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Effect of Virtual Reality versus Effleurage Massage on Shoulder Pain, Anxiety, and Satisfaction of Women Undergoing Gynecological Laparoscopic Operation

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Abstract

Background: Shoulder pain and anxiety are common in women undergoing gynecological laparoscopic operations, the effects of virtual reality treatment and effleurage massage on managing these issues and patient satisfaction remain underexplored. **Aim:** Assess the effect of virtual reality (VR) versus effleurage massage on shoulder pain, anxiety, and satisfaction in women undergoing gynecological laparoscopic operations. **Design:** A quasi-experimental design was adopted. **Sample:** 80 women undergoing for gynecological laparoscopic operations, equally divided into a VR group (40) and an effleurage massage group (40) were recruiting. **Setting**: This study was conducted at the Menoufia University Hospital, Obstetrics and Gynecology Department. **Tools:** Four tools were used.1) Structured interviewing questionnaire; 2) Visual Analog Scale; 3) Anxiety Rating Scale; 4) Modified Maternal Satisfaction Questionnaire. **Results**: there was a notable reduction in pain for the massage group with mean pain score for women in the massage group after the intervention was 2.30 ± 3.85, while in the VR group**,** was 4.40 ± 2.33, A highly significant difference was observed $p \leq 0.001$. The massage therapy group showed better improvement experienced a decrease in anxiety levels compared to the VR treatment group. Women experienced greater satisfaction in the massage group achieving an average score of 10.5 points whereas women in the VR group scored only 8.45 points. **Conclusion:** Effleurage massage was more effective regarding pain relief, anxiety reduction, and higher women's satisfaction compared to VR for women undergoing gynecological laparoscopic operation. **Recommendation:** Effleurage massage and VR should be integrated in nursing management for shoulder pain, and anxiety reduction post-gynecological laparoscopic operations.

Keywords: ***Anxiety, Effleurage Massage, Gynecological Laparoscopic Operation, Satisfaction, Shoulder Pain & Virtual Reality.***

Introduction

Numerous gynecological conditions can be diagnosed and treated with gynecological laparoscopy, a minimally invasive surgical technique (**Chuan, et al, 2021**). The majority of laparoscopic procedures in gynecology are performed electively for benign conditions, and they have several advantages over open surgery, including faster recovery, shorter hospital stays, lower morbidity, and better cosmetic benefits (**Chen, et al, 2024**). Gynecological laparoscopy is preferred for both diagnostic and therapeutic procedures of the pelvis and abdomen; it is less invasive, has less pain, and requires fewer postoperative analgesics than open surgeries. The majority of laparoscopic procedures in gynecology are elective for benign conditions (**Mohamed, et al, 2022**).

Many patients complain of post-operative discomfort, even though laparoscopic surgery improves patient satisfaction (**Kumar, 2023**). Nearly two-thirds of laparoscopic procedures are reported to cause shoulder pain related to irritation of the phrenic nerve, primarily to the patient's right side. According to **Chaichian, et al, (2018**), patients may become dissatisfied if they experience severe shoulder pain after surgery. In addition to patient demographics, comorbidities, and disease, patient satisfaction is a complicated concept that is heavily influenced by the expectations, knowledge, and attitude of the patient toward the surgery. All pertinent events and procedures related to the provision of healthcare might be considered to be included in this wide definition (**Johnson, 2019**).

Improving patient comfort, lowering the need for analgesics, and encouraging early ambulation and recovery all depend on properly managing postoperative shoulder pain (**Köse Tamer & Sucu Dağ, 2020**). The phrenic nerve, which shares sensory innervation with the shoulder region, and the diaphragm are frequently irritated, which is the cause

of this shoulder pain. Post-gynecological laparoscopic patients frequently complain of shoulder pain, which can have a major negative influence on their quality of life, anxiety, and general satisfaction with the surgical procedure (**Zerkle & Gates, 2020**).

Virtual reality (VR) is a non-pharmacological therapy and distraction technique to improve mood. By allowing users to interact with stimuli in a virtual world that replicates a real-life situation, this technology lessens discomfort, and anxiety and improves patient satisfaction by using a method that is computer-simulated and generates a visual image with accompanying audio while the user wears a headset linked to a computer or a smartphone (**Kwon, Kwon, et al,2022** & **Deo et al., 2021**).

Conversely, effleurage massage is a manual therapy method that is frequently utilized for relaxation and pain relief. To increase blood circulation, ease tense muscles, and trigger a relaxation reaction, it entails softly stroking and gliding motions over the skin. Effleurage massage is frequently employed in a variety of healthcare settings, including postoperative care, and has been demonstrated to provide analgesic effects (**Sholihah & Azizah, 2020**). Effleurage massage has a significant effect, which is the reduction of pain by activating the neural-gating mechanism in the spinal cord, as proposed by the gate control theory in neurology. Additionally, it has been found to raise serotonin levels, a neurotransmitter that plays a significant role in pain reduction and improving the quality of recovery (**Ibrahim & Ali, 2020**).

