0,54 ± 2,97 | -1 (-10 - 5) | 979,0 | <0,001 |
| Difference in the Score of the Active-Denial Coping Method | 2,97 ± 4,32 | 3 (-4 - 11) | -0,17 ± 1,12 | 0 (-5 - 3) | 353,0 | 0,001 |
| Difference in the Score of the Active-Confrontation Coping Method | -7,2 ± 5,48 | -8 (-18 - 2) | 0,14 ± 1,79 | 0 (-2 - 7) | 1081,5 | <0,001 |
| Difference in the Score of the Passive-Denial Coping Method | 2,74 ± 3,4 | 3 (-3 - 8) | 0,14 ± 1 | 0 (-2 - 3) | 373,5 | 0,002 |
| Difference in the Score of the Meaning-Based Coping Method | -5,77 ± 4,71 | -6 (-15 - 6) | -0,66 ± 2,34 | 0 (-10 - 3) | 1023,5 | <0,001 |
| Difference in the Total Score of the Mishel Uncertainty in Illness Scale | 33,43 ± 23,85 | 42 (-12 - 62) | -1,69 ± 6,22 | 0 (-18 - 9) | 141,5 | <0,001 |
| Difference in the Score of the Perception of the Current Situation | 18,49 ± 12,83 | 22 (-3 - 35) | -0,54 ± 3,25 | 0 (-11 - 6) | 150,0 | <0,001 |
| Difference in the Score of the Perception of Understanding | 6,89 ± 6,01 | 8 (-6 - 16) | -0,31 ± 1,84 | 0 (-5 - 5) | 196,0 | <0,001 |
| Difference in the Uncertainty Score | 8,06 ± 6,2 | 10 (-4 - 17) | -0,83 ± 2,65 | 0 (-8 - 3) | 145,0 | <0,001 |

***Mann–Whitney U test**

A statistically significant difference was found between the median values of the total score difference on the Coping with Infertility Stress Scale between the groups ($p < 0.001$). The post-test median score of the experimental group was -6, while the post-test median score of the control group was -1. A statistically significant difference was also found in the score difference of the Active-Denial Coping Method between the groups ($p = 0.001$). The post-test median score of the experimental group was 3, whereas that of the control group was 0. Regarding the Active-Confrontation Coping Method, a statistically significant difference was observed in the post-test median scores between the groups ($p < 0.001$). The post-test median score was -8 for the experimental group and 0 for the control group. There was a statistically significant difference in the score difference of the Passive-Denial Coping Method between the groups ($p = 0.002$). The experimental group's post-test median score was 3, while the control group's was 0. Lastly, a statistically significant difference was found in the score difference of the Meaning-Based Coping Method between the groups ($p < 0.001$). The post-test median score of the experimental group was -6, compared to 0 in the control group.

A statistically significant difference was found between the median values of the total score difference on the Mishel Uncertainty in Illness Scale – Community Form between the groups ($p < 0.001$). The post-test median score of the experimental group was 42, while that of the control group was 0. A statistically significant difference was also found between the median values of the score difference for the Perception of the Current Situation subscale between the groups ($p < 0.001$). The post-test median score of the experimental group was 22, compared to

0 in the control group. For the Perception of Understanding subscale, a statistically significant difference was observed in the post-test median values between the groups ($p < 0.001$). The post-test median score was 8 in the experimental group and 0 in the control group. Similarly, a statistically significant difference was found in the median values of the Uncertainty subscale scores between the groups ($p < 0.001$).

Discussion

This study was conducted to examine the effect of the 'Empowerment Program for Infertile Women,' developed based on the Uncertainty in Illness Theory, on the levels of uncertainty and coping with stress among women with infertility. The findings obtained from the study will be discussed in this section in line with the research hypotheses.

