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Jacobson's Relaxation Technique on Post Cesarean Section Pain, Sleep Quality and Physical Activities: An Intervention Study

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Abstract
The most annoying complaints from women after Caesarean sections are pain, sleep difficulties and a restriction on physical activity. A possible treatment for these complaints is Jacobson's progressive muscle relaxation (JPRT). This study **aimed** to evaluate the effect of Jacobson's relaxation technique on post cesarean section pain, sleep quality and physical activities. **Design:** a randomized controlled clinical trial. **Methods:** A convenience sample of 120 women undergoing CS from the maternity facility at Zagazig University Hospitals, Sharkia Governorate, Egypt, was selected, with 60 being placed in the intervention group and 60 being recruited for the control group. **Tools:** Structured interview schedule, Visual Analogue Scale (VAS), Physical Activities Limitation Questionnaire, and Groningen Sleep Quality Scale were the four instruments utilized to gather the data. **Results:** Jacobson's relaxation technique greatly reduced level of pain among intervention group compared to the control group. On the first day, 48.3% of participants in the intervention group had uncontrolled severe pain, compared to 55.0% in the control group; on the second day, it was 21.7% vs. 46.7%; and on the third day, it was 15.0% vs. 45.0%. These variations have statistically significant differences. The mean score after JPRT intervention was 10.5±2 versus 11.4±1.4 on the second day and on the third day was 6.6±3.8 versus 11.3±1.3, respectively, with a highly statistically significant difference between them. (p=0.001). A statistically significant difference in the physical activity limitation score among the intervention group (P=0.0001), with the severe physical activity limitation considerably absent from the entire intervention group on the third day following the intervention. **Conclusion:** It was clear that Jacobson's relaxation technique is a helpful and secure strategy that reduces pain intensity, enhances sleep quality and lower physical activities limitation in post-cesarean mothers. **Recommendation:** incorporating Jacobson's relaxation method into the nursing care program for women who have undergone caesarean sections.

Keywords: Jacobson's technique, Cesarean section, Pain, Sleep quality & Physical activity

Introduction:
A Cesarean section (CS) can save a life when performed in a timely manner to prevent dystocia or additional issues **(Chen et al., 2020).** By making an incision after the end of the 28th week, the fetus is removed from the abdomen and uterine walls during a caesarean section. The CS is the most widely used surgical procedure worldwide. Managing postoperative pain remains difficult, particularly in the setting of improved postoperative recovery **(Jufri et al., 2019)**.

According to a recent study by the World Health Organization (WHO), the number of CSs continues to increase internationally, encompassing more than one (21%) in every five infants. By 2030, this percentage is expected to account for nearly one-third (29%) of all births, with the trend expected to continue. Egypt has the biggest percentage of CS among Arab nations, making about 52% of the total **(Mansour & Saadoon, 2022)**.

The high rate of caesarean sections as a method of overcoming labor difficulties is typically supported by a number of indicators. Premature birth, high-risk pregnancy, multiple pregnancies, pre-eclampsia & eclampsia, impending uterine rupture, large fetuses weighing more than 4000 grams, antepartum hemorrhage, breach location, and repeated caesarean sections are among the indications. The best course of action in reducing maternal and fetal morbidity is to have a caesarean section, however, there is a chance of difficulties for the mother, such as suture scar infection, bladder damage, blood vessel damage, blood clots, and long-term hazards such an elevated risk of placenta previa in a subsequent pregnancy. Due to pain, which needed to be properly managed before it worsened, was another issue that was observed in all patients following surgery **(Fitri et al., 2020)**.

Surgery typically poses a threat to the integrity of the body, particularly with regard to bio-psycho-spiritual concerns, and might cause discomfort like a pain reaction. Numerous negative effects, both immediate and long-term, are linked to experiencing pain **(Raj & Pillai, 2021)**. Cesarean section is now a surgical cut rather than a pain caused by physiology. Post-CS

is a painful phase that affects a specific area and is brought on by tissue damage as a result of inflammatory reactions following a traumatic surgery **(International Association for The Study of Pain, 2017)**.

Normal side effects for puerperal women include breast engorgement, postpartum depression, constipation, perineal pain, urine retention, weariness, and exhaustion. Incision discomfort, sleep issues, activity restrictions, gastrointestinal issues, and anesthetic complications are examples of physical issues. Anxiety, depression, losing control, and a distorted body image are examples of psychological issues **(WHO, 2013 & Ismail & Elgzar, 2018)**.