Nurses serve as critical figures in postoperative shoulder pain management along with anxiety control and satisfaction improvements for women undergoing gynecological laparoscopic surgeries. Nurses deliver non-pharmacological strategies to patients by applying techniques including effleurage massage and virtual reality (VR) therapy to achieve better results. Research results showed intraoperative use of VR therapy works as an effective nursing approach to maintain patient satisfaction and control vital signs within surgeries with spinal anesthetic (**Sahin, & Basak, 2020; Wolla & Kelly, 2023**). Nurses who utilize these techniques enhance pain control along with decreased anxiety while delivering better patient satisfaction throughout the postoperative recovery period.

Despite increasing interest in non-pharmacological intervention for reducing pain and anxiety management during gynecological laparoscopic operations, experimental research comparing virtual reality(VR) to effleurage massage for pain and anxiety management during gynecological laparoscopic operations remains considerably scant. Research has mainly studied these techniques across a broad spectrum of surgeries without acknowledging their distinctive effect on shoulder pain and anxiety in addition to patient satisfaction in this patient group. Research shows that VR treatment succeed in decreasing immediate postoperative pain and exist about equating these findings to effleurage massage uses **(Wang et al, 2024).** The goal of this research is to fill the information gap through the investigation of these two therapeutic approaches.

Significance of the Study

The most unpleasant concern following a gynecological laparoscopic operation is shoulder-tip pain (STP). It can cause grave morbidity, late release, as well as readmission, and it affects up to 80% of women globally **(Kaloo, et al, 2019**). After an operation, 35% to 70% of patients in Egypt experience this pain. Opioids can produce negative side effects such as drowsiness, nausea, vomiting, and gastrointestinal ileus, despite their usefulness in masking pain **(Soliman Ahmed, & Ragab Mohamed, 2022).**

The research value stems from its investigation of new approaches toward postoperative pain and anxiety management that aim to improve the delivery of medical care. Patient recovery with lower satisfaction rates happens because shoulder pain and anxiety commonly persist after gynecologic laparoscopic surgery. The research team aims to establish important insights into effective non-invasive techniques that increase patient outcomes by evaluating virtual reality with effleurage massage procedures. The research findings will support standard nursing practices by providing alternative methods to improve comfort and total well-being among women undergoing gynecological laparoscopic operation Also, the research contributes to knowledge development regarding alternative pain treatments by conducting an assessment of virtual reality and effleurage massage effects in treating postoperative shoulder pain along with anxiety symptoms and patient satisfaction feedback. So, the current study aimed to assess the efficacy of virtual reality versus effleurage massage on the intensity of shoulder pain, anxiety levels, and women's satisfaction post-gynecological laparoscopic.

Aim of the Study

The study aimed to assess the effect of virtual reality versus effleurage massage on shoulder pain, anxiety, and satisfaction of women undergoing gynecological laparoscopic operations.

Specific objectives:

1. Compares virtual Reality applications alongside Effleurage Massage techniques for managing postoperative shoulder pain effects in women who underwent gynecological laparoscopic procedures.

2. Assesses the effects of both Effleurage Massage combined with Virtual Reality on anxiety levels during gynecological laparoscopic surgery for women.
3. Assess patient satisfaction with Virtual Reality and Effleurage Massage as pain and anxiety management interventions during the postoperative period.
4. Assess the correlation between patient satisfaction and the level of pain and anxiety relief

Research Hypotheses

H1: Women undergoing gynecological laparoscopic operation who receive virtual reality (VR) therapy will experience lower shoulder pain intensity, lower anxiety levels, and higher satisfaction compared to those who receive effleurage massage.

H2: Postoperative women with gynecological laparoscopic surgery who receive effleurage massage will experience lower shoulder pain intensity, lower anxiety levels, and higher satisfaction compared to those who receive virtual reality (VR) therapy.

Operational Definitions

Virtual Reality (VR): In this study, VR therapy involves the use of a VR headset and software designed to create a virtual environment where patients can interact and engage, aiming to divert their attention from postoperative pain and reduce anxiety.

Effleurage Massage: In this study, effleurage massage is performed by a trained nurse or therapist, applying light, rhythmic strokes to the patient's shoulders and upper back for a specified duration to alleviate shoulder pain and anxiety following a gynecological laparoscopic operation.

Gynecological Laparoscopic Operation: In this study, a gynecological laparoscopic operation includes procedures such as the removal of ovarian cysts, treatment of endometriosis, tubal ligation, and hysterectomy, performed using laparoscopic techniques.

Shoulder Pain: In this study, shoulder pain is measured using a standardized pain scale (e.g., Visual Analog Scale) to quantify the intensity of pain experienced by patients postoperatively, specifically in the shoulder area.

