Effect of a Group of Merged Exercises on Primary Dysmenorrhea Symptoms among Nursing Students

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Abstract

Background: Dysmenorrhea is a very frequent problem since it negatively impacts both physical and emotional wellbeing and restricts daily activities that need effective treatments. **Aim:** assess the effect of a group of merged exercises on primary dysmenorrhea symptoms among nursing students. **Design:** A quasi-experimental research design was utilized. **Sample:** A purposive sample of 72 nursing students who enrolled in the professional midwifery course was included and was distributed into two groups (36 students in the control group, 36 students in the exercise group). **Setting:** This study was conducted at the maternity nursing lab at Faculty of Nursing - Mansoura University, Egypt. **Tools**: Four tools were used; A structured interviewing questionnaire, Visual Analogue Scale, Pittsburgh Sleep Quality Index and the Short- Form (SF) - 36 Health Survey questionnaires. **Results**: The intensity of lower back pain has decreased from 58.3% pre intervention to 5.6 % after initiating a group of merged exercises. The Pittsburgh sleep quality index total score was significantly reduced in the exercise group than in the control group after 8 weeks of performing exercises. Furthermore, the short form (SF)-36 total score was significantly improved in the exercise group than in the control group after 8 weeks of performing exercises. **Conclusion:** Eight weeks of a group of merged exercises program was effective in reducing pain severity, improved quality of sleep and life among nursing students with primary dysmenorrhea. **Recommendation**: Designing and implementing efficient programs to raise awareness of adolescent girls about benefits of exercises on primary dysmenorrhea symptoms.

Keywords: Merged exercises, Primary dysmenorrhea

Introduction

One of the most prevalent issues with menstruation is dysmenorrhea. According to **Konar (2018),** it is characterized as painful menstruation and was classified into primary and secondary dysmenorrhea. Primary dysmenorrhea, the most common type, is described as menstrual discomfort in the lower abdomen prior to or during menstruation that starts one to two years after menarche or between six and twelve months later and does not exhibit any evidence of pelvic disease. According to **Carroquino-Garcia et al. (2019),** it can endure up to the age of forty and might even continue during menopause.

Dysmenorrhea is a health issue that has a significant negative influence on society and health, sustains a significant financial cost, and results in absence from work or school **(Kaur et al., 2019)**. The primary symptoms of dysmenorrhea are brought on by elevated prostaglandin levels during menstruation. In addition to nausea and vomiting, dysmenorrhea symptoms include discomfort in the lower back, head, legs, and abdomen **(Rafique, & Alsheikh, 2018).**

Additionally, it is well known that women with dysmenorrhea experience lower- sleep quality than those without the condition. Insomnia occurs in 14.9% of women with dysmenorrhea throughout their menstrual cycle, according to the prevalence research by **Aktas (2015)**. Moreover, research has revealed that dysmenorrhea symptoms may decrease women's quality of life and may even result in sleep disorders that reduce sleep quality **(Tartibian et al., 2021; Yuldasheva et al., 2021)**.

Treatment of dysmenorrhea varies mainly. According to **De Sá Souza et al. (2020)**, the three types of therapy for dysmenorrhea are pharmaceutical, non-pharmacological, and surgical. Non-steroidal anti-inflammatory drugs (NSAIDs) and oral contraceptives have been documented to cause adverse effects include nausea, breast soreness, intermenstrual bleeding, and hearing and visual disturbances. Therefore, the literature reported that successful non-pharmacological methods for treating primary dysmenorrhea symptoms had a high potential value **(Itani et al., 2022)**.

Complementary therapies, physical therapy, nutritional supplements, and lifestyle changes are examples of non-pharmacological treatments. Non-pharmacological therapy becomes crucial in order to prevent the medication's adverse effects. Physiotherapy, which employs physical modalities to lessen symptoms of dysmenorrhea, is a significant treatment. Exercise therapy is one such approach **(Mohamed, & Hafez, 2017)**.

Since exercise therapy affects the organs as well as the limbs, it has a therapeutic effect on the woman body. Recent studies reported that exercise therapy could reduce prostaglandin levels, pain, and stress. Additionally, exercise is beneficial for enhancing mental wellness, sleep pattern and quality of life **(Ramaiah et al., 2020; Yuldasheva et al., 2021)**.

Significance of the study

Researches carried out in numerous regions have revealed that the prevalence of dysmenorrhea ranges widely from 34 to 94% **(De Sanctis et al., 2016).** According to an epidemiological study conducted in Egypt, dysmenorrhea affected 75 percent of pubertal teenagers, with 20.3% of them reporting missing school due to the intensity of their symptoms **(Esimai, and Esan, 2010)** . A study at Beni-Suef University with a total of 1908 students concluded that 92.9% of the participants had dysmenorrhea **(Shehata et al., 2018).**

Hence, it is obvious that teenage females frequently have dysmenorrhea and that this problem is accompanied by a variety of physical, psychological, and emotional symptoms. According to particular research, dysmenorrhea significantly impairs peer and social activities as well as the academic and clinical quality of work while they are menstruating **(Kaur et al., 2019; Sandhiya et al., 2021).**

The principal symptoms of primary dysmenorrhea have been shown to be positively impacted by exercise routines that mostly include relaxation, stretching, aerobic exercises, pelvic floor muscle strengthening exercises, yoga, and Pilates **(Ortiz et al., 2015).** However, a number of other studies did not use of Kegel exercises, yoga positions, or core stability exercises, which affect the pelvic floor muscles and also reduce the symptoms of dysmenorrhea **(Kirmizigil and Demiralp, 2020).** Therefore, the researchers aimed to assess the effect of a group of merged exercises on primary dysmenorrhea symptoms among nursing students.