Chronic postoperative pain is a result of post-cesarean pain, which interferes with everyday functioning. It also makes it difficult to maintain proper breastfeeding posture, care for a newborn, take care of oneself, and perform daily tasks like sitting, standing, walking, and performing personal hygiene. All post-Cs mothers report experiencing problems with their sleep patterns, both in terms of quantity and quality. Anxiety, postoperative discomfort and wound pain were all linked to sleep disruptions. In order to cope with the new daily routines and duties of breastfeeding, new mothers frequently forego sleep during postpartum period **(Creti et al., 2017)**.

Nursing care for women after C-sections is complicated and requires specialized tailoring to match each of the minor discomforts. However, it can be said that the three nursing interventions that are most crucial after Cs are pain control, activity restriction, and sleep disturbance management. If these discomforts are treated effectively, they will have a favorable effect on all the other issues. Since these three discomforts actually relate to one another like the three heads of a triangle, better sleep will result from efficient pain management. Additionally, if activity limitations are reduced as a result of pain management, the mother's rate of independence will increase. Due to the correlation between pain, sleeping, and activity level, if pain is enhanced, sleep disruptions are also accelerated, and activity limitation is elevated (**Ismail & Elgzar, 2018).**

To satisfy the requirements of mothers after caesarean sections, maternity nurses play a crucial role. By assisting women by advocating for them, educating them about sleep issues, providing JPRT techniques, and teaching them how to manage discomfort, nurses play the roles of both advocate and educator **(Villadiego & Baker, 2021)**.Numerous studies have shown that Benson's relaxation is effective in reducing post-operative pain **(Priya et al., 2017)**.

Recently, many pharmacological and non-pharmacological methods have been developed to address the issue of pain in women who have experienced significant post-CS pain. Relaxation is a suitable non-pharmacological method for reducing the intensity of pain. Indirectly relieving pain is one of the goals of relaxation, along with lowering bone and muscle tension, anxiety, and tension associated to the body. Additionally, it lowers the required dosage of analgesic medications, lowering therapeutic side effects **(Mohammadi et al., 2020; Raja & Pillai, 2021)**.

The Jacobson Progressive Relaxation Technique (JPRT) is a complementary and non-pharmacological treatment for the aforementioned postoperative discomfort, commonly known as progressively relaxing the muscles. With this treatment, patients will learn how to distinguish between a sensation of tension and a feeling of relaxation within a similar muscle region. Women will thus acquire a profound level of relaxation in all of their muscles and comprehend the advantages of this relaxation **(Ibrahim et al., 2021)**. Better sleep quality and quantity, pain reduction, painkiller usage reduction, and improved postoperative physical activities. In addition, JPRT is not location or time-specific. The therapeutic nurse–patient interaction is strengthened most significantly by JPRT **(Hasanpour-Dehkordi et al., 2019 & Harorani et al., 2019)**.

The study significance

Cesarean birth continues to be the most common abdominal operation despite efforts to lower the frequency of primary caesareans. Egypt has the third-highest rate of caesarean sections in the world (54%) **(Jadoon et al., 2020)**. The most prevalent issues in the early post-Cs phase are pain, sleep difficulties, and physical activity restrictions. Pharmacological interventions alone are typically used to treat them. It is necessary to use non-pharmacological techniques depend on reliable research findings to reduce post-C-section pain, enhance sleep quality, and increase physical activity **(Windartik, 2017)**. Non-pharmacological management is less expensive and comes with no side effects when compared to using pharmaceutical management **(Ogunkua & Duryea 2021**). Although JPRT is an important evidence-based clinical practice for reducing pain, enhancing sleep quality, and increasing activity tolerance in postoperative patients, there is not enough data to determine its impact on postoperative recovery in patients having caesarean sections in Egypt. Thus, the present research aims to evaluate the effect of JPRT on post cesarean section pain, sleep quality and physical activities among women undergoing CS.

Aim of the current study:

This study **aimed** to evaluate the effect of Jacobson relaxation technique on post cesarean section pain, Sleep quality and physical activities.

- To assess the level of pain experienced by women who had Caesarean sections in the control and intervention groups.
- To determine whether the JPRT approach reduces pain in women who have had caesarean sections.
- To assess the impact of JPRT technique on caesarean section women levels of physical activity and sleep quality.

Hypothesis:

The following research hypotheses were generated in order to meet the study's aim:

H1: Women with post-Cs who employ the JPRT approach experience less pain than those who do not.

H2: Post-Cs women who use the JPRT technique experience better sleep quality than those who do not.

H3: Post-Cs women who use the JPRT approach have fewer restrictions on their physical activity levels than those who do not.