Anxiety: In this study, anxiety levels are assessed using a validated anxiety measurement tool (e.g., State-Trait Anxiety Inventory) to evaluate the degree of anxiety experienced by patients before and after undergoing gynecological laparoscopic operations.

Satisfaction: In this study, patient satisfaction is measured through a survey or questionnaire that assesses various aspects of the patient's experience, including pain management, overall care, and the effectiveness of interventions like VR therapy and effleurage massage

Subjects &Methods

Research Design:

A quasi-experimental, two-group pretest-posttest design: This design uses a non-randomized two-group pretest-posttest comparison for measuring outcomes before and after intervention (Kim **& Steiner, 2016).**

Setting:

The study was carried out at the obstetrics and gynecology department of University Hospital, in the Menoufia governorate. The University hospital was established in 1993. The bed capacity of the MUH is 700 beds. This divided into four buildings. Obstetrics and Gynecology department in the third level, which contains obstetrics surgeries and obstetrics department. The department consists of 3 sonography rooms, 8 inpatient rooms; the bed capacity of the department is 52 beds.

Sample

Eighty women who had undergone gynecological laparoscopic procedures were chosen as a purposive sample. The women were split equally into two groups:

There were 40 women in the virtual reality group and 40 women in the group receiving effleurage Massage. Women who are between the ages of 25 and 55 and who are willing to participate in the study within 24 hours following gynecological laparoscopic procedures are eligible to participate. Women who have a medical history of appendicitis, ovarian cyst rupture, pelvic inflammatory disease, or other medical conditions are excluded.

Sample Size

The Open Source Statistics for Public Health's Epi statistical tool was used to determine the sample size. A two-sided 95% confidence level, 80% power, a 1:1 sample size ratio (virtual reality group/effleurage massage group), and 5% of the unexposed group experiencing the result were among the assumptions. Eighty women getting post-gynecological laparoscopic procedures made up the entire sample size.

Tools for Data Collection

Tool (1) : Semi-Structured Interviewing Questionnaire: Developed by the researcher following a review of related literature **(Ibrahim & Ali, 2020)**, this tool is divided into two parts:

Part One: including socio-demographic data (age, marital status, education level, occupation, and current residence).

Part Two: including pain history after laparoscopy (Site and duration of pain, pain recurrence, factors that increase and decrease pain).

Tool (2): Visual Analogue Scale (VAS): it is a widely validated tool for measuring pain intensity, with scores ranging from 0 (no pain) to 10 (severe pain). Scores are categorized into levels of pain: 1-3 for mild, 4-6 for moderate, and 7-10 for severe pain. This scale is applied both pre- and post-intervention to assess changes in pain levels **(Hawker et al., 2011).** VAS has strong **construct validity and** demonstrates **high test-retest reliability (Bijur, Silver, & Gallagher, 2001).**

Tool (3): State-Trait Anxiety Inventory (STAI): Developed by Spielberger and colleagues, the STAI measures state anxiety (temporary) and trait anxiety (general). It consists of two subscales; 20-item each, with responses rated on a four-point Likert scale. Scores range from 20 to 80, with higher scores indicating higher anxiety levels. This tool is used to diagnose anxiety disorders, evaluate treatment outcomes, and explore anxiety's role in various conditions. The STAI demonstrates excellent construct validity because researchers find strong linkages between its scores and alternative anxiety measurements while showing excellent internal consistency being displayed through Cronbach's alpha scores between 0.86 and 0.95 across both state and trait subscales **(Spielberger, 1983).**

Tool (4): Modified Maternal Satisfaction Questionnaires: Constructed by the researcher to assess satisfaction with effleurage massage or virtual reality, this tool includes six questions rated as "Highly satisfied" (3 points), "Satisfied" (2 points), or "Unsatisfied" (1 point). The questionnaire gathers feedback on usability aspects, including ease of use, interest, immersive experience, comfort, discomfort, and the likelihood of recommending the technique to others.

Total satisfaction scores range from 6 to 18, with higher scores indicating greater satisfaction.

Validity: Five experts-three from the maternal and newborn health nursing departments and two from the obstetrics and gynecology departments—assessed the instruments' validity by evaluating their content and internal validity. The panel's assessment of the scale's sentence structure, content appropriateness, item sequence, and accuracy of item scoring and recording led to modification of the scale.

Reliability: Alpha Cronbach's coefficient was used to assess the internal consistency of the research tools' items. It was 0.82 for instrument 1, and, 0.742 for instrument 4.

Pilot study: To evaluate the research instruments and determine their viability and usefulness, a pilot study was conducted. Eight women, or 10% of the sample size, underwent gynecological laparoscopic procedures as part of this pilot study. The women were split equally between two groups: four women in the massage group and four in the virtual reality group. The purpose of the pilot study was to examine the instruments' efficacy and improve the study design

Ethical considerations: An official approval was obtained from the Research Ethics Committee in the Faculty of Nursing at Menoufia University, Ethical approval No.946 was obtained to conduct the proposed study. Then formal written consent was obtained from the women after informing them of the purpose and nature of the study. Women in this study are entirely voluntary; each woman has the option to accept or refuse participation in the study. After carefully reading the informed consent form, the study women signed it; the ethical considerations included explaining the goal and scope of the study; anonymity and confidentiality were ensured through data coding. Women had the right to withdraw from the study at any time, and the information.