Operational definitions

Group of Merged Exercises

In the current study it refers to a combination of a group of exercises which include piriformis muscle stretches, adductor stretching, cobra pose, sit up, bridge exercise, kegel exercise, pelvic elevation, pelvic rotation and diaphragmatic breathing.

Primary Dysmenorrhea Symptoms

In the current study it refers to severity of pain, quality of sleep and life. These will be measured using Visual Analogue Scale (VAS), Pittsburgh Sleep Quality Index (PSQI), and Short- Form (SF) - 36 Health Survey Questionnaires (before and after the exercise)

Aim of the study

The current study aimed to assess the effect of a group of merged exercises on primary dysmenorrhea symptoms among nursing students.

Study Hypotheses

Three hypotheses were examined to accomplish the study aim:

- ***Hypothesis I:*** Participant students who performed a group of merged exercises exhibit decreased in pain severity compared to those who do not.
- ***Hypothesis II:*** Participant students who performed a group of merged exercises exhibit improved sleep quality compared to those who do not.
- ***Hypothesis III:*** Participant students who performed a group of merged exercises exhibit higher levels of quality of life than those who do not.

Subjects and Method

Design: A quasi-experimental research design was utilized in the current study; the students were assigned to either the exercise group or the control group. A comparison of the results for the two groups can be used to assess the effect of the exercise program. Throughout the study, students were evaluated three times: at baseline (after enrollment but before the intervention began) and during the first and second menstrual cycles.

Setting

The current study was carried out at the maternity nursing lab which located on the third floor at Nursing Faculty - Mansoura University, Egypt. This laboratory is used for practical training of the 6th level students on Tuesday from 8-2 pm weekly.

Sample

A purposive sample of 72 nursing students who enrolled in the professional midwifery course for the second semester of the academic year 2022– 2023. Students who matched the following criteria might take part in the study: single, aged 17- 22 years, with regular menstrual cycle, had dysmenorrhea rating their pain ≥4 on Visual Analogue Scale and without any regular exercise activity. While students who were married and are known to have pelvic pathology were excluded from the study.

Seventy-two students were divided into two groups, with the odd numbers going to the control group (which included no exercise) and the even numbers going to the exercise group (which included exercise). Each group has 36 students.

Sample size calculation:

Based on data from literature **(Kirmizigil and Demiralp, 2020),** considering level of significance of 5%, and power of study of 80%, the sample size can be calculated using the following formula:

$$n = [(Z_{\alpha/2} + Z_{\beta})^2 \times \{2(SD)^2\}]/ (\text{mean difference})^2,$$

Where SD stands for standard deviation; $Z_{\alpha/2}$ is 1.96 and Z_{β} is 0.84. Therefore, $n= [(1.96 + 0.84)^2 \times \{2(3.0)^2\}]/ (2.0)^2=35.3$. Accordingly, the sample size required for the study was 36 females in each group.

Tools of data collection

Four tools were used to collect data:

I. A Structured Interviewing Questionnaire

The researchers developed this tool to collect the demographic characteristics of nursing students. The questionnaire consisted of two parts: **the first part** included age, and BMI categories and **the second part** included questions about the menarche age, menstrual duration, duration of pain, the number and soakage of pads during menstruation.

II. Visual Analogue Scale (VAS):

The pain rating scale designed by **Crichton (2001)** and used to identify the menstrual pain severity. Scores are based on self-reported pain measurements that are recorded with a single hand written mark placed at one point along a 10-cm line that represents a continuum between the two ends of the scale, with "no pain" on the left end (0 cm) and the "worst pain" on the right end (10 cm).

Scoring system

The VAS was divided into three main sections: the first section was graded from 1-3 cm, which represents mild pain; the second

section was rated from 4-7 cm, which represents moderate pain; and the third section was graded from 8-10 cm, which represents severe pain. Higher scores indicate the worst pain.

III. Pittsburgh Sleep Quality Index (PSQI):

The PSQI was developed by **Buysse et al. (1989)** to assess sleep quality and assist in differentiating between people who have bad sleep and people who have good sleep. Subjective sleep quality, sleep latency, sleep length, habitual sleep efficiency (the proportion of total sleep time to bedtime), sleep disruptions, usage of sleep medicine, and daytime dysfunction are the seven domains of the scale. The scale has 19 self-rated questions. The majority of the questions are arranged as multiple-choice questions, and they are all concise and simple to understand and answer.

Scoring system

The PSQI items are scored on a scale of 0 (no difficulty) to 3 (extreme difficulty), and the scores are assigned according to the scale's domains. The ratings range from 0 to 21, with higher scores indicate the poorer the quality of the sleep.

