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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 with Infertility: A Randomized Controlled Trial

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ABSTRACT

Objective: 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.

INTRODUCTION

Infertility is a global health issue that affects millions of individuals of reproductive age worldwide. Globally, 186 million people are estimated to be infertile [1]. In Turkey, as of 2018, it has been reported that 12% of women have experienced infertility at least once in their lives [2]. The World Health Organization defines infertility as a disease of the reproductive system, either in males or females, characterized by the failure to achieve pregnancy after 12 months or more of regular, unprotected sexual intercourse [1].

Driven by one of the most fundamental human instincts—the instinct to reproduce—nearly all couples plan to have children; however, this desire can sometimes be hindered by infertility. Couples facing infertility may experience disappointment, feelings of guilt, and mutual blame, which can eventually lead to a weakening of the marital bond. Infertility also affects individuals' social relationships with family, friends, and others, as well as their sexual lives [3]. Although infertility is not a life-threatening health condition, it negatively affects the mental health and quality of life of affected couples, thereby posing a threat to overall well-being [4]. Studies have shown that infertile couples experience higher rates of issues such as

depression, anxiety disorders, sexual problems, marital discord, reduced self-esteem, and social isolation compared to fertile couples [5]. It has been found that experiences such as loss of self-confidence, hopelessness, anger, guilt, and difficulties in relationships among individuals with infertility accelerate family stress and crisis [6].

Infertility treatment is a prolonged and emotionally stressful process for couples. It challenges their coping mechanisms, imposes significant financial burdens, and can negatively affect the spousal relationship, making it a crisis situation. During the diagnosis and treatment process, infertile women may experience a sense of loss of control, feelings of guilt, diminished perceptions of femininity, and disturbances in self-image due to the lengthy and painful nature of the treatment, as well as the possibility of treatment failure [3,4,7,8]. The dimensions of infertility—such as unpredictability, negativity, uncontrollability, and uncertainty—are considered to be highly stressful for individuals. Applying coping theories to infertility is essential for understanding the circumstances under which infertility is perceived as more stressful, identifying the factors that either facilitate or hinder the adjustment of individuals and couples diagnosed with infertility, and determining which therapeutic interventions are most effective in reducing stress. In such situations, which stem from the uncertainty of the illness, certain theories and models can be utilized to support individuals' empowerment in all aspects [9].

Mishel's Theory of Uncertainty in Illness conceptualizes the uncertainty experienced by individuals and families in the face of illness as a cognitive stressor [10,11]. This uncertainty manifests in individuals as a sense of meaninglessness and inadequacy. In order to identify the uncertainty experienced by patients and to help them utilize coping mechanisms, the role of nurses—who provide not only fundamental patient care but also psychosocial support and maintain close contact with patients—has become increasingly important in this process [12,13]. Providing individuals and couples diagnosed with infertility with coping strategies, preparing them emotionally for the treatment process, helping them explore their options, facilitating decision-making, and identifying the effects of infertility on individuals and their close environment are fundamental responsibilities of healthcare providers. It is particularly important to offer professional support to couples who lack adequate resources to cope with infertility. In Turkey, there appears to be a significant gap in the provision of high-quality services specifically aimed at infertile couples [14]. In Turkey, no studies have been found that investigate the effect of nursing interventions based on the Theory of Uncertainty in Illness (TUI) on coping with uncertainty and infertility-related stress in individuals experiencing infertility. The "Empowerment Program for Infertile Women" will be tested for the first time in this study as an innovative approach. This research was conducted to determine the effect of the "Empowerment Program for Infertile Women," developed based on the Theory of Uncertainty in Illness, on the ability of women with infertility to cope with uncertainty and infertility-related stress.

Research Questions

- Does the Empowerment Program for Infertile Women have an effect on the level of uncertainty experienced by women regarding infertility?
- Does the Empowerment Program for Infertile Women have an effect on the level of coping with stress related to infertility in women?

Research Hypotheses

- **H_0 Hypothesis:** The "Empowerment Program for Infertile Women," developed based on the Theory of Uncertainty in Illness, has no effect on the levels of uncertainty and coping with infertility-related stress among infertile women in the experimental and control groups.
- **H_1a Hypothesis:** The "Empowerment Program for Infertile Women," developed based on the Theory of Uncertainty in Illness, will increase the scores on the Coping with Infertility Stress Scale among women in the experimental group compared to those in the control group.
- **H_1b Hypothesis:** The scores on the Mishel Uncertainty in Illness Scale of women in the experimental group will decrease compared to those in the control group as a result of the "Empowerment Program for Infertile Women," developed based on the Theory of Uncertainty in Illness.
- **H_1c Hypothesis:** The pretest and posttest mean scores of the Coping with Infertility Stress Scale and the Mishel Uncertainty in Illness Scale–Community Form will differ significantly among women in the experimental group.

