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The effect of virtual reality (VR) glasses and therapeutic touch (TT) on pain, anxiety, and patient satisfaction during intrauterine insemination (IUI) compared to standard care: a single-blind, randomized controlled trial

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Abstract

Background Intrauterine insemination (IUI) also found that this experience was associated with anxiety. Therefore, measures must be taken to reduce or eliminate the pain and anxiety associated with it.

Objectives This study investigated the effect of virtual reality glasses (VRG) and therapeutic touch (TT) on pain, anxiety and satisfaction during intrauterine insemination.

Methods A single blind randomized controlled trial design was used. Patients were randomized into three groups: the virtual reality group (VRG, $n=32$), the therapeutic touch group (TT, $n=32$), and the control group (CG, $n=32$). The study was conducted between January and June 2022 in the obstetric outpatient clinics of a public hospital in northern Türkiye. Anxiety was evaluated using the State Anxiety Inventory. Pain, and satisfaction were evaluated using the Visual Analogue Scale [VAS]. "The study used non-parametric tests for its statistics."

Results There was a significant difference in the pain level of the VRG group during IUI was lower than those of CG 3.7 ± 2.7 and TT 3.6 ± 2.9 ($p=0.01$). Women were most satisfied with the TT application 9.2 ± 1.1 in the IUI procedure ($p=0.000$). Anxiety levels after IUI were lower in the TT 43.0 ± 4.2 and VRG 43.9 ± 4.4 than in CG 49.9 ± 4.0 ($p=0.000$).

Conclusion VRG application was effective in reducing pain associated with IUI procedure in women. Although the use of VRG with music reduced the pain associated with IUI more than the TT application, the women left the TT application satisfied.

Trial registration The study was registered at the Clinical Trials.gov website under the code NCT05192330. The first trial registration date was (12/01/2022).

Keywords Insemination, Virtual reality, Therapeutic touch, Pain, Anxiety

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Introduction

The practice of injecting male sperm collected outside of sexual contact into the uterine cavity through a catheter while the woman is in her ovulation period is known as Intrauterine insemination (IUI) [1]. IUI which is used to boost the likelihood of conception during infertility therapy, has not, however, been the subject of any studies. This is a commonly used and invasive method that is often described by women as uncomfortable and painful. Women who have reported pain during IUI also found that this experience was associated with anxiety [2–5]. The anxiety and pain experienced by women during the procedure negatively impact women's quality of life [1, 6]. It has thus been recommended that psychological interventions be used to improve treatment outcomes during the IUI procedure [6]. Healthcare practitioners must assess patients holistically and provide therapies that can lessen pain and anxiety.

Around the world, the process of digitalization is increasing daily, and its application in healthcare is spreading quickly. Virtual reality (VR) technology is one of the applications used in digitized healthcare [7]. These programs are becoming increasingly popular and are frequently used. Virtual reality glasses (VRG) are used in many healthcare settings [8–12]. Studies have also demonstrated that VRG, one of the most important technological developments in recent years, can be used for painful invasive procedures and to reduce anxiety [8, 9]. In virtual reality, individuals interact with a computer-simulated, three-dimensional environment. Users wear a head-mounted display (HMD), a headset that provides stereoscopic visual images, creating a sense of space and depth. The motion tracker in the HMD measures the position of the head and adjusts the visual display accordingly. As a result, users feel as if they can look around and move within the simulated environment. Indirectly, their attention is diverted, creating a therapeutic environment [13–15]. It is preferable to have one's attention diverted during painful processes [15].