According to the Uncertainty in Illness Theory (UIT), structure providers that support the framework of stimuli play a significant role in the formation of a cognitive schema related to the illness. These structure-providing elements include social support, which aids individuals in interpreting the framework of stimuli, and reliable authority sources that deliver healthcare services to the individual^{17,23}. In this study, it was determined that before the intervention, infertile women in the experimental and control groups received spousal and family support at similar levels. However, in terms of support from healthcare personnel, women in the experimental group, with 31.4% receiving reliable authority support, were found to be in a more advantageous position compared to 8.6% in the control group, and the difference between them was found to be significant ($p < 0.05$) (Table 1). In the literature, it is stated that, similar to our study, women are less affected by infertility when they talk about it with their partners and social circles²⁴ and that infertile women receive a high level of support from family and friends²⁵. Sharing feelings and thoughts about infertility with partners, close social circles, and other individuals experiencing infertility is highlighted as an effective method for reducing stress levels and coping with infertility^{25,26}. In another study conducted in Iran, it was stated that only the empathy, love, loyalty, and sufficient support of the spouse can provide the necessary emotional support to keep women's hope alive, help them continue treatment, and foster trust²⁶. On the other hand, it was noted that in some cultures, the lack of social and economic support for infertile women further deepens the psychological trauma they experience²⁷. In the process of infertility treatment, it can be stated that the support of the partner, social support, and the support of healthcare professionals who play the role of a reliable authority are crucial in helping women cope with the stress of infertility. These findings

highlight the importance of adequate perceived social support for infertile women to reduce the negative impacts of the diagnostic and treatment processes.

In the experimental group, the total score of the Coping with Infertility Stress Scale CISS was 43.0 ± 8.9 before the intervention and 50.3 ± 7.4 after the intervention. It was found that the average score increased after the intervention compared to before the intervention, and this increase was statistically significant ($p < 0.001$). The increase in the infertility stress coping scores following the Empowering Women with Infertility Program (EWIP), developed based on UIT, applied to infertile women in the experimental group, indicates that the women were positively affected in learning to cope with infertility stress. Although the average score of the control group on the Coping with Infertility Stress Scale CISS was higher than that of the experimental group before the intervention, after the intervention, the average score of the experimental group was higher than that of the control group, and the difference was found to be statistically significant ($p < 0.001$) (Table 2). Based on the findings of the study, the **H1a Hypothesis**, which states that the Infertility Stress Coping levels of infertile women in the experimental group will increase compared to those in the control group following the "Empowering Women with Infertility Program"(EWIP) developed based on the Uncertainty in Illness Theory, has been accepted.

In intervention studies similar to ours, it has been stated that after various interventions, the total scores of infertility-related stress in infertile women decreased, and the interventions were effective in reducing infertility stress^{28,29,30,31,32}. When evaluated in terms of results, it can be said that the findings of our study are consistent with the literature. Due to the limited number of studies in the literature that evaluate total scores using the Infertility Stress Coping Scale, comparisons have been made within the framework of the scale's subdimensions. In our study, different results were obtained regarding the effectiveness of the EWIP in terms of the methods used to cope with infertility stress. In the experimental group of infertile women, it was determined that before the intervention, the total score for the active-avoidance coping subdimension of the CISS was 11.1 ± 4.3 , and for the passive-avoidance coping subdimension, it was 8.8 ± 2.9 . After the intervention, the total score for the active-avoidance coping method was 8.1 ± 2.9 , and for the passive-avoidance coping method, it was 6.0 ± 2.1 . In the experimental group, it was found that the mean scores for the active-avoidance and passive-avoidance coping subdimensions decreased after the intervention compared to before the intervention, and this decrease was statistically significant ($p < 0.001$) (Table 2). When

comparing the experimental and control groups in terms of these two subdimensions, it was found that the post-intervention mean scores for the active-avoidance and passive-avoidance coping subdimensions in the experimental group were lower than those in the control group, and the difference between them was statistically significant ($p < 0.001$) (Table 2). This situation shows that the women in the experimental group used avoidance methods less frequently after the EWIP, whereas the women in the control group showed no change in their avoidance scores and continued to use avoidance methods at the same level. These findings indicate the effectiveness of the program and the sustainability of its impact. This situation can be explained by the possibility that the women in the experimental group continued to implement the processes related to the program's gains after its completion. In studies similar to ours, it has been found that the mean scores for active-avoidance and passive-avoidance are at levels similar to the findings of this study^{21,22,33}, that active-avoidance may be an effective method in situations where control is lacking in infertility³⁴, that increased use of avoidance methods is associated with higher stress scores³¹, and that infertile women in a negative emotional state predominantly use avoidance methods³⁴. It has been reported that the use of active and passive avoidance methods decreased among women in the experimental group, while no changes were observed in the psychological measures of the control group³⁵. Additionally, no changes were observed in the active-avoidance coping method scores of women in the experimental group, while these scores increased in the control group. Meanwhile, the passive-avoidance coping method scores decreased in the experimental group but increased in the control group³⁰. It has been found that women who feel economically inadequate have higher passive-avoidance scores, and women who have been diagnosed with infertility for more than five years have higher active-avoidance scores compared to other infertile women³². Additionally, women whose infertility is attributed to them and those under the age of 35 have higher active-avoidance scores compared to other women, while women with less than eight years of education have higher passive-avoidance scores compared to other women²². It has been stated that women with lower education levels and those who are not working have higher active-avoidance coping method scores compared to other women²¹. In our study, the decrease in the use of active and passive avoidance coping methods among the women in the experimental group, along with the reduction in their infertility stress levels, is consistent with the literature.