MATERIALS AND METHODS

Type of Study: This study was designed as a randomized controlled, double-blind (independent statistician and participants), pretest-posttest, control group experimental model.

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

Population and Sample: The population of the study consisted of women who applied to the gynecology outpatient clinic of Ondokuz Mayıs University Hospital for infertility treatment. The sample size was calculated using the Sample Size Calculator program. Referring to the mean score of the Mishel Uncertainty in Illness Scale (63.99 ± 11.52) reported in a study conducted with individuals having chronic illnesses [14] and assuming a 5% margin of error, 95% confidence interval, and 80% power, the required sample size was calculated as 32 participants for each of the experimental and control groups. Taking into account the possibility of participant dropout, at least 10% was added as a reserve, resulting in a total of 35 participants per group and 70 participants overall. Randomization was performed using a computer-based tool via the Research Randomizer website (https://www.randomizer.org/). Participants in the experimental and control groups were assigned according to the generated sequence.

Study Variables: Dependent Variables: The levels of uncertainty experienced due to infertility and the levels of coping with infertility-related stress among the women participating in the study.

Independent Variables: The socio-demographic characteristics of the infertile women included in the study, and the interventions implemented as part of the Empowerment Program for Infertile Women.

Data Collection Process and Instruments: For the pretest and posttest data of the study, the following tools were used: a 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).

Personal Information Form: This form consists of questions regarding the participants' socio-demographic and obstetric characteristics [16,17].

Coping with Infertility Stress Scale: The scale was developed by Schmidt in 1996. It consists of 19 items and four subscales. Items 1 through 17 are rated on a 4-point Likert scale: 1 = never used, 2 = used sometimes, 3 = used often, 4 = used very often. Items 18 and 19 are scored as follows: 1 = share with no one, 2 = share with close ones, 3 = share with most people I know. The subscales include: 1. Active-denial coping, 2.Active-confronting coping, 3.Passive-denial coping, 4.Meaning-based coping. Schmidt reported a Cronbach's alpha coefficient of 0.59 for women [17]. In this study, the Cronbach's alpha coefficient was found to be 0.86.

Mishel Uncertainty in Illness Scale – Community Form (MUIS-C): Originally developed by Merle Mishel in 1986, the scale was adapted into Turkish and validated by Çal and Aydın Avcı [15]. It is designed to assess 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 and is evaluated across three subscales: "perception of the current situation," "perception of understanding," and "uncertainty," as well as a total score. The Cronbach's alpha coefficient was reported as 0.79 by Çal and Aydın Avcı [15], while in the present study, the Cronbach's alpha was found to be 0.88.

Ethical Approval: Ethical approval for the study was obtained from the Ethics Committee of Social and Human Sciences at 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).

Empowerment Program for Infertile Women (EPIW): The Empowerment Program for Infertile Women (EPIW) was developed specifically for women experiencing infertility. Its aim, based on the Theory of Uncertainty in Illness (TUI), is to enable participants to reevaluate their perceptions of uncertainty by supporting the framework of stimuli within their cognitive schema through the aid of structure-providing components. The program also aims to help women learn strategies for coping with stress and to facilitate their ability to manage both stress and uncertainty related to infertility. The content of the EPIW was developed using a problem-centered, core education approach. The needs assessment for the program was conducted by the researcher through a review of national and international studies, a pilot study involving infertile women, and the theoretical assumptions of the TUI. The Empowerment Program for Infertile Women spans a total of four weeks, consisting of 20 sessions held five days a week, each lasting one hour. Each educational session is structured around main themes with subtopics, and various teaching methods were employed, including face-to-face interviews, active listening, slide presentations, direct instruction using models, brainstorming, group discussions, and question-and-answer techniques.