IV. Short- Form (SF)- 36 Health Survey Questionnaire:

Ware and Sherbourne (1992) produced the initial questionnaire. Physical and psychological quality of life are assessed using a 36-item, short-form, multi-purpose health survey. Physical functioning (PF-10 items), role limitation due to physical health (RP-4 items), bodily pain (BP-2 item), general health (GH-5 item), energy/fatigue (E/F-4 item), social functioning (SF-2 item), role limitation due to emotional problems (RE-3 items), and emotional wellbeing (EW-5 items) are among the eight domains of health covered by the short form health survey (SF). There is also one item that displays a sense of a change in health.

Scoring system:

The short- form 36-Item Health Survey is scored in two steps. Precoded numeric values are ***first*** recoded in accordance with the scoring key. Furthermore, each item is scored on a 0 to 100 range. Scores denote the percentage of total possible score attained. ***In step 2***, items in the same scale are averaged together to produce the 8 scale scores. Calculation of scores for the eight scales is performed using the transformed scores ranging from 0 (the worst) to 100 (the best).

Validity of the Tools

A panel of three academic nursing professionals with expertise in women's health and midwifery established the validity of the tools' content by reviewing them for clarity, relevance, applicability, comprehensiveness, and ease of implementation. In their opinion, no modifications should have been made.

.Reliability of the tools

The reliability of the tools was tested via Cronbach's alpha. The Cronbach's alpha value for Visual Analogue Scale, Pittsburgh Sleep Quality Index (PSQI) and Short Form (SF)-36v2 Questionnaire was (0.963, 0.861 &0.889, respectively) which indicated the high reliability of the tools.

Ethical Considerations

The Mansoura University Faculty of Nursing Ethical Committee granted its approval for the study's conduct *(Ref. No. p. 0390)*. Additionally, approval was obtained from the vice dean for education and student affairs to use the maternity nursing lab after regular working hours. All students who met the inclusion criteria were informed about the aim, procedure, benefits, and nature of the study. After explaining the study's nature and aim to each student, written consent was obtained before the study began. Each student was made aware that participation in the study was entirely voluntary and that they had the freedom to discontinue at any moment. For the course of the study, anonymity, confidentiality, privacy and safety were guaranteed. After finishing the study, control group received the same intervention (group of merged exercise).

Pilot study

In order to evaluate the current research method for their clarity, validity, and

completion time, a pilot study was conducted at the maternity nursing lab with 10% of the students (8 nursing students). The exercises' steps were assessed for their simplicity and clarity. The sample of students who participated in the pilot study was excluded in the main sample.

Procedure

Data were collected within four months from February 2023 to May 2023. The study was conducted through four steps: preparation, interviewing & assessment, implementation, and evaluation.

Preparatory step

After reviewing relevant and recent literature from both national and international sources on merged exercises program especially for their effect on primary dysmenorrhea symptoms, the researchers developed the study instruments and their validity were assessed. Then the researchers watched videos about the exercises on YouTube, read and reviewing books about these exercises to know how to perform the merged exercises program. After that, ethical approval was gained from the Faculty of Nursing Ethical Committee of Mansoura University and also from the vice dean for education and student affairs to conduct the study in the maternity nursing lab.

Interviewing and assessment:

The students were interviewed at the maternity nursing lab which located on the third floor at Nursing Faculty - Mansoura University, Egypt, on Tuesday from 8-2 pm weekly. Then the researchers assessed female students who registered in professional midwifery course for second semester of the academic year 2022–2023 for their eligibility to participate in the study, the researchers make a list of eligible students. After that the students signed a written consent to share in the study after explanation of the nature and aim of the study.

Then the researchers collected the baseline data from all students as student's age, BMI categories, menarche age, duration of menstruation, and duration of pain using a structured interviewing questionnaire. In addition, all students were assessed for severity of dysmenorrhea and pain intensity using Visual Analog Scale (VAS). Sleep quality and disturbance were assessed using Pittsburgh Sleep Quality Index, also, physical, and psychological quality of life were measured using Short Form (SF)-36 Health Survey Questionnaire. The questionnaires took about 20-30 minutes to be completed.

***Implementation step*:**

After baseline assessment, the students were assigned into an intervention (exercise) or control group and each constituted 36 students. All students were instructed to abstain from taking any painkillers, prescription drugs, or herbal tea for two consecutive menstrual cycles. During this step, the students in exercise group received brief but thorough instructions about the nature of exercise and its benefits in order to gain their confidence and co-operation.

Through the study the researchers divided the exercise group into four equal groups (Each group constitutes of nine students) and demonstrate the exercises then the students perform redemonstration in front of the researchers and using video illustration, visual images for more clarification. The exercise group was requested to perform the exercise program for eight weeks at home (once per day for 45 minutes, 3 times per week). The researchers follow up the students by phone to ensure their compliance to the program until the time of evaluation. While the students in the control group were instructed to refrain from any physical activity and to adhere to their normal routines as attention distraction activities, and application of warm compresses.

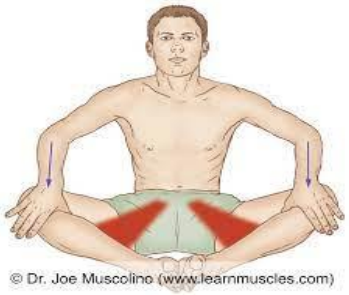
The Exercise program included:

Before the merged exercises, warm-up exercises were conducted for 10 minutes. The progressive increase in heart rate during the warm-up phase enables a reduction in injury risk.