Dolores Krieger and Dora Kunz initially discussed therapeutic touch (TT) in 1972 [16, 17]. It is a complementary holistic treatment method that efficiently lowers anxiety, eases pain, and encourages healing. By easing anxiety and pain, TT aids in the development and maintenance of wellbeing [18]. TT is still being taught in many colleges and universities across the US, and it is frequently used in the nursing literature. Along these lines, the North American Nursing Diagnostic Guidelines [19] now include a diagnosis named "Imbalanced Energy Field" [16]. Studies have shown substantial differences in comfort and anxiety levels when using TT, indicating that it can be employed in patient care due to its simplicity of use and successful outcomes [20–24]. It is a non-invasive, cheap and harmless method. TT, an evidence-based energy therapy, focuses on external electromagnetic fields and internal energy fields. This therapy utilizes universal energy with a specific intention while helping individuals maintain balance and restore their health. TT aims to harmonize, restore, and heal the flow of human biofield energy by removing blockages in a person's "biofield" by holding their hands 2–6 inches away [23]. TT begins with concentration, where the practitioner consciously focuses on the client with sincere intentions to help, while also inducing mental and physical relaxation and establishing a state of awareness. During the treatment of imbalances, energy flow is guided and harmonized through quiet, rhythmic hand movements, supporting energy balance. The client's energy is then reassessed, and if necessary, the treatment is repeated.TT is a form of complementary treatment that is effective in reducing anxiety, alleviating pain, and promoting healing [16, 25]. An examination of the literature shows that studies have been conducted on TT some fields [16, 18, 20, 21, 23, 24, 26–29]. When systematic reviews on this subject are considered, the widespread consensus is that there are still limitations in the scientific evidence [16].

However, no study that used TT and VRG approaches for IUI was discovered after analyzing the literature. Therefore, the purpose of the current study was to ascertain the impact of VRG and TT on women undergoing IUI in terms of pain, anxiety, and patient satisfaction. In this context, the following hypotheses were put forth.

Research question

- What is the effect of virtual reality (VR) glasses and therapeutic touch (TT) on pain, anxiety, and patient satisfaction during intrauterine insemination (IUI)?
- How does the combination of VR and TT influence the patient experience during IUI compared to standard care?
- When assessed independently, which intervention—VR or TT—is more effective in managing pain and anxiety?
- Is the contribution of VR or TT to patient satisfaction significant compared to standard care?

Hypotheses

Hypothesis 1 For women undergoing IUI, TT is effective in reducing pain and anxiety and increasing satisfaction.

Hypothesis 2 For women undergoing IUI, using VRG while listening to music (nature sounds) is effective in reducing pain and anxiety and increasing satisfaction.

Hypothesis 3 For women undergoing IUI, using VRG with music (nature sounds) is more effective than TT in reducing pain and anxiety.

Methods

Study setting and participants

Study design

The study was a single blind randomized controlled trial with included three parallel groups, VRG, TT and control group. This study was performed on 96 women. A single-blind, parallel group randomized controlled trial was used to evaluate the effect of using VRG and TT on pain, anxiety and patient satisfaction in women during the intrauterine insemination procedure. Participants and the statistician were blinded in the study. This clinical trial is registered at ClinicalTrials.gov (NCT05192330). Reporting adhered to the CONSORT extension for parallel group randomized trials (CONSORT 2010 Flow Diagram, accessed on 16 April 2019) and the TIDieR checklist (The CONSORT 2010 Checklist, accessed on 4 April 2023).

Participants

We conducted the study in a infertility polyclinic of a provincial education and trainig hospital in the northern Region, in Türkiye. Prior to the study, women presented to the outpatient clinic for the IUI procedure were told about the free IUI procedure and they were invited to participate in the study.

Volunteering women who were attending the IUI between January and June 2022 and satisfying the inclusion criteria were recruited. The study sample consisted of women who met the inclusion criteria. To calculate the sample size of the study, a power analysis was performed using the G*Power program 3.1.9 based on the pain level data in a similar study [30]. In this analysis, it was determined that at least 32 participants in each group should be included, with a 95% confidence level (1-α), 55% test strength (1-β), and effect size of d = 0.6875.

At the infertility clinic where the study was conducted, IUI is carried out by appointment every day during the working week. On the days that IUI was carried out during the study, the researchers evaluated the suitability of women who had IUI appointments for the study. The women who underwent IUI procedures rested for 15 min without getting up following the treatment, which took an average of 15 min. There were two experimental groups and one control group. One experimental group was the VRG application group and the other was the TT group. The control group received no intervention apart from routine care at the infertility center. The nurses did not apply any non-pharmacological pain management measures during the procedure. This was one of the main reasons for choosing this hospital and center.

Inclusion criteria

- Being over the age of 18.
- Having at least a primary school education.
- Not having drug sensitivity or allergies.
- Having a diagnosis of unexplained infertility.
- Having male factor infertility.
- Having a diagnosis of mild endometriosis.