The operational definition:

The Jacobson relaxation technique: This non-pharmacological pain management strategy, a type of therapy that involves engaging specific body muscle groups from the toes to the head to promote general body relaxation, was utilized in this study by post-cesarean section women (as deep breathing exercise, muscle contraction and relaxation).

Pain: Here, the term "pain" pertains to the discomfort a post-cesarean mother feels at the location of the operation.

Sleep quality: It relates to post-cesarean mothers' capacity to get enough hours of sleep each night.

Physical activity: Ability of a postpartum woman to sit in a chair, stand up, walk, do personal hygiene tasks, take a shower, nurse, eat, and use the bathroom

Subjects and Methods:

Study design: A randomized controlled clinical trial used to achieve the aim of this study.

Study setting:

In the postnatal department of the maternity hospital at Zagazig University Hospitals in Egypt's Sharkia Governorate, the study was carried out.

Sample Type*:*

120 women receiving Cs were chosen as a convenience sample

Sample Size:

The study sample was consisted from 120 women undergoing CS. The EpiInfo programme was used to estimate the sample size using the following parameters: Confidence level is 95% with power of study 80%, size effect 2. Sample size calculated to be 60 women in each group. According to Mansour and Saadon, (2022), percent of women with good sleep quality level in third day post cesarean section was 35.5% in control group. Percent of women' with good sleep quality level in third day post cesarean section was 74.2% post intervention relaxation program **.**

The randomization block technique was carried out by the researchers in six stages. First, the researchers created a list of numbers ranging from 1 to 120. Second, the researchers created little papers with numbers from 1 to 120. The paper pieces were then placed in a bowl after being folded by the researchers to cover the numbers written on them. Fourth, the 120 pieces of paper were randomly and blindly divided into six blocks, each of which contains 20 random numbers. Fifth, from each block, half of the numbers were chosen at random and without seeing them, and the remaining numbers were given to the control group. Sixth, the list of cases in order was recorded (using the terms JPRT or control). There were 60 women receiving JPRT in the intervention group (G1). There were 60 women in the control group (G2) who were receiving standard hospital treatment

Inclusion criteria:

Women between the ages of 20 and 35 who underwent elective Cs under spinal anesthesia and had healthy pregnancies, as well as those who took non-steroidal anti-inflammatory medications (NSAIDs) for the treatment of postoperative pain, were eligible to take part in the study.

Criteria for exclusion:

The study excluded women with intra- or post-operative problems, abusers, alcoholics, and those who drank more than three cups of coffee each day or used sleep aids.

Tools for collecting data:

Data was gathered using four tools.

Tool I: interviewing questionnaire:

It was created by the researchers to gather fundamental information. There are three sections to it. Socio-demographic information, including age, education level, occupation, place of residence at the time, and marital status, was included in the first section. The second portion discusses the history of the current pregnancy, which includes the gestational age at birth and the quantity of antenatal appointments. The third section covered analgesia, including the kind of analgesics used and their daily dosage.

Tool II: Visual analogue scale (VAS) which measures the intensity of pain:

It was adopted from Crichton (2001).The level of pain is indicated on a scale of 1 to 10, with 10 being the most painful. Where 0 means there is no pain, 1 to 3 means it is mild, 4 to 6 means it is moderate, and 7 to 9 means it is severe. Finally, a score of 10 denotes uncontrolled severe pain. The number that best reflected the women's perception of the intensity of her pain was asked to be chosen from a range of 10 numerical points.

Tool III: Physical activities limitation Questionnaire: (PALQ): The researchers created it to evaluate how much discomfort limits physical activity following Cs. It comprises of 8 tasks (lying in bed, getting out of bed, moving around, completing personal hygiene, bathing, nursing, eating, and using the restroom) that are graded as follows: 0 for easy performance, 1 for performance with problems, 2 for performance with assistance, and 3 for inability. The range of the total scores was 0 to 24. The following characteristics were assigned for women:

- 0–6 = No restriction on physical activity
- 7–12 = Moderate restriction of activity
- 13–18: Moderate restrictions on activity
- 19–24 = Severe physical activity limitations

Tool four: The Groningen Sleep Quality Scale: (GSQS)

It was created by **Meijman et al. in 1988** to evaluate the subjective sleep nature. It consists of 15 yes-or-no questions to assess the previous night's sleep quality. The score for the first question is not included. If the woman responded positively to questions 2, 3, 5, 6, 7, 9, 11, 14, and 15, she receives one point; if she responded negatively to questions 8, 10, and 12, she receives one point. The scale goes from 0 to 14. Lower subjective sleep quality is indicated by a lower score on the scale **(Meijman, 1988)**. If the woman's score fell between 0 and 4, fair quality of sleep was detected, and poor sleep quality was indicated by a score between 5 and 14.