Data Analysis

The data were analyzed using IBM SPSS version 23. The results of the analyses are presented as mean ± standard deviation and median (minimum–maximum) for quantitative data, and as frequency (percentage) for categorical data. To compare the frequency distributions of two independent groups, the Pearson chi-square test was used; for categorical comparisons, the chi-square test with Yates correction and Fisher's exact test (Fisher's chi-square) were applied. For non-parametric analysis of differences between independent groups, the Mann–Whitney U test was used. To compare the means of two independent groups, the independent samples t-test was applied. For non-parametric analysis of differences in dependent groups, the Wilcoxon signed-rank test was used. Paired t-tests were conducted to measure the effect of the intervention. The level of statistical significance 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)

Variables		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±Stan.dev.	Mean(min-maks.)	Mean±Stan.dev.	Mean(min-maks.)		
Infertility Stress Coping Scale Total Score	Pre-test***	43.0 ± 8.9	43 (23 - 71)	48.0 ± 9.7	46 (26 - 74)	-2.246	0.028**
	Post-test****	50.3 ± 7.4	50 (34 - 71)	48.6 ± 9.6	48 (29 - 74)	0.836	0.406**
Active-Disregard Coping Method	Pre-test	11.1 ± 4.3	11 (4 - 16)	10.8 ± 3.7	10 (4 - 16)	585.5	0.748*
	Post-test	8.1 ± 2.9	8 (4 - 16)	10.9 ± 3.6	11 (4 - 16)	901	0.001*
Active-Fighting Coping Method	Pre-test	14.5 ± 3.5	14 (8 - 23)	18.9 ± 4.9	20 (8 - 26)	923.5	0.001*
	Post-test	21.7 ± 4.0	22 (14 - 26)	18.7 ± 4.7	19 (9 - 26)	405.5	0.014*
Passive-Disregard Coping Method	Pre-test	8.8 ± 2.9	9 (3 - 12)	9.6 ± 2.8	12 (3 - 12)	726.5	0.163*
	Post-test	6.0 ± 2.1	6 (3 - 12)	9.4 ± 2.8	9 (3 - 12)	1006	<0.001*
Meaning-based Coping Method	Pre-test	8.7 ± 3.8	7 (5 - 20)	8.8 ± 3.4	10 (5 - 20)	642	0.724*
	Post-test	14.5 ± 3.4	15 (9 - 20)	9.5 ± 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 ($p < 0.001$). The post-test median score of the experimental group was 10, whereas the control group's was 0.

DISCUSSION

This study was conducted to examine 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 with infertility. The findings obtained from the study will be discussed in this section in accordance with the research hypotheses.

According to the Theory of Uncertainty in Illness (TUI), structure-providing factors that support the stimulus frame are crucial in the formation of the cognitive schema related to illness. These structure providers include sources of social support and reliable authority figures in healthcare who assist individuals in interpreting the stimulus frame [12,18]. In this study, it was found that, prior to the intervention, infertile women in both the experimental and control groups received a similar level of spousal and family support. However, in terms of support from healthcare personnel, women in the experimental group were at an advantage, with 31.4% receiving support from a reliable authority compared to only 8.6% in the control group. This difference between the groups was found to be statistically significant ($p < 0.05$) (Table 1). According to the literature, similar to the findings of our study, it has been reported that women are less affected by infertility when they talk with their spouses and social circles [19,20], and that infertile women receive a high level of support from their family and friends [20]. It is also noted that when partners share their feelings and thoughts about infertility with each other, their close social circles, and others who have experienced infertility, it can reduce their stress levels and serve as an effective coping strategy [20,21,22]. Another study conducted in Iran reported that the husband's empathy, love, loyalty, and adequate support alone could provide the emotional support necessary for women to maintain hope, continue treatment, and build trust [22]. On the other hand, it has been noted that in some cultures, the lack of social and economic support for infertile women further deepens the psychological trauma they experience [23]. During the infertility treatment process, it can be stated that spousal support, social support, and the support of healthcare professionals who serve as reliable authority figures play a key role in helping women cope with infertility-related stress. These findings highlight the importance of ensuring that infertile women perceive adequate social support in order to reduce the negative impact of the diagnosis and treatment processes.

Among the infertile women in the experimental group, the total score on the CISS was 43.0 ± 8.9 before the intervention and increased to 50.3 ± 7.4 after the intervention. This increase in the mean score was found to be statistically significant ($p < 0.001$). The rise in coping scores following the implementation of the Empowerment Program for Infertile Women (EPIW), which was developed based on the Theory of Uncertainty in Illness (TUI), indicates that the program had a positive effect on the women's ability to learn how to cope with infertility-related stress. Although the control group had a higher mean score on the CISS compared to the experimental group before the intervention, the post-intervention mean score of the experimental group was higher than that of the control group, and the difference between the groups was found to be statistically significant ($p < 0.001$) (Table 2). Based on the findings of the study, the H1a hypothesis — stating that the "Empowerment Program for Infertile Women" (EPIW), developed based on the Theory of Uncertainty in Illness, would increase the coping levels of infertile women in the experimental group compared to those in the control group — was accepted. In intervention-based studies similar to ours, it has been reported that the total stress levels caused by infertility in infertile women decreased following various interventions, and that these interventions were effective in reducing infertility-related stress [24,25,26,27,28,29]. When evaluated in terms of outcomes, it can be stated that the results of our study are consistent with the literature.