In the study, it was found that the total score for the active coping subdimension of the Coping with Infertility Stress Scale CISS in the experimental group was 14.5 ± 3.5 before the intervention and 21.7 ± 4.0 after the intervention. The average score for this subdimension

increased after the intervention compared to before, and this increase was statistically significant ($p < 0.001$) (Table 2). The findings suggest that women in the experimental group started using the active coping method to combat infertility stress more frequently after the EWIP. The post-test results showed that the average score for the active coping subdimension in the experimental group was higher than that in the control group, and the difference between them was statistically significant ($p < 0.001$) (Table 2). Similar to the findings of our study, it has been suggested that the use of emotion- and problem-focused active coping strategies may be associated with lower stress levels³⁶. The use of active coping strategies has been found to be positively related to the reduction of infertility-related stress³⁷, and individuals who employed problem-focused active coping strategies experienced lower stress levels³⁸. Additionally, the use of this coping strategy was linked to lower depression rates³⁴. It was also noted that women with social security were more likely to use active coping strategies compared to other women²¹, and post-intervention, the women in the experimental group showed significantly higher average scores compared to the control group³⁰. In contrast to the results of our study, Eroğlu and Temiz³¹ found that as the use of active coping strategies increased, stress also increased. The reason for this difference may be that while the use of active coping strategies reduces stress through behaviors such as research, control, and sharing for infertility, on the other hand, it may increase stress due to the tendency to focus on infertility, potentially leading to an increased sense of stress.

It is known that individuals' efforts to find new meanings through thoughts, beliefs, and actions while coping with stress help them manage challenging situations. Upon first encountering a stressor, perceiving the situation as a threat, the individual's reevaluation of the situation, and the process of finding new meanings through thoughts, beliefs, and actions constitute a meaning-based coping strategy²⁹. It is known that there is a negative relationship between an optimistic approach and infertility-related stress and depression³⁹. In this study, it was found that the total score for the meaning-based coping subdimension of the infertility-specific coping strategy in the experimental group of infertile women was 8.7 ± 3.8 before the intervention and 14.5 ± 3.4 after the intervention, with a significant increase in the average score after the intervention ($p < 0.001$). The application of the Empowering Women with Infertility Program (EWIP) to the infertile women in the experimental group revealed that, after the intervention, the women began to use meaning-based coping strategies more frequently in response to infertility stress (Table 2). In terms of meaning-based coping strategy scores, it was found that the pre-program average scores of women in both the experimental and control groups were

very similar. After the program, the scores of the experimental group increased, while there was no change in the scores of the control group. The difference between the groups was statistically significant ($p < 0.001$) (Table 2). Upon reviewing the literature, it has been stated that meaning-based coping strategies facilitate well-being in painful, challenging situations and are moderately to highly effective for personal stress^{31,34}. On the other hand, meaning-based coping has been found to have a low level of effectiveness on stress²⁶ and a negative relationship has been observed between meaning-based coping strategies and anxiety as well as infertility-related stress^{36,37}. In other studies, it has been found that infertile women without children use meaning-based coping strategies more frequently than women with secondary infertility³² and that women under the age of 35 have higher usage and scores for meaning-based coping strategies compared to other infertile women²². In a controlled study by Li et al³⁵ involving infertile women, it was reported that the use of meaning-based coping strategies increased in the experimental group, while no changes were observed in the psychological measurements of the control group. The results from these examples in the literature are found to be consistent with the findings of our study.