Validity:

Three experts in "obstetrics and gynecological nursing" were assembled to ensure the legitimacy of the information. The revisions were driven by the panel's evaluation of the content's relevancy and sentence clarity.

Reliability:

Study tool	Cronbach's Alpha	No of Items
Quality of sleeping	0.476	14
Physical activities limitation	0.96	8

Ethical Considerations:

After receiving a formal correspondence from the faculty of nursing at Zagazig University and addressing it to the appropriate authority .with ethical code (ID/Zu.Nur.REC#:0025), the researchers were able to conduct the study with the head of the Obstetrics and Gynecology Department at the hospital affiliated with Zagazig University. This approval followed an explanation of the study's purpose and scientific background. The study participants provided written informed consent after being guaranteed of the confidentiality of their data and that the procedure would not damage them. The participants had the same freedom to leave at any time.

A pilot study:

Twelve post-cesarean women participated in a pilot research to assess the questions' clarity, applicability, and time requirements before the necessary revisions were made and the mothers were removed from the study population.

Fieldwork*:*

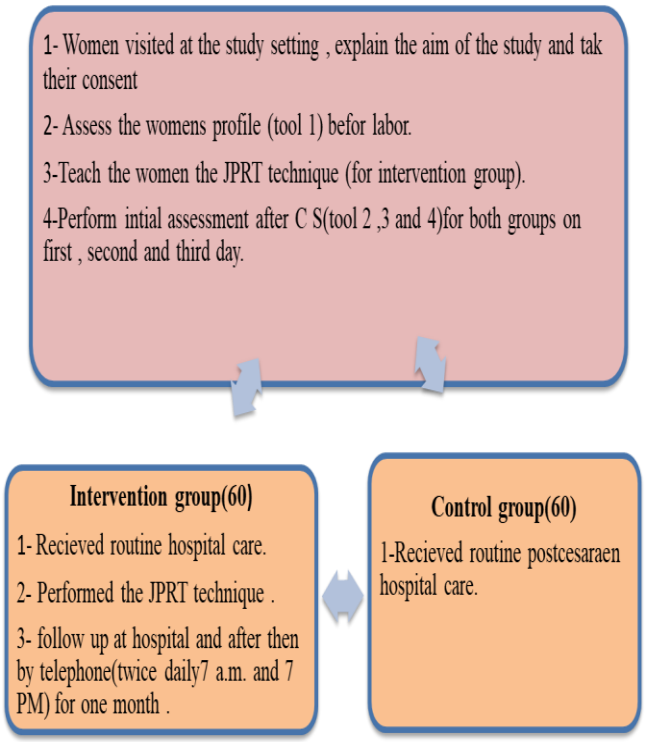

Figure (1): Flow chart of the study process.

The research's goal was accomplished using the preparatory, assessment, implementation, evaluation, and follow-up processes. The six-month period from the beginning of February 2023 to the end of July 2023 was used to carry out these phases.

1-Preparatory phase: After evaluating relevant material on several aspects of the research topic from both domestic and foreign sources. This improved the researchers' comprehension of the size and importance of the problems and provided instructions on how to create the necessary data-gathering tools. The first and third tools were created; the second and fourth tools were translated into Arabic and adopted from earlier related publications.

2-Assessment phase: on the day prior to the CS, before starting the interview, the researchers introduced themselves to each woman, explained the goal and scope of the study, took action, and got their mothers' blessing. Before implementing the training and educational guidelines, each woman was

questioned separately to gather women's baseline data and obstetric history using the study tool(I)from both group .While(tool II, tool III and tool IV) were carried out after women become conscious.