Data collection procedure

Administrative design: Before starting the study, the directors of each study setting received an official letter from the faculty dean of nursing at Menoufia University asking for permission to perform the study. The goal of the study was explained in this letter to obtain consent and assistance for data collection.

Fieldwork: The fieldwork for this study was conducted from early September 2023 to the end of December 2023, with researchers working the attending shift from 8:00 AM to 2:00 PM, three days a week, at the study sites. Each woman provided informed consent to participate. The researchers introduced themselves to the physician and nursing staff at the University Hospital where one to three women who met the inclusion criteria were selected daily. To gain their cooperation, the researcher welcomed each participant, introduced herself, and explained the study's purpose.

Baseline assessment data

After providing consent from the women who met the **inclusion** criteria, researchers collected both sociodemographic and clinical data from women. Also, the first assessment including women's pain, anxiety, and satisfaction was measured immediately after recovery from anesthesia and before any intervention using tools 2, 3, and 4. The assessment process for pain lasted approximately five minutes but assessing both anxiety and maternal satisfaction required about fifteen minutes.

Intervention phase

The researchers implemented a systematic data collection method for the Virtual Reality and effleurage massage group to properly assess the pain levels anxiety and satisfaction of women who underwent laparoscopic gynecological surgery. A total of 80 women were assigned to either Group 1 (Virtual Reality Group) of 40 women receiving

virtual reality treatment or Group 2 (Effleurage Massage Group) of 40 women receiving shoulder massage therapy. The research investigator applied the intervention to both groups exactly four hours following surgery.

The researchers applied the intervention to both groups at a four-hour postoperative based on various clinical and practical aspects. Most patients reached the post-anesthesia recovery phase at this moment which ensured cognitive awareness and precise perception of both pain and anxiety. The stabilization of postoperative pain occurs during the initial few hours which makes this period suitable for introducing non-pharmacological interventions without affecting immediate post-anesthesia procedures. The patients attained medical stability alongside the completion of basic postoperative checks at four hours' post-procedure which minimized potential complications during intervention participation. The specific time choice allowed patients to be awake enough for maximum benefit from either virtual reality experience or effleurage massage participation. The application of the intervention at the four-hour time point provided enough hospital time to evaluate its performance before reaching discharge.

The Virtual Reality Group received their intervention in a step-by-step manner. The setup process for the VR system started with installing all elements including headset components based on manufacturer instructions to maintain operational excellence. The researcher picked a VR program that provided visually enriching pain management combined with relaxation features. The researcher positioned each patient for comfort while also supporting the shoulder to prevent discomfort before properly adjusting the straps holding the VR headset in place. A crash course with an explanation was delivered to explain interaction methods as well as session goals.

The participants moved into the virtual world through the VR application before being directed to interact with the realistic digital environment. The VR session relied on its ability to distract and relax users as an approach to minimize the focus on unpleasant sensations. The length of each session depended on how the participant felt and became progressively longer according to their comfort with the technique. The researcher regularly monitored participants' condition while sessions ran to ensure their well-being and supplied any needed backup. The intervention within the Virtual Reality Group required between one to three sessions based on patient comfort and pain severity. The first session started four hours after surgery and took between 20 to 30 minutes to complete. Further sessions were given to patients with persistent pain or discomfort during their hospital stay with a maximum number of three sessions allowed. The flexible treatment model allowed medical staff to provide suitable pain control and relaxation techniques to patients before their hospital release.

The Effleurage Massage Group therapy included multiple massage sessions delivered to patients within their hospital stay based on their individual needs. Immediately after surgery the first massage took place at four hours and maintained a 10-minute duration for each treatment. The designed protocol aimed to achieve relaxation while reducing shoulder pain by following specific movements. Previous to the massage the patient received suitable positioning whether sitting or lying down while the therapist applied hand lotion to create clear skin-to-skin contact. The therapeutic massage started with relaxing strokes which promoted blood circulation and then shifted to effleurage movements that extended from the neck to the shoulder joint region. Circular motions were used with palms to give attention to tense areas in combination with the stripping technique which delivered controlled pressure for deep muscle tension release. Massage techniques were adjusted based on the patient's responses about pain levels and discomfort. The session duration increased step by step until the patient exhibited better tolerance to treatment. Each patient at the hospital could receive one or more massage sessions including a required four-hour session followed by more sessions for improving their pain condition. Each massage intervention required an assessment of shoulder pain to monitor treatment effectiveness in the patient.