Exclusion criteria

- Being under the age of 18
- Not having at least a primary school education.
- Having drug sensitivity or allergies.
- Having a diagnosed cause of infertility other than unexplained infertility or male factor infertility.
- Having severe endometriosis or other serious gynecological conditions.
- Being diagnosed with female factor infertility.
- Having serious systemic or chronic diseases (e.g., diabetes, hypertension, autoimmune diseases, etc.)

Sampling methods

No stratified distinction was made because all participants were of the same gender and all were in reproductive age. No stratification was made for any factor. Among 110 women evaluated by the researcher,14 women have been excluded from the study for the following reason: Not meeting inclusion criteria ($n = 14$). 96 women met the eligible criteria and were allocated to VRG ($n = 32$), TT ($n = 32$), and control ($n = 32$) groups using a block randomization method.

Women included in the study were divided into three equal groups using a block randomization method prepared in Microsoft Excel. To verify the homogeneity of the groups after randomization, independent variables such as age, duration of marriage, education level, and employment status of the intervention and control groups were compared using the Pearson chi-square test and the Kruskal-Wallis H test, confirming that the groups had a homogeneous distribution.

The groups were coded as follows: 1 for the VRG intervention group, 2 for the TT group, and 3 for the control group, and were randomized from 1 to 96. The randomization results for the 96 women were printed in a Word document by a faculty member who was not involved in the study. Papers numbered from 1 to 96 were placed in opaque envelopes. During the data collection phase, the assigned person conducted interviews with the women, assessed the inclusion criteria, and obtained informed consent from the participants before administering the pre-tests. After the pre-test administration, the women were asked to select an envelope. For example, a woman who selected the envelope with the number 9 was assigned to the VRG intervention group, while a woman who selected the envelope with the number 6 was assigned to the control group. In order

to prevent bias and ensure confidentiality during randomization, it was performed by a statistical expert not from among the authors. Pre-test and post-test data were collected and transferred to the computer by a graduate student blinded to group allocations. The analysis of the data coded in terms of groups was done by a statistical expert. After statistical analyses were completed and the research report was written, the researcher explained the coding for the VRG, TT and control groups. In this way, single blinding was applied to the researcher (Fig. 1).

Intervention

At the infertility clinic where the study was conducted, the IUI technique is carried out by appointment every day during the working week. The researchers evaluated the eligibility to participate in the study of the women who had IUI appointments on the days when IUI applications were being accepted. The women who underwent IUI procedures rested for 15 min without getting up following the treatment, which took an average of 15 min. There were two experimental groups and one control group. One of the experimental groups was the VRG application group and the other was the TT group. The control group received no intervention apart from routine care at the infertility center.

VRG intervention

VRG are devices that work with compatible smartphones. They can be used to view videos taken at a 360-degree angle, and any type of wired headphones can be connected to the audio output. Viewing relaxing images accompanied by relaxing music with VRG during the invasive procedure allows the women to embark on an imaginary journey that takes them away from the clinic in which they are surrounded by medical equipment and leads them into a more tranquil environment. The use of VRG is thought to increase the release of endorphins and oxytocin hormones while decreasing adrenaline levels, resulting in physical relaxation. The technology can be used for pain relief as a non-invasive, effective pain-relieving method. This approach was chosen because studies utilizing VRG have demonstrated that it is an