Uncertainty, defined as a cognitive state, arises when an individual is unable to adequately structure or categorize their illness, or when they cannot accurately predict its causes and consequences. Uncertainty can occur at any stage of the process—ranging from preliminary diagnosis, symptom onset, definitive diagnosis, treatment, prognosis, to recovery—or at all stages⁴⁰. In our study, it was determined that the total score of the Mishel Uncertainty in Illness Scale-Community Form (MUIS-C) in the experimental group was 84.9 ± 13.8 before the intervention and 51.5 ± 20.4 after the intervention. The average score decreased significantly after the intervention compared to before, and this reduction was found to be statistically significant ($p < 0.001$). In the control group, the pre-test average total score of the Mishel Uncertainty in Illness Scale-Community Form (MUIS-C) was 84.9 ± 11.7 , while the post-test average score was 86.6 ± 10.3 . It was determined that there was no statistically significant difference between the average scores. It was found that there was no significant difference between the pre-test results of the experimental and control groups. However, in the post-test, the experimental group's average total score on the Mishel Uncertainty in Illness Scale-Community Form (MUIS-C) was lower than that of the control group, and the difference between the groups was statistically significant ($p < 0.001$) (Table 3). Based on the findings of the study, the H1b **hypothesis**—stating that the "Empowering Women with Infertility Program" (EWIP), developed based on the Uncertainty in Illness Theory (UIT), would reduce

the uncertainty levels of infertile women in the experimental group compared to those in the control group—was accepted.

Similar to our study, controlled studies have reported that the uncertainty scores of participants in the experimental group significantly decreased after the intervention^{41,42}. Descriptive studies have reported that the scores on the Uncertainty in Illness Scale were found to be 73.51 ± 18.55 by Chen et al.⁴³, 60.6 ± 15.7 by Guan et al.⁴⁴. The findings of our study appear to be consistent with the literature.

In our study, the total scores of the infertile women in the experimental group on the subdimensions of the Mishel Uncertainty in Illness Scale - Community Form (MUIS-C), including current situation perception, comprehension perception, and uncertainty, were found to be lower after the intervention compared to before the intervention. This decrease was determined to be statistically significant ($p < 0.001$) (Table 3). The decrease in the total scores of the subdimensions of the Mishel Uncertainty in Illness Scale - Community Form (MUIS-C) in the experimental group of infertile women after the intervention indicates that they were positively affected, as their difficulties in perceiving the current situation, comprehension, and uncertainty related to infertility decreased. It was also found that the post-test average total scores of all Mishel Uncertainty in Illness Scale - Community Form (MUIS-C) subdimensions in the experimental group were lower than those in the control group, and the difference between the groups was statistically significant ($p < 0.001$) (Table 3). According to the results of our study, it was found that participants in both the experimental and control groups experienced high levels of uncertainty during the diagnosis and treatment phases. The areas where they experienced the most uncertainty were in the field of information, and they struggled with perceiving and making sense of the current situation. Similarly, during the Covid-19 pandemic, Turgut et al.⁴⁵ reported that nurses were unable to meet the information demands of patients, which are precursors to the uncertainty caused by Covid-19. As a result, they perceived themselves as a potential danger to patients, felt they lacked sufficient training, had no experience, and underwent significant role changes due to uncertainty. The lack of information and experience among nurses was considered as precursors to uncertainty. Similarly, in the study conducted by Taş Bora and Buldukoğlu⁴⁶ with caregivers of patients with schizophrenia, it was reported that caregivers were unable to understand the course of the illness, were confused about how to behave and what to do, felt a sense of unpredictability regarding the outcomes of the illness, and experienced uncertainty related to the illness. In the study