Evaluation phase:

The women's pain, anxiety, and satisfaction were remeasured immediately after the end of the intervention before the patient was discharged from the hospital (approximately 6 hours after surgery).

Statistical analysis:

Data analysis was conducted using the IBM SPSS software package, version 23.0 (Armonk, NY: IBM Corp). The researchers checked all data to avoid any discrepancies. Data were examined for coding and entry errors. The research employed the Chi-square test for demographic data analysis together with pain level and anxiety level but used an independent t-test to evaluate pre-post intervention mean pain scores. The analysis showed statistical significance with $p \leq 0.05$ (*), while $p \leq 0.001$ (**), indicated high statistical significance. The researchers applied the Pearson correlation to analyze patient satisfaction and pain levels in massage therapy and virtual reality groups.

Results:

Table (1): Demographic Characteristics of Women in The Massage and Virtual Reality Groups (N =80)

Demographic Characteristics	Massage Group(n=40)		VR Group(n=40)		X^2	P
	No.	%	No.	%		
Age						
Less than 30	30	75.0	31	77.5	2.835 ns	.242
30-39 years	4	10.0	7	17.5		
40 and above years	6	15.0	2	5.0		
Marital status						
Single	7	17.5	2	5.0	4.006 ns	.135
Married	33	82.5	37	92.5		
Widow	0	0	1	2.5		
Divorced	0	0	0	0		
Educational level						
Illiterate	0	0	1	2.5	2.533 ns	.469
Read and write	6	15.0	3	7.5		
Secondary education	16	40.0	14	35.0		
Faculty Education	18	45.0	22	55.0		
Occupation						
Housewife	32	80.0	30	75.0	.287 ns	.592
Working	8	20.0	10	25.0		
Place of residence						
Rural	14	35.0	15	37.5	.054 ns	.816
Urban	26	65.0	25	62.5		

NB: ns = not significant (p> 0.05)

Table (2): Pain History of Women in The Massage and Virtual Reality Groups (N =80)

Pain Data	Massage Group(n=40)		VR Group(n=40)		X^2	P
	No.	%	No.	%		
Post-operative pain after laparoscopic gynecological operation						
Yes	40	100.0	40	100.0	A	-
No	0	0	0	0		
Site of pain						
Right Shoulder	16	40.0	24	60.0	5.867 ns	.118
Left Shoulder	12	30.0	12	30.0		
Both	11	27.5	4	10.0		
Subtotal	1	2.5	0	0		
Duration of pain						
10 minutes	1	2.5	3	7.5	14.58 *	.001
15 minutes	12	30.0	27	67.5		
20 minutes	27	67.5	10	25.0		
Pain Recurrence						
Permanent	30	75.0	36	90	3.12 ns	.08
Intermediate	10	25.0	4	10		
Factors increase pain						
Walking	8	20.0	16	40.0	7.14*	.03
Movement	23	57.5	22	55.0		
Cough	9	22.5	2	5.0		
Factors decrease pain						
No	32	80.0	39	97.5	6.26*	.04
Warm Compresses	6	15.0	1	2.5		
Walking	2	5.0	0	0.0		

N.B: *a: No statistics are computed because the variable is a constant,*
ns = not significant (p> 0.05)
**= significant (p≤ 0.05),*
*** = highly significant (p≤ 0.001).*

Table (3): Mean Score of Pain for Women in Massage and VR Groups On Pre and Post-Intervention

The mean score of pain	Massage Group X ± SD	VR Group X ± SD	Independent t-test	p-value
Pain score				
Pre-intervention	6.65±2.09	7.30±2.22	1.35 ns	0.18
Post-intervention	2.30±3.85	4.40±2.33	2.95*	0.004**
Paired t-test	5.66**	8.60**		
p-value	0.00	0.00		

N.B: *ns = not significant (p> 0.05)* **= significant (p≤.0.05),* *** = highly significant (p≤.0.001).*

Table (4): Pain Level of Women in The Massage and Virtual Reality Groups during Pre and Post-Intervention (N =80)

Pain level	Massage Group(n=40)				$X^2$1 P1	VR Group(n=40)				$X^2$2 P2	$X^2$3 P3
	Pre-intervention		Post-intervention			Pre-intervention		Post-intervention			
	No.	%	No.	%		No.	%	No.	%		
No Pain	0	0.0	31	77.5		0	0.0	3	7.5		
Mild Pain	4	10.0	7	17.5	62.62**	4	10.0	23	57.5	31.92**	40.82**
Moderate Pain	18	45.0	2	5.0	0.00	13	32.5	11	27.5	0.00	0.00
Severe Pain	18	45.0	0	0.0		23	57.5	3	7.5		

N.B: *ns = not significant (p> 0.05)* **= significant (p≤.0.05),* *** = highly significant (p≤.0.001).*
X21&P1" comparison between pre & post-intervention for the massage group,
$X^2$2&P2 comparison between pre & post-intervention for the VR group,
$X^2$3&P3 comparison between post-intervention for massage & VR Group