Due to the limited number of studies in the literature that evaluate infertility-related stress using the total score of the CISS, comparisons were made based on the subdimensions of the scale. In our study, different findings were obtained regarding the effectiveness of the Empowerment Program for Infertile Women (EPIW) in terms of the coping strategies used to manage infertility-related stress. Among the infertile women in the experimental group, the pre-intervention total score for the active-denial coping method subdimension of the CISS was 11.1 ± 4.3, and for the passive-denial coping method subdimension it was 8.8 ± 2.9. Post-intervention, these scores decreased to 8.1 ± 2.9 and 6.0 ± 2.1, respectively. It was found that the mean scores for both the active-denial and passive-denial coping method subdimensions in the experimental group significantly 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 of the active-denial and passive-denial coping method subdimensions were lower in the experimental group than in the control group, and

this difference was statistically significant ($p < 0.001$) (Table 2). This finding indicates that women in the experimental group used denial-based coping strategies less frequently after participating in the EPIW, whereas the women in the control group showed no change in their use of denial strategies and continued to use them at the same level. These results suggest that the program was effective and that its impact was sustained over time. This may be explained by the possibility that the women in the experimental group continued to apply the strategies and skills gained from the program even after its completion. In studies similar to ours, it has been reported that the mean scores of active-denial and passive-denial coping methods were at levels consistent with the findings of this study [17,19,30]; that active denial may be a useful strategy in situations where control is not possible in infertility [31]; that increased use of denial-based coping methods is associated with higher stress levels [28]; and that infertile women experiencing negative emotional states tend to use denial strategies more frequently [31]. Other findings in the literature indicate that the use of active and passive denial strategies decreased among women in the experimental group, while there were no changes in the psychological assessments of women in the control group [32]; that there was no change in active-denial scores in the experimental group, whereas these scores increased in the control group; and that passive-denial scores decreased in the experimental group but increased in the control group [27]. It has also been noted that women who feel economically inadequate tend to have higher passive-denial scores, and women who have been diagnosed with infertility for more than five years tend to have higher active-denial scores compared to other infertile women [29]. Furthermore, women under the age of 35 and those who believe the cause of infertility is due to themselves tend to have higher active-denial scores, while women with less than eight years of education tend to have higher passive-denial scores [17]. Similarly, women with lower educational levels and those who are unemployed have been found to score higher on active-denial strategies than others [16]. In our study, the reduction in the use of both active and passive denial coping strategies among women in the experimental group, along with a decrease in infertility-related stress levels, is consistent with the existing literature.

In the study, it was found that the total score of the Active-Confronting Coping Method subdimension of the CISS among infertile women in the experimental group was 14.5 ± 3.5 before the intervention and increased to 21.7 ± 4.0 after the intervention. This increase in the mean score was statistically significant ($p < 0.001$) (Table 2). These findings indicate that, following the Empowerment Program for Infertile Women (EPIW), women in the experimental group began to use the active-confronting coping method more frequently in response to infertility-related stress. The post-test mean score of the experimental group for the active-confronting coping method subdimension was higher than that of the control group, and this difference was found to be statistically significant ($p < 0.001$) (Table 2). Similar to the findings of our study, it has been suggested that using the emotion- and problem-focused active-confronting coping method may be associated with lower levels of stress in individuals [33], and that the use of this method is positively related to the reduction of infertility-related stress [34]. It has also been reported that stress decreases among those who use problem-focused active-confronting coping methods [35], that individuals who use this method have lower levels of depression [31], that women with social security use the active-confronting coping method more frequently than others [16], and that post-intervention scores of women in the experimental group were significantly higher than those in the control group [27]. However, contrary to the results of our study, another study [28] reported that increased use of the active-confronting coping method was associated with increased stress. This discrepancy may be due to the fact that while active-confronting coping behaviors such as researching, gaining control, and sharing help reduce stress, they may also lead individuals to become more fixated on infertility, which in turn could increase stress.