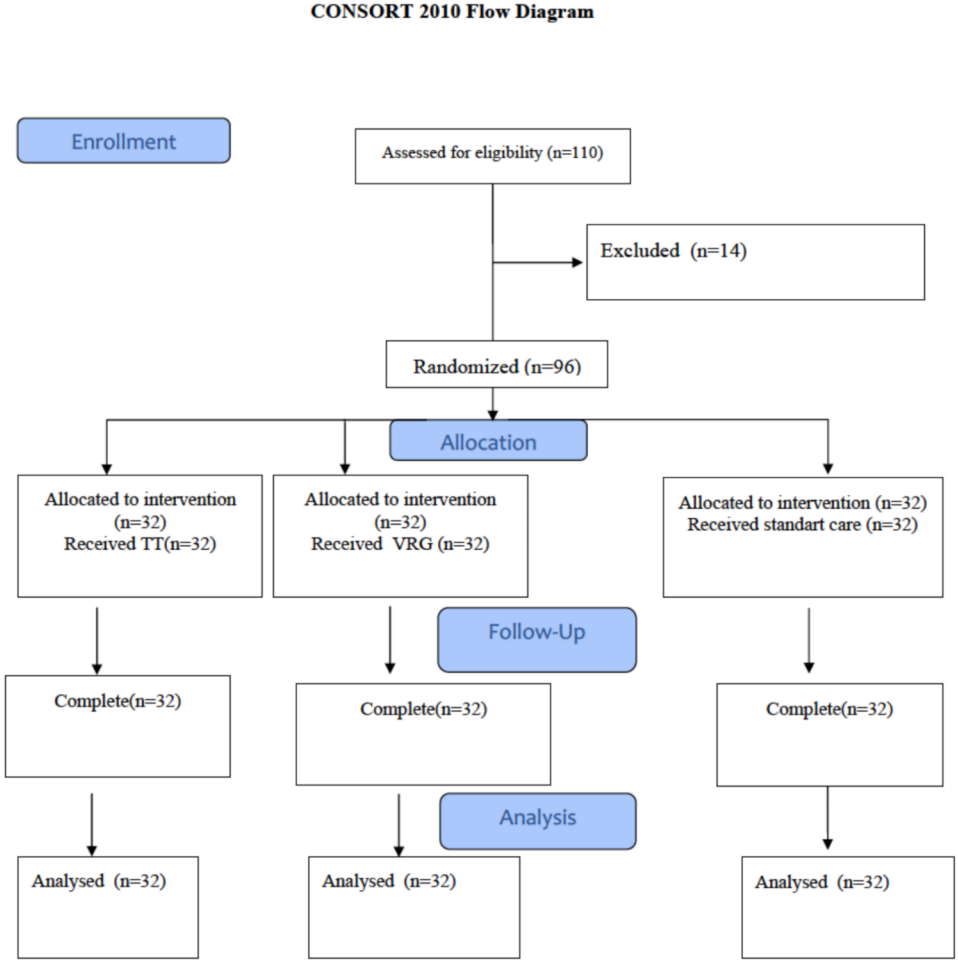

Fig. 1 CONSORT flow diagram for the research (20)

efficient way to manage pain [8, 9, 31–33]. A video showing a natural setting and music featuring nature sounds was shown to the women in the VRG application group for a total of 30 min, 15 min prior to and 15 min following the IUI process. The goggles' headphones were used to listen to a music recording that featured natural noises. The content of the VRG video includes plants, land, water and sky [34]. The VRG were given to the women before the procedure. The glasses were put on before the procedure began and were not removed during the procedure. The goal was to enable the women to observe nature more effectively and listen to its sounds, allowing them to focus on the images and sounds and distract themselves from the tension of the current environment. Each woman was shown the same video and the glasses were disinfected after each use.

Therapeutic touch intervention

The women in the TT group received a total of 30 min of TT only, 15 min before the IUI treatment and for 15 min during the IUI treatment. The participants were guided or gently led to their room prior to the beginning of the intervention. They were laid on their backs on their hospital beds for the treatment. The intervention consisted of centering, assessment, TT administration (directing human energies, modulating human energies, changing patterns in human energy field), reassessment of the patient's energy field and additional treatments as needed. The practitioner's hands were held 2–6 inches away from the participant's skin.

To prevent the possibility of meeting, sharing experiences, and interaction between women in the groups, the participants were taken alone to an isolated room right next to the IUI room and administered TT or VRG before being taken to the IUI room for the procedure. After the procedure, the final tests were performed in another room by another researcher. To avoid statistical bias, the experimental and control groups were assigned the codes x, y, and z, and the groups were hidden from the statistician during data analysis when the data were transferred to the SPSS program. There was no interference with the routine procedures and care of the women during the study.

Data collection

Data were collected from January and June 2022. Data collection tools included a demographic and Visual Analog Scale for Pain Spielberg State-Trait Anxiety Inventory (STAI)) and Visual Analog Scale for Satisfaction(VAS-satisfaction).