Table (5): Anxiety Level of women in The Massage and Virtual Reality Groups during Pre and Post Intervention (N =80)

Anxiety level	Massage Group(n=40)				$X^2$1 P1	VR Group(n=40)				$X^2$2 P2	$X^2$3 P3
	Pre-intervention		Post-intervention			Pre-intervention		Post-intervention			
	No.	%	No.	%		No.	%	No.	%		
Mild anxiety	0	0.0	4	10.0	23.86**	0	0.0	12	30.0	29.49**	5.00**
Moderate anxiety	16	40	36	90.0	0.00	17	42.5	28	70.0	0.00	0.02
Severe anxiety	24	60	0	0.0		23	57.5	0	0.0		

N.B: *ns = not significant (p> 0.05)* **= significant (p≤.0.05),* *** = highly significant (p≤.0.001).*
X21&P1" comparison between pre &post intervention for massage group,
$X^2$2&P2 comparison between pre & post-intervention for a group,
$X^2$3&P3 comparison between post-intervention for massage & VR Group

Table (6): Pearson Correlation Between Satisfaction and Pain for Massage and VR Groups

Variables	Pain score			
	Massage group		VR Group	
	r	p. value	R	p. value
Total score of anxiety	0.221*	.04	0.07ns	0.53
Satisfaction score	0.04ns	0.80	-0.35*	0.02

N.B: *ns = not significant (p> 0.05)* **= significant (p≤.0.05),* *** = highly significant (p≤.0.001).*

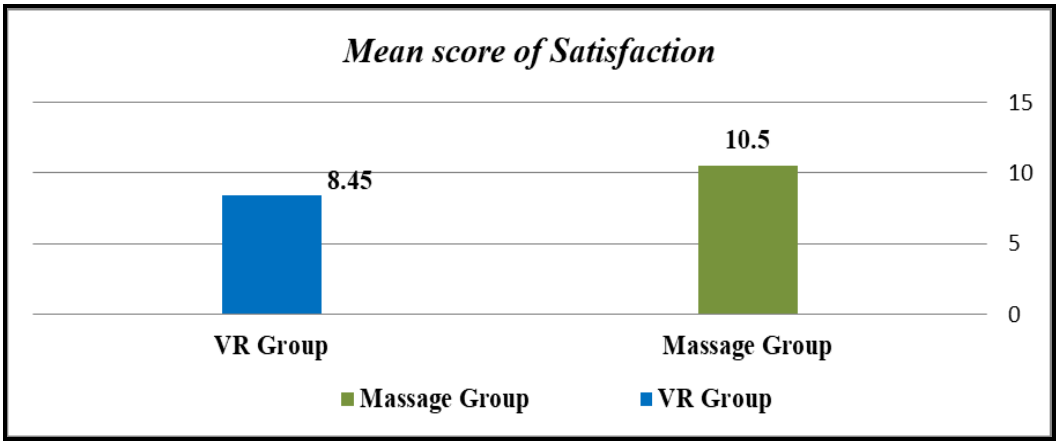

Figure (1): Mean score of Satisfaction among women in The Effleurage Massage and Virtual Reality Groups during post-intervention.

Table (1): shows the demographic characteristics of women in the massage and virtual reality groups respectively. As evidenced from that table, most of the studied women (75.0% & 77.5%) their age less than 30 years old and married (82.5% & 92.5%). Nearly half (45.0%) of the massage group and more than half (55.0%) of the VR group have faculty education, three quarters or more (80.0% & 75.50%) of both groups were housewives and nearly two-thirds (65.0% & 62.5%) of studied women coming from urban areas.

Table (2): Displays the pain history of women in the massage and virtual reality groups respectively. As evidenced from that table, all studied women (100%) suffer from pain, two-fifths three-fifths of the studied women (40% &60%) in both groups have pain in the right shoulder. Regarding the duration of pain, more three-fifths of the women (67.5%) in the massage group had pain for 20 minutes, and more three-fifths of the women (67.5%) in the VR group for 15 minutes. Also, the majority of the massage group and virtual reality group respectively (75.0% & 90.0%) have permanent pain. More than half (57.5% & 55.0%) of both (massage and virtual reality) groups revealed that movement was the main factor for increasing pain. The majority of both groups revealed that no factor can decrease their pain pre-intervention.

Table (3): The data in the table depicts the pain scores of women who received massage treatment and virtual reality interventions across two measurement points. The evaluation showed the massage and VR groups did not display different pain measurement results before the intervention started. A highly significant difference emerged between the two groups during the post-intervention assessment phase. After intervention, the women in the massage group recorded a mean pain score of 2.30 ± 3.85 but the VR group showed a higher mean score of 4.40 ± 2.33 indicating stronger pain relief in the massage group.