It is known that individuals' efforts to find new meanings through thoughts, beliefs, and actions help them cope with difficult situations. When a stressor is first encountered, if the situation is perceived as a threat, the individual's process of re-evaluating the situation and deriving new meanings through thoughts, beliefs, and actions is referred to as meaning-based coping [25]. A negative correlation between an optimistic outlook and infertility-related stress and depression has also been established [36]. In this study, the total score of the Meaning-Based Coping subdimension of the CISS among infertile women in the experimental group was 8.7 ± 3.8 before the intervention and increased to 14.5 ± 3.4 after the intervention. This increase in the mean score was found to be statistically significant ($p < 0.001$). These findings indicate that following the implementation of the Empowerment Program for Infertile Women (EPIW), the women in the experimental group began to use meaning-based coping methods more frequently in response to infertility-related stress (Table 2). In terms of meaning-based coping scores, the pre-intervention mean scores of women in both the experimental and control groups were very similar. However, post-intervention, the scores of the experimental group increased, while no change was observed in the control group. The difference between the groups was found to be statistically significant ($p < 0.001$) (Table 2). When the literature is examined, it is indicated that meaning-based coping facilitates well-being in painful and challenging situations and is moderately to highly effective for personal stress [28,31]. On the other hand, some studies report that meaning-based coping has a low level of effectiveness on stress [22], and that there is a negative correlation between meaning-based coping and both anxiety and infertility-related stress [33,34]. Other studies have shown that infertile women without children use meaning-based coping strategies more frequently than those with secondary infertility [29], and that women under the age of 35 use meaning-based coping methods more often and have higher scores compared to other infertile women [17]. In a controlled study conducted by Li et al. [32] with 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 of these studies in the literature are consistent with the findings of our research.

Uncertainty, defined as a cognitive state, begins when an individual is unable to adequately structure or categorize their illness, and cannot accurately predict its causes and outcomes. Uncertainty may occur at any or all stages of the illness process, including preliminary diagnosis, symptom phase, definitive diagnosis, treatment, prognosis, and recovery [37]. In our study, the total score of the Mishel Uncertainty in Illness Scale–Community Form (MUIS-C) among infertile women in the experimental group was 84.9 ± 13.8 before the intervention and decreased to 51.5 ± 20.4 after the intervention. This decrease in the mean score was found to be statistically significant ($p < 0.001$). In contrast, the mean pre-test score in the control group was 84.9 ± 11.7, and the mean post-test score was 86.6 ± 10.3, indicating no statistically significant difference between the two. Although no significant difference was observed between the pre-test scores of the experimental and control groups, the post-test total score of the MUIS-C was significantly lower in the experimental group than in the control group ($p < 0.001$) (Table 3). Based on these findings, the H1b hypothesis—stating that the uncertainty levels of infertile women in the experimental group would decrease compared to those in the control group following the Empowerment Program for Infertile Women (EPIW) developed based on the Uncertainty in Illness Theory—was accepted. In controlled studies similar to ours, it has been reported that the uncertainty scores of participants in the experimental group significantly decreased after the intervention [38,39]. In descriptive studies, the reported mean scores of the Uncertainty in Illness Scale were 73.51 ± 18.55 [40] and 60.6 ± 15.7 [41]. These findings indicate that the results of our study are consistent with the literature.