3-Implementation Phase: The trial lasted for a total of 24 weeks (3–4 mothers per day). On Saturday, Mondays, and Wednesdays from 11 AM to 5 PM, the researchers visited the place already mentioned. The moms were asked to practice Jacobson relaxation technique under their watch on the day of admission. The researchers explained and showed it as follows:

The patients in the intervention group were informed that the procedure calls for successive systemic tension in particular muscle groups. Take a long, deep breath in before holding it for 10 seconds. Then, while slowly exhaling for ten seconds, the tension is released. The twelve groups into which the body's muscles fall include the muscles in the hands, arms, shoulders, neck, mouth, jaw, eyes, and forehead as well as the muscles in the chest, abdomen, back, thighs, and feet. From the start of the JPRT session until its conclusion, the researchers assisted the patients in finding comfortable positions in their beds. One of the researchers demonstrated the JPRT approach in front of the patients during the training session and asked to do it again until they were comfortable with it. Following the collection of baseline data, on the second and third postoperative days, throughout the three shifts (morning, evening, and night), women were advised to use this relaxation method for 30 minutes each time, while being supervised by a researcher. Six JPRT sessions were completed, and 48 hours following the baseline evaluation, instruments were used to reassess the JPRT's pain, level of activity, and sleep quality. On the first postoperative day, baseline assessments of pain intensity, physical activity, and sleep quality were performed for both groups (tool II, tool III and tool IV). After the mother regained consciousness, it was carried out.

During the interview, the researcher used questions, discussion, and a variety of teaching techniques like group discussions, brainstorming, demonstrations, and repeated demonstrations. A power point presentation and many didactic tools, such as handout guidelines, were used.

An Arabic guidebook were given to each women about the Jacobson relaxation technique. Also it were given for all nurses in the postpartum ward.

4- Evaluation and follow up phase: Following the application of the intervention, the women were reviewed on the second and third postoperative days. A house visit or telephone call as a kind of follow-up (twice daily7 a.m. and 7 PM) until one month postpartum.

Statistical analysis

The 2015 release of IBM Corp. was used to gather, tabulate, and statistically analyse all data. Version 23.0 of IBM SPSS Statistic for Windows. IBM Corp., Armonk, NY. Qualitative data were expressed as number & (percentage), whereas quantitative data were expressed as mean SD & (range). Two groups of normally distributed variables were compared using the t test. Fridman' test was used to compare between repeated measure variable. Percent of categorical variables were compared using, Chi square. To determine the relationship between the various research variables, the Pearson's correlation coefficient or spearman correlation was determined. The (+) and (-) signs denote direct and inverse correlation, respectively. Numbers close to 1 denote a strong correlation, while numbers close to 0 denote a weak correlation. Every test had two sides. p-value < 0.05 was considered statistically significant, p-value ≥ 0.05 was considered statistically insignificant.

Results

Table (1): Demographic characteristics of studied women (n=60 each group):

Variables		Intervention group n.60		Control group n.60		χ 2	p-value
		No.	%	No.	%		
Age per years	Mean ±SD range	27.6±4.1 20-35		27.6±4.4 20-35		t 0.02	0.98
Residence	Rural	37	61.7	40	66.7	0.33	0.57
	urban	23	38.3	20	33.3		
Occupation	Housewife	50	83.3	47	78.3	0.48	0.49
	Employed	10	16.7	13	21.7		
Education	Illiterate	5	8.3	4	6.7	1.9	0.57
	Primary school	8	13.3	6	10.0		
	Secondary school	41	68.3	39	65.0		
	University	6	10.0	11	18.3		

t:test of significant, ***χ 2 :Chisquare test, p >0.05 no significant***

Table (2): Obstetrical history of studied women (n=60 each group):

Variables		Intervention group n.60		Control group n.60		χ 2	p-value
		No.	%	No.	%		
Antenatal visits	Less than 3	32	53.3	25	41.7	1.6	0.201
	Equal or more 3	28	46.7	35	58.3		
Number of abortion	0	19	31.7	17	28.3	1.4	0.69
	1	25	41.7	21	35.0		
	2	12	20.0	16	26.7		
	3	4	6.7	6	10.0		
Number of curettage	0	28	46.7	30	50.0	2.7	0.44
	1	25	41.7	26	43.3		
	2	7	11.7	3	5.0		
	3	0	.0	1	1.7		
Cause of CS	Maternal cause	38	63.3	41	68.3	0.33	0.56
	Fetal cause	22	36.7	19	31.7		
Analgesics	Ketolac injection	46	76.7	52	86.7	2	0.16
	Voltarin injection	14	23.3	8	13.3		
Number of doses	One	27	45.0	35	58.3	2.1	0.14
	Two	33	55.0	25	41.7		

Table (3): Visual analogue scale score in both groups throughout the study (n=60 each group):