Table (4): Shows the pain level of women in the massage and virtual reality groups during pre and post-intervention. As evidenced by that table, there were highly statistically significant differences pre and post-intervention between both groups, nearly half (45.0%) of the massage group had moderate and severe pain score levels pre-intervention but post-intervention more than three quarters (77.5%) hadn't any pain level. More than half (57.5%) of the VR group had severe pain score levels pre-intervention but post-intervention more than half (57.5%) had mild pain levels. These results show that massage proved more successful for pain removal compared to virtual reality since VR only managed to decrease pain intensity rather than eliminate it.

Table (5): Displays the anxiety level of women in the massage and virtual reality groups during pre and post-intervention. As evidenced by that table, there were highly statistically significant differences pre and post-intervention between both groups. Three fifth (60%) of the massage group has severe anxiety score levels pre-intervention but in post-intervention, the majority (90%) have moderate anxiety levels. More than half (57.5%) of the VR group had severe anxiety score levels pre-intervention but post-intervention less than three-quarters (70%) had moderate anxiety levels. These findings indicate that massage was more effective in reducing anxiety severity than VR.

Table (6): Shows a correlation between the total score of anxiety and pain& satisfaction for massage and VR groups. As evidenced by that table, there was a statistically significance positive correlation between pain score and anxiety in the massage group but VR group there was no statistically significance correlation. There was no statistically significance

correlation between pain score and anxiety in the VR group and there was a statistically significance negative correlation between satisfaction score and pain in the VR group.

Figure (1): Illustrates the mean score of satisfaction for women in the massage and virtual reality groups during post-intervention. The mean score of satisfaction for women in the Massage group was 10.5 while the VR group was 8.45 which means the massage group was more satisfied than the VR group.

Discussion

Laparoscopy is a common procedure for gynecological patients and has been demonstrated to be more effective than laparotomy in reducing postoperative pain scores, but shoulder pain following laparoscopic surgery is still a major issue (**Li, et al., 2023; Li & Li, 2021; Zeeni et al., 2020**).

As a result, non-pharmacological methods like massage therapy have been proposed for managing pain in a variety of conditions, and immersive virtual reality (VR) technology has emerged as a potential tool to divert patients and alter their perception of pain. The need for safe, affordable, and effective analgesic treatment options has been accelerated in part by the emergence of an opiate epidemic in several countries linked to narrow safety profiles and dependence risk (**Nadeau, et al., 2021**).

Concerning post-operative pain after laparoscopic gynecological operation. The current research indicates laparoscopic gynecological surgery resulted in discomfort for all treated women after the surgery. The research results conform to the findings of **Malik et al. (2024). El-Naser, et al., (2022)** indicated laparoscopic surgeries stand as one of the principal surgical procedures that cause moderate to severe pain during the initial 24-hour postsurgical period. (**Choi, et al., 2023)** reported that patients recorded moderate amounts of pain following surgery during their research on music therapy's impact on recovery and postoperative pain after gynecological laparoscopy in Korean medical settings. The surgical procedure itself seems to cause this unpleasant sensation.

About the site of pain, this finding is consistent with a study conducted in China by **Niyonkuru et al. (2023)** on "Complementary Approaches to Postoperative Pain Management' which found that the majority of women in both groups experienced pain in their right shoulder following surgery. This could be because insufflated carbon dioxide irritates the phrenic nerve.

This result comes in disagreement with **Ibrahim & Ali (2020)**, who discovered that studied women stated pain in both shoulders. While in a study done by, **El-Naser, et al., (2022)** who stated that nearly half of the studied group had pain in both shoulders after a laparoscopic surgery. Nevertheless, there are different strategies were advocated to drain CO2 later post-gynecological laparoscopic surgery. Moreover, **El-Naser, et al., (2022)** stated the majority of the effleurage massage group had pain in the left shoulder. This could be due to stretching of the shoulders, which is constrained by many muscles and ligaments.

As regards the duration of pain, the massage group had pain for 20 minutes and the VR group for 15 minutes. This result corresponds with **El-Naser, et al., (2022)** who indicated the duration of pain in the massage group was 15 minutes. **Regarding pain recurrence**, the majority of the massage group and virtual reality Group have permanent pain. This result supports the findings of **Pedram, et al., (2023)** who studied "Toward the validation of VR-HMDs for medical education" in Australia and stated the effectiveness of VR as a tool to decrease pain. This result comes in agreement with **Niyonkuru, et al., (2023)** who stated the pain was permanent pain after massage. Additionally, **El-Naser, et al., (2022)** stated permanent pain. The two methods offer short-term alleviation of shoulder pain.

Regarding Factors that increase pain, more than half of both groups revealed that movement was the main factor for increasing pain. This result comes in agreement with **Pedram, et al., (2023)** who listed the same result. This result comes in dissimilarity with **El-Naser, et al., (2022)** who indicated cough was the main factor for increasing pain. This could be due to the presence of carbon dioxide.