In our study, the total post-intervention scores of the subdimensions of the Mishel Uncertainty in Illness Scale–Community Form (MUIS-C)—namely, perception of the current situation, perception of understanding, and uncertainty—were lower among infertile women in the experimental group compared to their pre-intervention scores. This decrease was found to be statistically significant ($p < 0.001$) (Table 3). The reduction in the subdimension scores of MUIS-C after the intervention indicates that the women in the experimental group experienced a positive improvement in perceiving their current condition, understanding their situation, and coping with uncertainty caused by infertility. Furthermore, the post-test mean scores of all MUIS-C subdimensions in the experimental group were significantly lower than those in the control group, and the differences between the groups were statistically significant ($p < 0.001$) (Table 3). According to the results of our study, it was determined that participants in both the experimental and control groups experienced a high level of uncertainty during the diagnosis and treatment phases of their illness prior to the intervention. The areas of greatest uncertainty were related to a lack of information, and participants particularly struggled with understanding and perceiving their current condition. Similarly, Turgut et al. [42] reported that during the covid-19 pandemic, nurses were unable to meet patients' demands for information—one of the key antecedents of uncertainty—and as a result, perceived themselves as a potential threat to their patients. The nurses believed they lacked adequate training and experience and reported dramatic role confusion due to uncertainty, with insufficient knowledge and experience identified as primary sources of this uncertainty. Additionally, Taş Bora and Buldukoğlu [43] found in their study with caregivers of patients with schizophrenia that caregivers struggled to understand the course of the illness, were uncertain about how to behave or what actions to take, and experienced unpredictability regarding the outcomes of the illness—all of which contributed to a profound sense of uncertainty. In the study conducted by Çamlıca and Çoşkun Erçelik [44] with patients diagnosed with chronic renal failure, it was found that patients experienced difficulty in deciding on treatment options, indecisiveness due to a lack of information about which treatment method to choose, and inadequacy in individual coping and uncertainty. However, after receiving information, the uncertainty in making treatment decisions decreased. Similarly, in a study by Çınar et al. [45] conducted with a cancer patient using the Uncertainty in Illness Theory, it was reported that the patient experienced symptoms of uncertainty such as a lack of knowledge about the disease process, anxiety, fear, difficulty in adhering to treatment, challenges in individual coping, and disturbances in emotional perception, along with a lack of social support. It was emphasized that in order to reduce illness-related uncertainty, establishing open, trustworthy, and effective communication with the patient, eliminating knowledge deficits, including relaxation techniques, and enhancing social support opportunities led to improved treatment compliance in previously unmotivated patients. Furthermore, with increased support from social networks and healthcare personnel, patients who initially perceived the disease as the end of life began to develop more hopeful beliefs.

Within the scope of the Empowerment Program for Infertile Women developed based on the Uncertainty in Illness Theory (UIT), it was determined that meeting the information needs of infertile women, facilitating communication with other infertile women, reducing infertility-related uncertainty, and supporting effective coping with infertility stress were achieved. According to the results of the study, the coping with infertility stress scores of the women in the experimental group increased, while the scores on the Mishel Uncertainty in Illness Scale decreased. It was found that the pre-test and post-test scores obtained from both scales by the women in the experimental group differed at a statistically significant level (Table 4). Based on the findings of the study, the hypothesis H1c, which states that "the pre-test and post-test mean scores of the Coping with Infertility Stress Scale and the Mishel Uncertainty in Illness Scale–Community Form of the women in the experimental group will differ," was accepted.

Likewise, based on the study findings, the null hypothesis (H0), which stated that "The Empowerment Program for Infertile Women developed based on the Uncertainty in Illness Theory does not affect the uncertainty levels and

the ability to cope with infertility stress among infertile women in the experimental and control groups," was rejected.

CONCLUSION AND RECOMMENDATIONS

Following the implementation of the "Empowerment Program for Infertile Women" developed based on the Uncertainty in Illness Theory, it was determined that the total score of the Coping with Infertility Stress Scale, as well as the mean scores of the Active-Confronting Coping subdimension and the Meaning-Based Coping subdimension, increased in the experimental group, indicating a positive change ($p<0.001$). A decrease was observed in the mean scores of the Active-Denial Coping and Passive-Denial Coping subdimensions, indicating that the participants in the experimental group used denial-based coping strategies less frequently ($p<0.001$).

Following the implementation of the "Empowerment Program for Infertile Women," which was developed based on the Uncertainty in Illness Theory, it was found that the total score of the Mishel Uncertainty in Illness Scale - Community Form, as well as the subdimension scores for Perception of Current Situation, Comprehension, and Uncertainty, decreased in the experimental group. This indicates that the level of uncertainty experienced by participants due to infertility was reduced ($p<0.001$). As a result, this study concluded that the empowerment program, supported by a structured educational intervention, increased the coping levels of infertile women in the experimental group with infertility-related stress and decreased the level of uncertainty associated with infertility ($p<0.001$).

It is recommended that nursing interventions developed based on Mishel's Uncertainty in Illness Theory be implemented during the diagnosis, treatment, and follow-up processes of infertility. These interventions should aim to facilitate coping with uncertainty and stress, improve treatment adherence, and be evaluated at regular intervals for individuals diagnosed with infertility. Nurses should actively support efforts to reduce illness-related uncertainty and stress. Additionally, it is suggested that model-specific care practices be integrated into in-service training programs for nurses. Further studies should be conducted with larger samples to evaluate different nursing interventions developed based on the Uncertainty in Illness Theory in individuals undergoing infertility diagnosis, treatment, and follow-up. Finally, qualitative and/or mixed-method research designs are recommended to assess the impact of such theory-based nursing interventions on the care of individuals diagnosed with infertility.

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