Piriformis stretches: When lying supine, with the knee flexed and the hip in external rotation, the extended extremity was put on the opposite side. After that, the arms were used to pull the affected limb towards the trunk in order to stretch the piriformis muscle (5 repetitions for 20 seconds).

Asher, A. (2022). Piriformis Stretching Routine for Intermediates. https://www.verywellhealth.com/intermediate-piriformis-syndrome-stretching-routine-4022709

Adductor stretching: The elbow and forearm were used to support the legs while they were pressed on the floor while sitting (5 repetitions for 20 seconds).



MUSCOLINO, J. (2017). Adductor Longus – Stretching. https://learnmuscles.com/glossary/adductors-longus-stretching/

***Cobra Pose*:** While lying on one's abdomen, the arms were extended to the width of the shoulders while being held in flexion. The lower back was then extended while being supported by the arms. The trunk flexors were stretched for five repetitions (20 seconds) in this position.

Gupta, A. (2021). Are you doing the cobra pose wrong? Here are 7 common mistakes you are likely to commit. https://www.healthshots.com/fitness/staying-fit/are-you-making-these-7-mistakes-in-the-cobra-pose/

Sit up: Start in the supine posture and move your trunk forward to extend your body. An assessment of abdominal muscular strength performed before the exercise (10 repetitions x 3 sets) was used to determine the exercise's level of difficulty.

Stafford, T., Hall, K. (2020). How to Do Sit Ups. https://www.wikihow.com/Do-Sit-Ups

Bridge exercise: The body was in a supine posture, with the legs flexed and thrust up. This exercise, which consists of 10 repetitions over three sets, was made to strengthen the core.

Steber, C. (2022).7 Glute Bridge Exercises That'll Work All The Muscles In Your Butt. https://www.bustle.com/wellness/glute-bridge-exercises

Kegel exercise: While supine with the knees bent, the pelvic muscles were repeatedly tensed and relaxed. One repeat was made up of two types of contraction movements: slow and quick. This exercise's objective is to activate the pelvic floor muscles (10 repetitions over three sets).

Kushwah, B., K. (2019). 3 Benefits of Kegel Exercises. https://www.lybrate.com/topic/3-benefits-of-kegel-exercises/46a467d9b9b263edf7493f37b7eab22a

Pelvic elevation: The person was standing with an elevated pelvis. Pelvic elevation movements were performed throughout one repetition, first raising the pelvis to the right and then to the left. The goal of pelvic elevation was to stimulate the pelvic area (10 repetition × 3 sets).

Pelvic rotation: The pelvis rotated while the person was standing. One repetition was accounted for each pelvic rotation, one to

the right and one to the left. This exercise had the same objective as pelvic elevation, which was to activate the pelvic area (10 repetitions over 3 sets).

Furthermore, diaphragmatic breathing was included in each activity. Menstruation days were not included in the exercise schedule. Between the two menstrual periods, this exercise was done.

Evaluation step

The students' level of pain was the primary outcome that evaluated, and this was determined using VAS. As a supplementary outcome measures, sleep quality and disturbance were assessed using the PSQI. Additionally, the students' quality of life was evaluated using the Short Form 36 Health Survey Questionnaire. During the course of the study, outcome measures were taken on the first day of the menstruation that was the most painful time during the two subsequent menstrual cycles.

Statistical Analysis

SPSS for Windows version 20.0 (SPSS, Chicago, IL) was used to complete all statistical analysis. The mean and standard deviation (SD) of all continuous data were both regularly distributed. Numbers and percentages were used to express categorical data. For comparison between two variables using continuous data, the student's t test was applied. Along with the student's t test, the mean difference and 95% confidence interval (CI) were determined. For the comparison of variables using categorical data, the chi-square test was employed. The cutoff for statistical significance was at $p<0.05$.

Limitations of the study

The published articles in the subject of exercise in improving sleep quality were different group category, except only one study included participants with primary dysmenorrhea. It is considered a limitation of the current study. Accordingly, the researchers argued these studies in the discussion part.

Results

Table (1) displayed that the mean age of exercise and control group was almost identical (20.2 ±1.4 vs. 19.9 ±1.3) respectively. 63.9% &72.2%, respectively of the exercise and control groups had normal body weight. There was no statistically significant difference between the studied groups concerning age, and BMI at baseline assessment ($p > 0.05$).

Table (2) showed that the mean menarche age for the exercise and control group was nearly the same (13.7 ±2.2 vs. 13.2 ±1.9, respectively). In the exercise and control group 72.2% & 75% respectively of the studied students had cycles that last between (3-5) days. It was clear that 58.3% of the exercise group and 75% of the control group experienced pain for two to three days on average. According to the data in this table, less than three pads were used per day by 58.3% of the exercise group and 55.6% of the control group. Furthermore, moderate pad soaking during menstruation occurred in 86.1% of the exercise group and 88.9% of the control group. At the initial assessment, there was no statistically significant difference between the study groups in terms of menstrual characteristics ($p > 0.05$).

Table (3) illustrated that there was no statistically significant differences between the studied groups related to pain levels at baseline assessment. Meanwhile, the pain levels in the lower back, abdomen, thigh, and headache in the exercise group was lower than that in the control group with a highly statistically significant difference during first and second menstrual cycle ($p < 0.001$).