Variables		Intervention group		Control group		χ 2	p-value
		No.	%	No.	%		
Visual analogue first day	4-6 moderate pain	6	10.0	4	6.7		
Before intervention	7-9 severe pain	25	41.7	23	38.3	0.74	0.64
	10 Uncontrolled severe pain	29	48.3	33	55.0		
Visual analogue Second day	4-6 moderate pain	16	26.7	6	10.0	10.5	0.006*
After intervention	7-9 severe pain	31	51.7	26	43.3		
	10 Uncontrolled severe pain	13	21.7	28	46.7		
Visual analogue third day	4-6 moderate pain	28	46.7	7	11.7	21.3	0.0001*
After intervention	7-9 severe pain	23	38.3	26	43.3		
	10 uncontrolled severe pain	9	15.0	27	45.0		
F	28.9	28.9		6.7			0.0001*
p	0.0001	0.0001		0.062			

*F: Friedman, χ 2 :Chisquare test, Test p>0.5: no significant, *p<0.05: significant*

Table (4): Post cesarean sleep quality in both groups (n=60 each group):

Variables		Intervention group		Control group		χ 2	p-value
		No.	%	No.	%		
Had a deep sleep first night	True	2	3.3	0	.0	f	0.5
(Before intervention)	False	58	96.7	60	100.0		
Had a deep sleep second night	True	11	18.3	3	5.0	5.2	0.023*
(After intervention)	False	49	81.7	57	95.0		
Had a deep sleep third night	True	17	28.3	2	3.3	14.1	0.0001*
(After intervention)	False	43	71.7	58	96.7		
F		14.2		3.5			
p		0.001*		0.17			

*F: Friedman, χ 2 :Chisquare test, Test p>0.5: no significant, *p<0.05: significant*

Table (5): Quality of sleep mean scores at study phases in both groups (n=60 each group):

Variables		Intervention group		Control group		χ 2	p-value
		No.	%	No.	%		
Quality of sleep of **first** day (before intervention)	Slightly distributed sleeping	6	10.0	7	11.7	0.087	0.77
	Considerable poor sleeping	54	90.0	53	88.3		
	Mean ±SD Range	11.5±1.3 7-12		11.4±1.3 7-12			
Quality of sleep of **second day** (after intervention)	Slightly distributed sleeping	24	40.0	8	13.3	10.9	0.001*
	Considerable poor sleeping	36	60.0	52	86.7		
	Mean ±SD Range	10.5±2 6-12		11.4±1.4 7-12			
Quality of sleep of **third day** (after intervention)	Normal refreshing sleeping	11	18.3	0	.0		
	Slightly distributed sleeping	30	50.0	10	16.7	29.6	0.0001*
	Considerable poor sleeping	19	31.7	50	83.3		
	Mean ±SD Range	6.6±3.8 1-12		11.3±1.3 7-12			
F p		64.9 0.0001		2 0.37			

*F: Friedman, χ 2 :Chisquare test, Test p>0.5: no significant, *p<0.05: significant*

Table (6): Physical activities limitation in both groups (n=60 each group):

Variables		Intervention group		Control group		χ 2	p-value
		No.	%	No.	%		
Physical activities limitation **first day** (before intervention)	Moderate limitation	34	56.7	35	58.3	0.034	0.85
	Severe limitation	26	43.3	25	41.7		
	Mean ±SD Range	19.3±3.4 16-24		19.3±3.4 16-24			
Physical activities limitation **second day** (after intervention)	Mild limitation	8	13.3	0	0.0		
	Moderate limitation	36	60.0	34	56.7	10	0.007*
	Severe limitation	16	26.7	26	33.3		
	Mean ±SD Range	17.1±4.7 7-24		19.2±3.5 13-24			
Physical activities limitation **third day** (after intervention)	Mild limitation	29	48.3	3	5.0	43.3	0.0001*
	Moderate limitation	31	51.7	34	53.3		
	Severe limitation	0	0.0	23	41.7		
	Mean ±SD Range	12.2±3.7 7-18		19.1±3.6 12-24			
F p		91.4 0.0001*		2.1 0.14			

*F: Friedman, χ 2 :Chisquare test, Test p>0.5: no significant, *p<0.05: significant*

Table (7): Correlation matrix between visual analogue scale, quality of sleeping and physical activities limitation throughout intervention program (n=60):

Variables		Intervention group			
		Visual analogue scale		Quality of sleeping	
		r	p	r	p
First day	Quality of sleeping	0.098	0.457		
	Physical activities limitation	0.087	0.507	0.27*	0.04
Second day	Quality of sleeping	0.305*	0.018		
	Physical activities limitation	0.25*	0.043	0.73**	0.0001
Third day	Quality of sleeping	0.159	0.226		
	Physical activities limitation	0.23*	0.046	0.179	0.171

(r) correlation coefficient *** Correlation is significant at the 0.01 level (2-tailed).*

** Correlation is significant at the 0.05 level (2-tailed).*

Table (1): Shows that there were no statistically significant differences in the overall general characteristics of the two groups (p>0.05). The mean age of the women in the study and control group was 27.6±4.1 and 27.6±4.4 years, respectively. As for women education, they mostly have secondary school education and most of them were housewives and rural dwellers. This indicates a match between the two groups.