The first session (pre-test): In both VRG, TT and control groups, Demographic and VAS for pain Form, *Spielberg State-Trait Anxiety Inventory (STAI)*, were administered.

The second session (post test): In both VRG, TT and control groups, after IUI procedure. Demographic and VAS for pain Form, *Spielberg State-Trait Anxiety Inventory (STAI), Visual Analog Scale for Satisfaction(VAS-satisfaction)* were administered.

Measurement tools

Visual analog scale for pain

The scale, developed by Hayes and Patterson in 1921, is a one-dimensional, 0–10 cm (0–100 mm) measuring instrument commonly used to measure severity of pain. This measurement tool can be used horizontally or vertically. The scale starts with "no pain" and ends with "unbearable pain." High scores on the scale indicate a high severity of pain. The cutoff points for the scores obtained on the scale are 0 cm "no pain," 1–4 cm "mild pain," 5–6 cm "moderate pain," and 7–10 cm "severe pain" [35]. Baseline pain was assessed just before the procedure. The worst pain during the IUI was evaluated immediately after the IUI. The pain was re-evaluated 15 min after the procedure. Its validity and reliability have been shown in the previous studies [36, 37].

Visual analog scale for satisfaction(VAS-satisfaction)

Satisfaction level was measured using the visual analog scale. VAS is used to convert some numerically unmeasured values to numeric values. VAS is a continuous scale tahat comprises a horizontal line or a vertical line, usually 10 cm in a length. 'I am not satisfied at all'(zero point), whereas the statement at the other end is 'very satisfied'. Patients were asked to mark their satisfactin levels on this scale of 10 cm. Satisfaction were evaluated using the Visual Analogue Scale [VAS] 15 second after treatment.

Spielberg State-Trait anxiety inventory (STAI)

This inventory consists of two separate self-report scales, the State Anxiety Inventory and the Trait Anxiety Inventory, each comprising 20 items and structured according as a four-point Likert-type scale. The State Anxiety Inventory refers to how the person feels at a specific time and under specific conditions, and is answered with one of the statements 1("…"), 2 ("a little"), 3 ("a lot"), 4 ("completely") depending on the severity of the feelings at that time. The Trait Anxiety Inventory refers to how the person usually feels and is answered with one of the statements 1 ("almost never"), 2 ("sometimes"), 3 ("most of the time"), 4 ("always") depending on the severity of the constant feelings. The scores obtainable from both scales ranges from 20 to 80, and an increase in the overall score corresponds to an increase in the amount of anxiety. In the Turkish adaptation of the inventory, the Cronbach's alpha reliability coefficients were found to range from 0.83 to 0.92 for the State Anxiety Inventory and from 0.83 to 0.87 for the Trait Anxiety Inventory [38]. All

participants filled out the scale baseline before treatment and 15 s after treatment.

Blinding

In order to avoid any inductive effects of the VRG and TT we used a single-blinded design where the assessor observed the outcomes and the interviewers were unaware of the treatment that each patient had received. Thus, the treatments were given to the patients by one researcher and the effects of the treatments were evaluated independently by another researcher.

Data analysis

Data were analyzed by IBM SPSS V23 (SPSS Inc., Chicago, IL, USA). Normality assumption was tested by Kolmogorov-Smirnov and Shapiro-Wilk tests. Data were presented with descriptive statistics such as number, percentage, arithmetic mean, standard deviation. Mann Whitney-U test was used for categorical variables, and Kruskal Wallis-H analysis for the continuous variables to confirm differences in sociodemographic characteristics and some outcomes of health and IUI between the groups. The scores of the VAS (for pain) and STAI between groups were compared Kruskal Wallis H analysis, Tukey test pairwise comparison post hoc test and for comparison within groups was used Freidman Test and Wilcoxon Test.Statistical significance value was accepted as $p < 0.05$.

Results

Table 1 shows the sociodemographic characteristics of the women.

Table 2 shows some outcomes for health and IUI between the groups of women. No significant difference was found between the groups in terms of duration of unprotected intercourse, duration of menstruation, having a serious health problem and having a child, menstrual pattern, experiencing menstrual pain, having IUI for the first time, being informed about IUI, and body mass index ($p > 0.05$). The groups in the study were homogeneous in terms of these characteristics.