Table (4) showed that there was no statistically significant difference between the two groups' mean PSQI item scores at the baseline evaluation. Meanwhile, throughout the first and second menstrual cycles, the exercise group's mean PSQI item ratings were significantly lower than those of the control group ($p <0.001$), with this difference being a highly statistically significant.

Figure 1 Showed that at the baseline assessment, there was no significant difference in the PSQI total score between the two groups ($p = 0.750$). Meanwhile, the total score of PSQI was significantly lower in the exercise group than in the control group (8.5 ± 1.6 vs. 14.5 ± 2.5, respectively) during first menstrual cycle

with a highly statistically significant difference noted between studied groups ($p < 0.001$). Moreover, the PSQI total score were further reduced in the exercise group than in the control group (4.8± 0.7 vs. 14.5 ± 1.8, respectively) during second menstrual cycle with a highly statistically significant difference noted between studied groups ($p < 0.001$).

Table (5) elaborated that before implementation of the exercise program, there was no statistically significant difference in the mean scores of quality-of-life items between the studied groups. However, after implementation of the exercise program, the mean scores were significantly higher in the exercise group than in the control group during first and second menstrual cycle with a highly statistically significant difference noted between the studied groups ($p <0.001$).

Figure (2) clarified that, before implementation of the exercise program, the total scores of quality-of-life items of exercise and control group were (379.2 ±44.4 & 360.7 ±74.4), respectively with no statistically significant difference among the studied groups ($p = 0.204$). However, after implementation of the exercise program, the total scores were significantly higher in the exercise group than in the control group (516.5 ±60.3 vs. 377.0 ±41.4, respectively) during first menstrual cycle with a highly statistically significant difference noted between studied groups ($p < 0.001$). Moreover, the subscales of quality-of-life total scores were further improved in the exercise group than in the control group (627.5 ±31.0 vs. 377.6 ±45.9) during second menstrual cycle with a highly statistically significant difference between both groups ($p < 0.001$). Such significant differences also existed in all domains of quality of life.

Table 1. Comparison between the studied groups regarding their demographic characteristics (N=72).

Items	Control group (n=36)		Exercise group (n=36)		Chi-Square	
	No.	%	No.	%	X^2	P
Age (year)						
17 – 18	3	8.3	4	11.2		
19 – 20	24	66.7	16	44.4		
21 – 22	9	25.0	16	44.4	3.703	0.157
Mean ±SD	19.9 ±1.3		20.2 ±1.4		1.039	0.303
BMI categories (kg/m2)						
Under weight	4	11.1	3	8.3		
Normal weight	26	72.2	23	63.9		
Overweight	6	16.7	10	27.8	1.327	0.515

Table 2. Comparison between the studied groups regarding their menstrual characteristics (N=72)

Items	Control group (n=36)		Exercise group (n=36)		Chi-Square	
	No.	%	No.	%	X^2	P
Age at menarche (Years)						
10 – 13	14	38.9	20	55.6		
14 – 17	22	61.1	16	44.4	2.006	0.157
Mean ±SD	13.2 ±1.9		13.7 ±2.2		1.032	0.306
Duration of menstruation (day)						
2 or less	2	5.6	1	2.8		
3 – 5	27	75.0	26	72.2		
6 or more	7	19.4	9	25.0	0.602	0.740
Duration of pain (day)						
1 or less	8	22.2	15	41.7		
2 – 3	27	75.0	21	58.3		
4 or more	1	2.8	0	0.0	3.880	0.144
Number of pads/days						
Less than 3	20	55.6	21	58.3		
3 or more	16	44.4	15	41.7	0.057	0.812
Soakage of pads during menstruation						
Stained	1	2.8	1	2.8		
Moderate	32	88.9	31	86.1		
Heavy	3	8.3	4	11.1	0.159	0.924

Table 3. Comparison between the studied groups according to their pain levels before and after exercise program (N=72)