Table (2): Reveals that, 53.3% in the intervention group and 41.7% in the control group had fewer than three antenatal visits. 41.7% in the intervention group had previously one abortion compared to 35.0% for the control group. Regarding the etiology of CS, 63.3% and 68.3%, respectively, in the study and control groups had CS attributable to maternal causes. As for analgesics, both groups of women frequently used ketolac injection. There were no statistically significant differences between the two groups in terms of prenatal visits, abortions, CS reasons or utilized analgesics.

Table (3): Highlights the efficacy of Jacobson's progressive muscle relaxation technique in reduction of post cesarean section pain on the intervention group. In the intervention group, uncontrolled severe pain was present on 48.3% on the first day compared to 55.0% in the control group, on the second day it was 21.7% vs. 46.7% and on the third day it was 15.0% vs. 45.0%, respectively. These differences were statistically significant.

According to Table 4, the post-cesarean sleep quality of the two groups was almost comparable before the intervention. The study group's sleep quality improved following JPRT intervention on the second and third days with a significant statistical difference (p=0.001).

Table (5): Reflects a highly statistically significant difference between the study and control group regarding post CS sleep quality. The first day's mean sleep quality was 11.5±1.3 and 11.4±1.3, with no noticeable significant difference (P=0.77). Meanwhile, the mean score after JPRT intervention was 10.5±2 versus 11.4±1.4 on the second day and on the third day was 6.6±3.8 versus 11.3±1.3, respectively, with a highly statistically significant difference between them.

Table (6): Reveals that, 43.3% and 41.7% of the study and control groups had severe limitation of physical activities prior the intervention no statistically significant difference (P = 0.85). The severe physical activity restriction significantly decreased among the study group after the intervention. Before and after the intervention, there was a statistically significant difference in the physical activity limitation score among the study group (P=0.0001). However, the same difference was not statistically significant (P=0.14) among the control group.

Table (7): Reflects a positive correlation between post CS pain and quality of sleeping among the studied women in the second day after intervention with no statistically significant difference. Additionally, there was a positive statistically significant correlation between post CS quality of sleeping and physical activities limitation among the studied women in the second day after intervention.

Discussion

The prevalence of CS has dramatically increased globally, especially in Egypt. With increasing the rate of CS, it is essential to develop quick, safe ways to enable the woman return to her regular life. This is achievable by reducing post-Cs pain, which will afterwards increase activity level and sleep quality. For that purpose, Jacobson's relaxation technique is thought to be a reliable and secure method **(Ibrahim et al., 2023)**.

The current findings of the present study found no statistically significant variations in the socio-demographic characteristics of the two groups. This was in line with **Ibrahim et al., (2023)** study in Egypt about effectiveness of applying relaxation technique on post cesarean section pain and sleep quality who showed that the two groups had a large percentage of

housewives who live in rural areas with no significant differences between the two groups which indicated that the two groups were similar.

The intervention group's post-cesarean pain was statistically considerably lower than the control group's on the second and third post-cesarean days, according to the current study's findings. This shown that Jacobson's relaxation technique is a suitable non-pharmacological way for lowering the severity of pain. One of the purposes of relaxation is to reduce bone and muscle strain, anxiety, and body tension. As a result, the women will reach a high level of relaxation across all of their muscles and recognize the positive effects of this relaxation. These results were consistent with **Ibrahim et al., (2023)** study which showed that the study group's VAS mean score was lower than the control group's following the intervention, with a highly statistically significant difference among both groups. Furthermore, the difference in VAS rating system averages between the study group before and after the intervention was statistically significant (P=0.001). A comparable outcome was observed by **Ibrahim et al., (2021)** study in Egypt who found that compared to the control group, the intervention group's mean pain levels declined considerably following JPRT.

Additionally, **Varghese, (2018)** study indicated that JPRT application was used to alleviate pain in their study participants. The decrease in average pain ratings among intervention group confirms the current study hypothesis, "Post-Cs women who use the JPRT method suffer from less pain than others who do not." The research findings specifically suggested that the use of JPRT is a beneficial strategy for decreasing post-CS pain in women in the study group.