conducted by Çamlıca and Çoşkun Erçelik⁴⁷ with patients diagnosed with chronic kidney failure, it was stated that the healthcare providers faced difficulties in deciding on treatment options due to a lack of information about which treatment method to choose. They experienced uncertainty and inadequacy in individual coping, and it was noted that after receiving proper information, the uncertainty in making treatment decisions decreased. In a study conducted by Çınar et al⁴⁸. with a cancer-diagnosed patient using their UIT, it was found that the patient experienced symptoms of uncertainty such as lack of information about the disease process, anxiety, fear, difficulty in treatment adherence, challenges in individual coping, and impairment in emotional perception, along with a lack of social support. It has been suggested that reducing uncertainty related to the illness can be achieved by establishing open, reliable, and effective communication with the patient, addressing the lack of information, incorporating relaxation practices, and increasing social support opportunities. These measures were found to enhance treatment adherence in patients who were initially reluctant to undergo treatment. Additionally, with social support and healthcare staff assistance, patients who perceived their illness as the end of life experienced an increased belief that this situation could improve. In a study conducted by Chen et al⁴³. with patients suffering from heart failure, it was stated that there is a relationship between uncertainty and depression, and that social support provided according to the UIT was effective in reducing symptoms of uncertainty and depression. In a study conducted by Cypress⁴⁰ with intensive care unit patients and their families, it was stated that both patients and their families experienced uncertainty, and that the level of uncertainty decreased with the establishment of healthy communication between the patient and the family. In a study conducted by Goutzamanis et al⁴⁹. with patients suffering from liver diseases, it was noted that the participants experienced stress at every stage of their lives, with uncertainty being the underlying cause of the stress. It was further indicated that the uncertainty stemmed from a lack of information and unpredictability. In a study conducted by Reinoso⁵⁰ with Hepatitis C patients, it was stated that there is a strong relationship between uncertainty and support from healthcare staff, who are perceived as reliable authorities. In a study conducted by Guan et al⁴⁴. it was noted that uncertainty in illness negatively affected physical and mental well-being. The use of positive avoidant coping strategies was associated with an increase in the negative effects of uncertainty, while the use of active coping strategies was positively related to mental well-being. According to the research findings, the primary causes of uncertainty experienced by infertile individuals due to infertility were identified as a lack of information, inability to predict the treatment outcome, and a lack of social support. The results of our research are consistent with the findings in the literature.

It has been determined that within the framework of the empowerment program for infertile women developed based on UIT, addressing the information needs of infertile women, ensuring communication with other infertile women, reducing uncertainty related to infertility, and coping with infertility stress were effective. According to the results of the study, the women in the experimental group showed an increase in their scores for coping with infertility stress, while their scores on the Mishel Uncertainty in Illness Scale - Community Form decreased. It was found that the pre-test and post-test scores of the women in the experimental group were statistically significantly different on both scales (Table 4). Based on the findings of the study, the **H1c hypothesis**, which stated that the average scores of the experimental group women on the Coping with Infertility Stress Scale and Mishel Uncertainty in Illness Scale - Community Form would differ between the pre-test and post-test results, was accepted.

Again, based on the findings of the study, the **H0 hypothesis**, which stated that the Empowerment Program for Infertile Women developed based on the Uncertainty in Illness Theory would not affect the uncertainty levels and infertility stress coping of infertile women in the experimental and control groups, was rejected.

Conclusion and Recommendations

In the study, following the implementation of the Empowering Women with Infertility Program' developed based on the Uncertainty in Illness Theory, an increase was observed in the total score of the Coping with Infertility Stress Scale, as well as in the subdimension scores of active-confronting coping and meaning-based coping in the experimental group, indicating a positive change ($p < 0.001$). It was determined that there was a decrease in the total scores of the active ignoring and passive ignoring coping subscales in the experimental group, indicating that participants used the ignoring methods less frequently ($p < 0.001$). In the study, following the implementation of the ' Empowering Women with Infertility Program ' developed based on the Uncertainty in Illness Theory, it was determined that there was a decrease in the total score of the Mishel Uncertainty in Illness Scale - Community Form, as well as in the subscales of perceived current health status, perception of meaning, and uncertainty. This indicates that the participants' levels of uncertainty related to infertility decreased ($p < 0.001$). In conclusion, this study found that the empowerment program for infertile women, supported by a structured and planned educational program, led to an increase in the coping levels of infertility-related stress and a decrease in the levels of infertility-related uncertainty among the women in the experimental group ($p < 0.001$).

It is suggested that nursing interventions developed based on Mishel's Theory of Uncertainty in Illness be applied in the diagnosis, treatment, and follow-up processes of infertility. These interventions should be regularly evaluated to facilitate the coping with uncertainty, stress, and treatment adherence for individuals diagnosed with infertility, and nurses should provide support to reduce illness-related uncertainty and stress levels in these individuals. Additionally, it is recommended that in-service training programs for nurses integrate model-specific care practices. Further evaluation studies with larger samples should be conducted to assess various nursing interventions based on the Theory of Uncertainty in Illness during the diagnosis, treatment, and follow-up processes for individuals diagnosed with infertility. Furthermore, qualitative and/or mixed research designs should be employed to evaluate the impact of nursing interventions based on the Theory of Uncertainty in Illness in the care of individuals diagnosed with infertility.

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