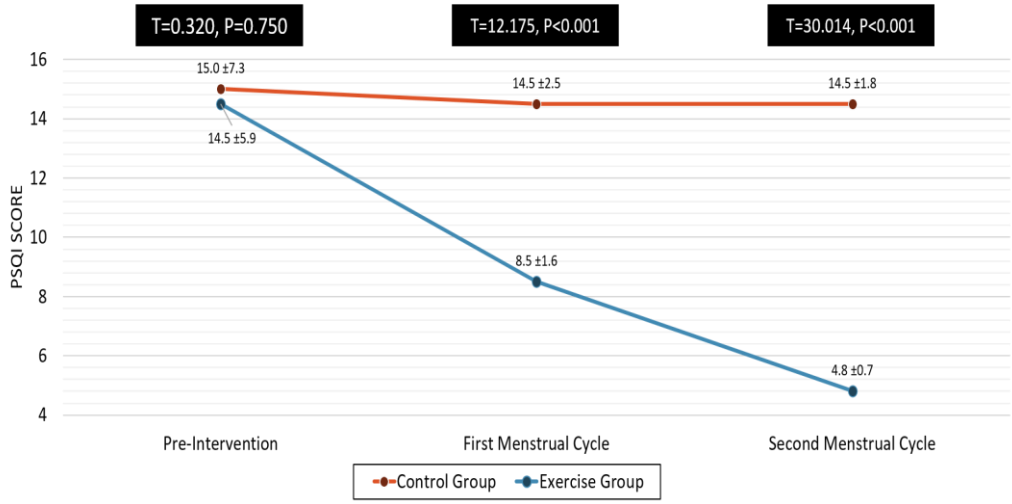
Items	Control group (n=36)								Exercise group (n=36)								Chi-Square	
	None		Mild		Moderate		Severe		None		Mild		Moderate		Severe			
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	X^2	P
Lower back																		
Pre-intervention	0	0.0	3	8.3	13	36.1	20	55.6	1	2.8	2	5.6	12	33.3	21	58.3	1.264	0.738
First Menstrual Cycle	0	0.0	3	8.3	24	66.7	9	25.0	1	2.8	14	38.9	13	36.1	8	22.2	11.447	0.009*
Second Menstrual Cycle	0	0.0	6	16.7	24	66.7	6	16.7	1	2.8	22	61.1	11	30.6	2	5.6	16.971	<0.001**
Abdomen																		
Pre-intervention	0	0.0	3	8.3	18	50.0	15	41.7	0	0.0	3	8.3	19	52.8	14	38.9	0.062	0.970
First Menstrual Cycle	0	0.0	0	0.0	11	30.6	25	69.4	0	0.0	6	16.7	27	75.0	3	8.3	30.023	<0.001**
Second Menstrual Cycle	0	0.0	1	2.8	20	55.6	15	41.7	1	2.8	17	47.2	18	50.0	0	0.0	30.327	<0.001**
Thighs																		
Pre-intervention	3	8.3	13	36.1	18	50.0	2	5.6	7	19.4	9	25.0	19	52.8	1	2.8	2.688	0.442
First Menstrual Cycle	3	8.3	8	22.2	23	63.9	2	5.6	7	19.4	24	66.7	5	13.9	0	0.0	23.171	<0.001**
Second Menstrual Cycle	3	8.3	9	25.0	22	61.1	2	5.6	7	19.4	28	77.8	1	2.8	0	0.0	32.531	<0.001**
Headache																		
Pre-intervention	5	13.9	10	27.8	14	38.9	7	19.4	6	16.7	12	33.3	15	41.7	3	8.3	1.907	0.591
First Menstrual Cycle	0	0.0	8	22.2	21	58.3	7	19.4	9	25.0	21	58.3	4	11.1	2	5.6	29.165	<0.001**
Second Menstrual Cycle	0	0.0	4	11.1	32	88.9	0	0.0	15	41.7	17	47.2	2	5.6	2	5.6	51.518	<0.001**

***Statistically significant at *P* <0.05** ****Highly significant at *P* <0.001**

Table 4. Comparison between the studied groups according to mean scores of sleep quality subscales before and after exercise program (N=72)

Domains	Control (n=36)	Exercise (n=36)	Mean difference	t-Test	
	Mean ±SD	Mean ±SD	[95% CI]	t	P
Pre-Intervention					
Duration of sleep	2.2 ±0.4	2.1 ±0.7	0.1 [-0.29,0.23]	0.744	0.459
Sleep disturbance	2.4 ±1.2	2.5 ±0.8	0.3 [-0.78,0.18]	1.248	0.216
Sleep latency	2.2 ±0.6	2.4 ±0.7	0.2 [-0.51,0.11]	1.302	0.197
Day dysfunction	2.3 ±1.0	2.6 ±0.6	0.3 [-0.69,0.89]	1.543	0.127
Sleep efficiency	2.2 ±0.7	2.1 ±0.3	0.1 [-0.15,0.32]	0.702	0.485
Overall sleep quality	2.4 ±1.2	2.1 ±0.5	0.3 [-0.15,0.57]	1.384	0.171
Medication use	1.5 ±0.7	1.3 ±0.6	0.2 [-0.78,0.11]	1.301	0.193
First Menstrual Cycle					
Duration of sleep	2.2 ±0.7	1.5 ±0.5	0.7 [0.42,0.97]	4.966	<0.001**
Sleep disturbance	2.4 ±0.6	1.5 ±0.5	0.9 [0.63,1.15]	6.840	<0.001**
Sleep latency	2.3 ±0.7	1.5 ±0.5	0.8 [0.45,1.05]	5.054	<0.001**
Day dysfunction	2.2 ±0.5	1.1 ±0.4	1.1 [0.92,1.36]	10.448	<0.001**
Sleep efficiency	2.3 ±0.7	1.1 ±0.5	1.2 [0.95,1.49]	8.939	<0.001**
Overall sleep quality	2.4 ±0.5	1.0 ±0.2	1.4 [1.23,1.61]	14.811	<0.001**
Medication use	1.1 ±0.3	0.8 ±0.4	0.3 [0.41,0.36]	3.600	<0.001**
Second Menstrual Cycle					
Duration of sleep	2.2 ±0.5	1.0 ±0.2	1.2 [1.00,1.34]	13.730	<0.001**
Sleep disturbance	2.3 ±0.6	1.0 ±0.1	1.3 [1.07,1.43]	12.823	<0.001**
Sleep latency	2.1 ±0.7	1.0 ±0.3	1.1 [0.89,1.33]	8.666	<0.001**
Day dysfunction	2.3 ±0.7	0.9 ±0.2	1.4 [1.10,1.57]	11.442	<0.001**
Sleep efficiency	2.4 ±0.5	0.6 ±0.3	1.8 [1.52,1.98]	18.521	<0.001**
Overall sleep quality	2.4 ±0.7	0.4 ±0.2	2.0 [1.96,2.48]	22.283	<0.001**
Medication use	0.9 ±0.4	0.2 ±0.1	0.7 [0.63,1.21]	10.186	<0.001**