Table 3 shows comparison of the mean VAS and STAI scores between and within groups. There was significant difference between the groups of preoperative pain

Table 1 Sociodemographic characteristics between the groups

Variable	VRG group ($n=32$)	TT group ($n=32$)	SCG group ($n=32$)	*p Value*
	Median (min-max)	Median (min-max)	Median (min-max)	
Age (years)	29 (20–45)	27 (20–41)	30 (23–39)	0.274 [a]
Age of spouse (years)	31(23–48)	30 (25–45)	33 (22–41)	**0.022**[a]
Duration of marriage (years)	4 (1–12)	4 (1–10)	4 (2–16)	0.893 [a]
Education status				
Primary and secondary school	7 (21.9)	11(34.4)	12(37.5)	
High school	14 (43.8)	6 (18.8)	8 (25)	0.215 [b]
University	11 (34.4)	15 (46.9)	12 (37.5)	
Employment status				
Employed	20 (62.5)	19 (59.4)	19 (59.4)	0.957 [b]
Unemployed	12 (32.5)	13 (40.6)	13 (40.6)	
Income status				
Income lower than expenditure	5 (15.6)	9 (28.1)	5 (15.6)	
Income equal to expenditure	24 (64.4)	20 (62.5)	26 (81.3)	0.459 [b]
Income more than expenditure	3 (9.4)	3 (9.4)	1 (3.1)	
Primary place of residence				
Village/town	2 (6.2)	3 (9.4)	2 (6.2)	
District	19 (59.4)	15 (46.9)	10 (31.3)	0.210[b]
City center	11 (34.4)	14(48.3)	20 (62.5)	
Family type				
Nuclear	25 (78.1)	26 (81.3)	26 (81.3)	0.936 [b]
Extended	7 (21.9)	8(25.0)	6 (18.7)	
Smoking status				
Smoker	7(21.9)	4(12.5)	8(25.0)	1.426 [b]
Non-smoker	25(78.1)	28(87.5)	24(75.0)	
Family history of infertility treatment				
Yes	8(25.0)	4(12.5)	8(25.0)	0.364[b]
No	24(75.0)	28(87.5)	24(75.0)	

Categorical variables are presented as *n* (%) and continuous variables as mean (SD)

Abbreviations: [a]: Kruskal-Wallis H analysis; [b]: Mann Whitney U test

Table 2 Some outcomes for health and IUI between the groups

Variable	VRG group (*n* = 32)	TT group (*n* = 32)	SCG group (*n* = 32)	*p Value*
	Median (min-max)	Median (min-max)	Median (min-max)	
Duration of unprotected intercourse (years)	2.5 (1–6)	3 (1–10)	3 (1–16)	0.262[a]
Duration of menstruation (days)	5 (4–10)	5.5 (4–7)	6 (4–9)	0.817[a]
Serious health problem				
Yes	4(12.5)	6 (18.7)	8(25.0)	0.440 [b]
No	28(87.5)	26 (81.3)	24(75.0)	
Menstruation pattern				
Regular	24(75.0)	24(75.0)	25 (78.1)	0.944[b]
Irregular	8(25.0)	8(25.0)	7 (21.9)	
Menstruation pain				
Yes	22 (68.8)	18 (56.2)	20 (62.5)	0.587[b]
No	10 (31.2)	14 (43.8)	12 (37.5)	
First IUI insertion				
Yes	18 (56.2)	23 (71.9)	15 (46.9)	0.122[b]
No	14 (43.8)	9 (28.1)	17 (53.1)	
Being informed about IUI				
Yes	18 (56.2)	22 (68.8)	21 (65.5)	0.557[b]
No	14 (43.8)	10 (31.2)	11 (36.5)	
Body mass index				
Normal	17 (53.1)	20(62.5)	16 (50.0)	0.847[b]
Overweight	7 (21.9)	5 (15.6)	6 (18.8)	
Obese and extremely obese	8 (25)	7 (21.9)	10 (31.2)	

Categorical variables are presented as *n* (%) and continuous variables as mean (SD)