Regarding Factors that decrease pain, the majority of both groups revealed that no factor can decrease pain in their pain pre-intervention. This result is by **Niyonkuru, et al., (2023) & El-Naser, et al., (2022)** who stated that pharmacological intervention is not enough to stop the pain. This could be due to the presence of carbon dioxide which is thought to be the major cause.

Regarding the mean score of pain for women in massage and VR groups on pre and post-intervention. The massage and VR treatment groups demonstrated decreased pain scores yet the massage group demonstrated increased reductions compared to the VR group results. Studies by **Malik et al. (2024)** demonstrated VR applications resulted in pain reduction while **Niyonkuru et al. (2023)** detected a post-massage pain score of 1.9. The effectiveness of massage and VR serve as non-pharmacological pain-relief methods since they demonstrated results in the study.

Regarding the pain level of women in the massage group during pre and post-intervention. There were highly statistically significant differences pre and

post-intervention between both groups, more than half of the massage group had moderate and severe pain score levels pre-intervention but post-intervention more than three-quarters hadn't any pain level. This result aligns with **Niyonkuru, et al., (2023**) **& El-Naser, et al., (2022)** who stated the pain level decreased post-intervention from severe pain to mild pain and no pain. This may be due to the effectiveness of non-pharmacological interventions to decrease pain.

More than half of the VR group has severe pain score levels pre-intervention but post-intervention more than half has mild pain levels. This result aligns with **Malik, et al., (2024)** who stated the pain score decreased post-intervention from severe to mild. Additionally, **Wang, et al., (2024)** studied "Virtual reality exposure reduce acute postoperative pain in female patients undergoing laparoscopic gynecology surgery: A Randomized Control Trial (RCT) study" in China and stated that the effectiveness of VR in decreasing pain. This may be due to the use of VR as a non-pharmacological intervention helping to distract the patient thus decreasing the pain.

Regarding the anxiety level of patients in the massage and virtual reality groups during pre and post-intervention. There were highly statistically significant differences pre and post-intervention between both groups. More than half of the massage group has severe anxiety score levels pre-intervention but post-intervention the majority have moderate anxiety levels. This result corresponds with **El-Naser, et al., (2022)** who stated a decrease in women's anxiety post-intervention. **Hassan, et al., (2023)** stated effleurage massage is extra safe, economical, and easy, and decreases pain as well as anxiety in a safe way resulting in an early passage of CO2 gas, fewer hospital stays, and minimal pain score and complications, with less cost to hospitals (**Ibrahim & Ali, 2020**; **Türkmen & TunaOranb, 2021**). This could be due to effleurage massage results in an early passage of CO2 gas minimizing anxiety levels.

More than half of the VR group had severe anxiety score levels pre-intervention but post-intervention nearly three-quarters have moderate anxiety levels. This result matches with **Baytar, & Bollucuoğlu (2024)** who studied the "Effect of virtual reality on preoperative anxiety in patients undergoing septorhinoplasty" in Brazil and **Wang, et al., (2024)** who found anxiety levels decreased post-intervention than pre-intervention. This could be due to the use of VR distracting the patient thus decreasing anxiety level.

Regarding the mean score of satisfaction for women in the massage and VR groups during post-intervention. The mean score of satisfaction for patients in the Massage group was 10.5 while the VR group was 8.45. that means the massage group was more satisfied than the VR group. This result does not align wit**h Malik, et al., (2024)** who stated that VR technology was found to have a high satisfaction rate in patients undergoing laparoscopic abdominal surgeries. **Regarding the correlation between the total score of anxiety and pain& satisfaction for massage and VR groups**. The present study revealed that there was no statistically significance correlation between pain score and anxiety in the VR group. This results in disagreement with **Baytar & Bollucuoğlu (2024)** who found a statistically significance positive correlation between pain score and anxiety. Additionally, **Niyonkuru, et al., (2023)** found a positive correlation between pain and anxiety.

In VR groups, the current study found a statistically significant negative correlation between pain and satisfaction scores. This finding is consistent with that of **Malik et al. (2024)**, who reported a statistically significant negative connection between patient satisfaction and pain scores following VR application. Additionally, this result supports the findings of **Niyonkuru et al. (2023)**, who found a negative association between contentment and discomfort.

Conclusion:

Effleurage massage was more effective regarding pain relief, anxiety reduction, and higher women's satisfaction compared to Virtual Reality technique women undergoing gynecological laparoscopic operation, with significantly higher improvement rates across all outcomes.

Recommendations

- Integrating virtual reality (VR) therapy and effleurage massage as non-pharmacological management of shoulder pain and anxiety management into standard postoperative care protocols for gynecological laparoscopic operations.
- Updated the nursing education curriculum to include non-pharmacological management of shoulder pain after laparoscopic operation.
- Conduct further research to discover the long-term effects of VR therapy and effleurage massage on postoperative pain, anxiety, and satisfaction in other larger sample sizes and diverse patient populations.

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