****Highly significant at *P* <0.001**



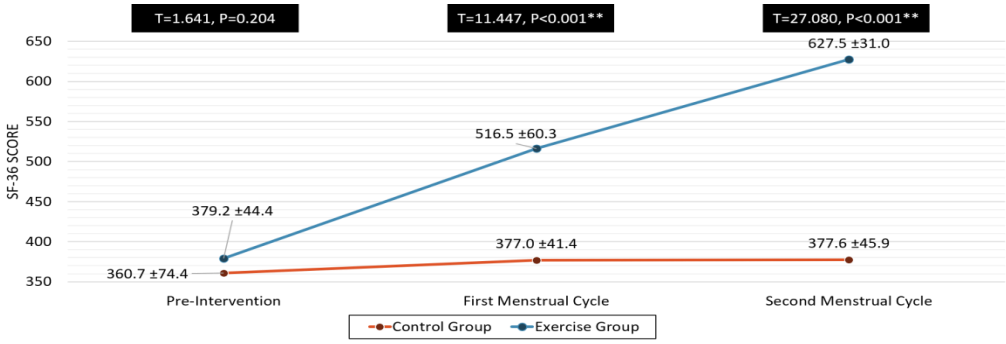
****Highly significant at *P* <0.001**

Figure 1. Comparison of Pittsburgh Sleep Quality Index total scores between the exercise and control group

Table 5. Comparison of mean scores of quality of life subscales between exercise and control group before and after exercise program (N= 72)

Domains	Control (n=36) Mean ±SD	Exercise (n=36) Mean ±SD	Mean difference [95% CI]	t-Test t	P
Pre-Intervention					
Physical Functioning	46.1 ±13.7	49.7 ±15.1	3.6 [-10.39, 3.17]	1.063	0.292
Role limitation due to physical health	22.9 ±11.4	26.8 ±13.4	3.9 [-21.47, 2.14]	1.330	0.187
Role limitation due to emotional problems	35.2 ±17.1	40.4 ±20.2	5.2 [-23.28, 4.73]	1.178	0.242
Energy/ Fatigue	40.3 ±20.1	48.6 ±24.3	8.3 [-25.63, 11.15]	1.579	0.118
Emotional wellbeing	48.4 ±15.6	51.8 ±10.9	3.4 [-9.71, 2.93]	1.069	0.289
Social functioning	53.3 ±13.9	48.5 ±11.4	4.8 [-1.25, 10.72]	1.579	0.119
Pain	54.3 ±14.9	47.4 ±16.6	6.9 [-0.50, 14.34]	1.859	0.067
General health	48.1 ±23.9	42.8 ±20.5	5.3 [-0.30, 10.25]	1.009	0.316
First cycle					
Physical Functioning	47.2 ±14.6	73.3 ±14.4	26.1 [19.29, 32.93]	7.639	<0.001**
Role limitation due to physical health	36.8 ±18.4	63.9 ±25.0	27.1 [16.77, 37.39]	5.240	<0.001**
Role limitation due to emotional problems	40.7 ±18.9	76.5 ±23.7	35.8 [23.34, 48.15]	7.086	<0.001**
Energy/ Fatigue	56.0 ±10.3	51.4 ±8.5	4.6 [9.34, 0.06]	2.067	0.042*
Emotional wellbeing	48.1 ±8.7	57.4 ±8.0	9.3 [5.45, 13.30]	4.768	<0.001**
Social functioning	52.6 ±9.6	67.8 ±12.8	15.2 [9.85, 20.49]	5.684	<0.001**
Pain	52.6 ±14.2	68.5 ±11.1	15.9 [9.97, 21.98]	5.305	<0.001**
General health	43.0 ±7.4	57.6 ±7.4	14.6 [11.19, 18.15]	8.407	<0.001**
Second cycle					
Physical Functioning	46.3 ±17.3	95.3 ±5.5	49.0 [43.01, 55.04]	16.253	<0.001**
Role limitation due to physical health	39.0 ±13.4	95.2 ±13.1	56.2 [47.22, 65.05]	17.994	<0.001**
Role limitation due to emotional problems	44.4 ±20.2	96.8 ±11.1	52.4 [43.17, 61.48]	13.641	<0.001**
Energy/ Fatigue	56.4 ±7.3	52.9 ±5.1	3.5 [8.53, 1.58]	2.358	0.021*
Emotional wellbeing	46.9 ±8.6	62.4 ±8.5	15.5 [11.46, 19.49]	7.682	<0.001**
Social functioning	50.4 ±14.8	79.9 ±11.3	29.5 [23.29, 35.65]	9.511	<0.001**
Pain	53.1 ±15.1	80.3 ±8.5	27.2 [21.46, 32.98]	9.427	<0.001**
General health	41.1 ±12.7	64.7 ±8.8	23.6 [18.49, 28.77]	9.169	<0.001**

***Statistically significant at *P* <0.05** ****Highly significant at *P* <0.001**



****Highly significant at *P* <0.001**

Figure 2. Comparison the short- From- 36 Health Survey total scores between the exercise and control group

Discussion

The current study was conducted to assess the effect of a group of merged exercises on primary dysmenorrhea symptoms among nursing students. Within the study hypotheses nursing students who performed a group of merged exercises program had reduced pain severity and improved quality of sleep and life.