Abbreviations: [a]: Kruskal-Wallis H analysis; [b]: Mann Whitney U test

Table 3 Comparison of the mean pain and anxiety scores between and within groups

VAS	VRG group (*n* = 32)	TT group (*n* = 32)	CG (*n* = 32)	Between groups *p*-value [a]	Difference [c]
	Mean (SD)	Mean (SD)	Mean (SD)		
VAS-1	3.5(2.38)[x]	2.9(3.6)[y]	1.5(2.5)[z]	**0.01**	z < x
VAS-2	1.8 (0.4) [x]	3.6 (2.9) [y]	3.7 (2.7) [z]	**0.01**	x < y,z
VAS-3	1.7 (2.0) [x]	1.5 (2.7) [x]	1.4 (1.8) [x]	0.66	-
Within group *p*-value [b]	**0.000**	**0.000**	**0.000**		
STAI					
STAI1	42.5 (5.07) [x]	39.5 (4.7) [y]	39.7 (6.1) [z]	**0.02**	z< x
STAI2	43.9 (4.4) [x]	43.0(4.2) [y]	49.9 (4.0) [z]	**0.00**	y < z
Within group p-value [d]	0.175	**0.001**	**0.001**		
VAS (Satisfaction)	8.2 (1.3) [x]	9.2 (1.1)[y]	7.6 (0.8)[z]	**0.00**	z< x

Data are presented as mean (SD)

VAS-pain baseline IUI (VAS-1), pain during IUI(VAS-2), and 15 min after IUI (VAS-3); Anxiety baseline (STAI1) and immediately after IUI (STAI2)

Abbreviations: [a]: Kruskal-Wallis H analysis; [b]: Friedman test; [c]:Tukey test, [d]: Wilcoxon analysis

scores ($p < 0.05$). Intraoperative pain scores, there was a difference between the groups ($p < 0.05$). Postoperative pain scores, the results were similar between the groups ($p > 0.05$). When the mean preoperative and postoperative pain scores were analyzed, the difference between the mean preoperative and postoperative pain scores of the VRG, TT and CG was significantly different ($p < 0.05$).

Between the VRG group and the CG, there was a significant difference between the groups for the preoperative STAI ($p < 0.05$). The analysis of the mean postoperative STAI scores revealed that there were significant differences between the groups ($p < 0.05$). The difference between the preoperative and postoperative STAI mean scores of the TT and CG was statistically significant ($p < 0.05$) when the preoperative and postoperative STAI mean scores were evaluated. In the VRG group, there was no statistically significant difference between the preoperative and postoperative STAI mean scores ($p > 0.05$). The patient satisfaction scores between the groups differed significantly ($p < 0.05$). Between the VRG and CG there was a significant difference ($p < 0.05$). Between the TT and VRG groups, there was no discernible difference.

Analysis of the post-operation satisfaction levels revealed that there was a difference between the groups, with the VRG group demonstrating this difference. The TT group reported feeling the most satisfied.

Discussion

The study's findings indicate that VRG significantly reduced women's pain during the operation compared to the other groups. Despite the fact that anxiety levels increased following the surgery in all groups, it is interesting that the increase was greater in the CG.

TT was also determined to be the technique that the women liked the most. The women in the TT group in the current study reported feeling more pain during IUI and more anxiety after IUI, but their degree of pleasure was higher than that of the other groups. TT is acknowledged as a component of holistic healthcare. According to studies, which was carried out in Türkiye, women who received TT treatment during active labor had decreased pain and anxiety [20, 39]. In Muellers study, TT was found to be effective in reducing back pain [23], and in Alp's study, it was effective in reducing anxiety in the elderly [24]. Additionally, a systematic review concluded that TT could improve the health conditions of patients experiencing anxiety in various diseases such as cancer, heart disease, stroke, hypertension, anxiety, and depression [40]. The idea that TT continues to be a faith-based intervention, with little distinction from other faith-healing methods, is supported. Our study findings indicate that pain levels in individuals were at a minimum, while participant satisfaction levels were at their highest.