The Jacobson relaxation technique emphasizes consistent main muscle groups in the body are relaxed with the goal of relaxing the body and mind while minimizing stress reaction and pain experience. The study findings were consistent with a study conducted in Indonesia by **Choirunissa & Ayuningtyas, (2022)** on the influence of the relaxation technique on pain severity in post-cesarean section mothers.

Similar findings were reported by **Soumya Raj & Pillai, (2021)** study who revealed a considerable difference between the pretest and the posttest pain in the intervention women. Such findings were in agreement with those of the Indonesian study by **Fitri et al., (2020)** about the influence of relaxation technique on the severity of pain following CS which revealed that the average post-cesarean section pain in the intervention group ranged from 6.13 to 1.784 before treatment. The difference in pain scores between the pre and post treatment periods was 3.131±1.078.

These results were, in turn, consistent with the study by **D'Souza & Miranda, (2020)**, they detected a statistically significant improvement in the experimental group, although the mean post-intervention pain score gradually declined at various time intervals in comparison to the control group. Furthermore, the effect of relaxation technique on post-cesarean pain management was researched by **Devmurari & Nagrale, (2018)**, which was found to be effective in reducing the pain level of post-cesarean women.

The current study's findings showed that Jacobson's relaxation technique intervention improved the sleep quality of the post-cesarean study group on the second and third days with a statistically significant difference (p=0.001). This finding may be explained by the possibility that Jacobson's relaxation technique improves the quality of sleep by ensuring muscular relaxation, promoting circulation, lowering blood pressure, and relaxing the body. Those exercises help the body and mind relax by assisting the transition to the parasympathetic nervous system **(Yona & Dahlia, 2020)**.These findings were consistent with the findings of **Mansour & Saadoon, (2022)** study who showed that the examined group experienced better sleep on the second and third days following relaxation technique intervention, with a statistically significant difference. In this respect, a study by **Aktaş & Topaloğlu, (2020)** study in Ankara which found that, on the second day following a caesarean section there was a slight improvement in women's sleep quality. Training in relaxation can enhance the quality of a mother's postpartum sleep and being aware of how inexpensive it is to learn and use, as well as the benefits of relaxing.

These accords with **Ibrahim et al., (2021)** study who found that JPRT can help individuals who are having gynecological surgery sleep better. These findings could be attributed to the JPRT technique's ability to increase sleep quality by relaxing the body, maintaining normal blood pressure, increasing blood circulation, and assuring muscular relaxation. Furthermore, using the JPRT approach aids the passage to the parasympathetic nervous system, enabling physical and mental relaxation. This was matched with **Harorani et al., (2019)** who revealed that JPRT is an efficient method of improving sleep quality. After the intervention, they discovered a considerable improvement in the study group's sleep quality scores.

The current study's findings indicate that, before the intervention, 43.3% and 41.7%, respectively, in study and control women had severe physical activity limitations. On the third day following the intervention, the entire study group showed a marked absence of the severe physical activity limitation with

difference was statistically significant (P=0.0001). This is supported by the **Ismail & Elgzar, (2018)** study which reported that prior the intervention, the majority of the study and control groups' levels of physical activity were severely restricted without any statistically significant differences. Following the intervention, the severe physical activity restriction was dramatically reduced in the study group, while it was significantly persistent in 70% of the control group.

In this respect, the results of **Ibrahim et al., (2021)** study indicated that compared to the control group, activity tolerance increased significantly in the intervention group following Jacobson's relaxation training. In general, if women are in pain, they will refrain from engaging in any physical exercise in order to minimize the discomfort. If JPRT help with pain management exercise tolerance will improve. So, incorporating JPRT into nursing care after surgery may eliminate the requirement for another strategy for relaxation.

JPRT is thought to provide extensive advantages for patients following surgery. It assists in the reduction of pain, stress, and anxiety, as well as the improvement of muscle oxygenation and the removal of oxidation. As a result, it should be integrated into post-operative nursing practices. It may be applied by nurses to reduce nursing exhaustion **(Silveira et al., 2020)**.

Conclusion

According to the current study's findings, it can be concluded that post C-section women who use Jacobson's Relaxation Technique have less post CS pain, improved sleep quality and less physical activity restriction than those who just received usual nursing care.

Recommendations

1. Jacobson's Relaxation Technique should be available to post-cesarean women whenever possible because it is simple, has no known adverse effects, and has a high level of acceptability.
2. All post-C-section women should get patient education on the Jacobson's Relaxation Technique approach helping with pain relief and improve sleep quality.
3. Replicating the study with an extensive probability population will allow the findings to be more broadly used in subsequent studies.

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