In the healthcare industry, VR applications are actively employed to educate students, healthcare professionals, patients, and their families, as well as to prevent, treat, and cure diseases [7, 10, 41]. Medical professionals mostly use VR to lessen discomfort and anxiety during difficult medical procedures. The group that had VRG while listening to natural sounds was reported to have reduced pain throughout the treatment, no discernible change in anxiety level, and high levels of satisfaction with the application. Studies have shown that using VRG helps with pain management during perineal repair after childbirth and increases postpartum comfort [42], that it reduces pain and anxiety levels during breast biopsy using the fine-needle aspiration biopsy technique [43], hysteroscopy [44], VR helps patients experience less pain and fear and makes them more satisfied with hysterosalpingography [45], HSG procedure, VRG application accompanied by nature sounds led to a reduction in patients' anxiety and pain [46] and that it significantly reduces patients' anxiety levels before minor gynecologic procedures [47]. Similar to this study, Dutucu, Ozdilek and Bektas discovered that watching a relaxation video using VRG during mammography reduced discomfort but not anxiety [48].

In the current study, the women's anxiety before an IUI operation can be regarded typical [49]. According to the results of the current study, using VRG and listening to nature sounds was more helpful than TT alone in reducing pain in women undergoing IUI. The use of both TT and VRG in the study is crucial in terms of contributing to the literature and demonstrating how midwives and nurses can gain from different techniques for reducing pain and anxiety. One of these techniques has been around for a while, while the other is now being incorporated into holistic care thanks to recent technological advancements.

Limitations

We carried out the study in one hospital only and the sample of the study only included women; the findings cannot be generalized to the general public. The results reported in the present study are to be used to inform about practices only in this study area. The results may be irrelevant to the women in the general population of Turkiye.

Another limitation of this study was that it was a single-blind, randomized controlled trial. In other words, women participating in the study were blinded to the training offered. The study was designed as a single-blind because researchers performed VRG and TT application.

In addition, women's family environment such as family support, psychological conditions, cultural conditions, social support and other confounding factors were not known and they may have influenced the results of the study.

Despite all these limitations, there are strengths of the research. This was a single-blind, randomized, controlled trial in which VRG and TT gave both acceptable and feasible results.

Conclusions

The results of the current study, the majority of the women who underwent IUI had no substantial health issues, were having the treatment for the first time, and were aware about the technique. TT had no effect on pain and anxiety levels but increased the level of satisfaction, while VRG accompanied by nature sounds reduced the perception of pain, had no effect on anxiety level, but increased satisfaction. It was determined that using VRG reduced pain more effectively than the use of TT alone. In clinical procedures and outpatient treatments, particularly painful procedures in women, it may be helpful to use VRG. It is clear that VR technology is advancing quickly, particularly in the healthcare industry. It is anticipated that VRG will compete with other evidence-based healthcare strategies for use in pain management.

During invasive procedures like IUI, nurses and midwives can manage women's pain without the use of drugs, and they can use technological tools like VRG to help women shift their focus and feel less pain. For patients, using TT in treatment is a humane and relaxing method. There are tremendous therapeutic benefits when nurses and midwives employ effective contact with patients to lower the incidence of negative feelings. It can also be recommended that nurses' and midwives' understanding of TT be improved. The impact of TT should be covered in hospital in-service training programs and it should be incorporated into the nursing curriculum.

Supplementary information

The online version contains supplementary material available at https://doi.org/10.1186/s12884-025-07435-0.

Supplementary Material 1

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Author contributions
S.B. and E.K. conceived the study and initiated the study design. All authors were involved in the design and writing of the research protocol from different perspectives. S.B., N.K. and E.K. are responsible for writing the research proposal; S.B. and N.K. are responsible for subject consent and recruitment; S.B. is responsible for therapeutic touch application; D.G. is responsible for intrauterine insemination; S.B. are responsible for statistical data analysis. All authors have read and approved the final draft.

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Data availability
The dataset used in the present study is available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate
The trial will be conducted in accordance with the requirements of the Declaration of Helsinki. The whole project has been approved by the Clinical Research Ethics Committee of the Ondokuz Mayıs University (Approval Number: 2021/350, number: B.30.2.ODM.Ü.20.08/464) and the study was registered at the Clinical Trials.gov website under the code NCT05192330. The first trial registration date was (12/01/2022). Before randomization, patients are required to sign an informed consent form. Subject's personal information is confidential, participation in the study is entirely voluntary, with the right to withdraw at any time during any study phase.

Consent for publication
Not applicable.

Competing interests
The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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