The current study results stated that there were no statistically significant differences between the groups that were examined related to pain levels at baseline assessment. Meanwhile, the pain levels in the lower back, abdomen, thigh, and headache in the exercise group were lesser than that in the control group with highly statistically significant difference during first and second menstrual cycle. The current study's findings supported the first study hypothesis. H1 "Participant students who performed a group of merged exercises exhibit decreased in pain severity compared to those who do not".

The current study findings are supported by **Hashemi et al. (2022)** who investigated the effect of yoga exercises on the pain severity and duration among young students with primary dysmenorrhea in Iran, it was shown that doing yoga for eight weeks reduced the amount of pain in young students with primary dysmenorrhea experienced. A significant difference in pain intensity was found between the exercise group and the control group.

Additionally, the findings of the current study are consistent with those of a study done in India by **Ramaiah and Albokhary (2021)**, which involved one hundred and eighty adolescent participants and examined the impact of pelvic rocking exercises and home workouts on dysmenorrhea in teenage girls. They concluded that aerobic activity and gradual muscle relaxation (pelvic rocking) at home considerably reduced the intensity of pain when treating menstrual irregularities.

Moreover, in the same line **Kirmizigil and Demiralp (2020)** who performed randomized control trial (RCT) on twenty eight sedentary students to assess the efficacy of purposeful exercises on primary dysmenorrhea pain, and found that an exercise program led to statistically significant reductions in the intensity of pain in lower back and abdomen.

Also, **Fallah and Mirfeizi (2018)** conducted a comparative study in Iran entitled "How is the quality and quantity of primary dysmenorrhea affected by physical exercises?" It was discovered that exercise and lifestyle changes can help lower both the quantity and quality of pain in relation to the length and intensity of pain. These findings may be rationalized by the fact that physical activity and exercise therapy boost premenstrual pelvic blood flow, delaying the onset of pain by causing prostaglandin accumulation in this region. Additionally, it raised the body's pain threshold and increased endorphin release in the brain, both of which lessened menstrual pain.

The present study finding showed that the total score of Pittsburgh sleep quality index was significantly reduced in the exercise group than in the control group during first and second menstrual cycle with a highly statistically significant difference noted among studied groups. Thus, the second study hypothesis was also validated: H2 "Participant students who performed a group of merged exercises exhibit improved sleep quality compared to those who do not".

The current study's finding is similar with that of **Kirmizigil and Demiralp (2020)** who discovered that after an exercise program was completed, the exercise group's sleep quality significantly improved, whereas the control group's sleep quality showed no such increases.

Furthermore, a systematic review carriedout by **Wang et al. (2020)** about the influence of exercise therapy on sleep quality and sleep disturbance in young women. They showed positive impacts of exercise using PSQI scores in sixteen randomized control trials, compared with the control group in enhancing sleep quality among young women. In addition, the analysis by **Kovacevic et al., (2018)** concerning the impact of resistance exercise on sleep

quality. It claimed that strengthening exercises would enhance the quality of sleep. This finding may be supported by the fact that exercise enhanced sleep quality due to that the participants in the exercise group experiencing significantly less severe pain and menstruation symptoms. Additionally, the researchers thought that the disruption of the pain cycle following regular exercise improves the quality of sleep.

The current study finding revealed that after implementation of the exercise program, the subscales of quality-of-life mean scores were further increased in the exercise group than in the control group during first and second menstrual cycle with a highly statistically significant difference noted between both groups. Such significant differences also existed in all domains of quality of life. Therefore, the third study hypothesis was also supported: H3 "Participant students who performed a group of merged exercises exhibit higher levels of quality of life than those who do not".

Sandhiya & Senthil Selvam, (2022) supported the current study finding in an experimental study about the efficiency of core stability exercise and aerobic exercise in improving Quality of Life (QOL), they reported that the group received core stability exercise for 8 weeks had improved quality of life more effective.

The current study's result also coincides with that of an experimental study performed by **Onur et al. (2012)** in Turkey, where the researchers found that, exercise intervention appeared to significantly enhance quality of life. With each subsequent visit, the SF-36's eight dimensions alongside the summary indicators of physical and mental health significantly improved.

In addition RCT conducted by **Kannan et al. (2019)** on the effects of aerobic exercise on pain, daily functioning, and quality of life in adolescent girls with primary dysmenorrhea showed that exercise has a significant impact on QOL and function linked to primary dysmenorrhea. These findings may be supported by the fact that exercise enhanced quality of life due to, that it reduces the negative effect on the female who exercise regularly, exhibit lower levels of physical symptoms across the menstrual cycle. In addition exercise improves cardiovascular status, increased bone mineral content, improve premenstrual syndrome symptoms. Moreover, it helps in reducing pain, relieving stress, increasing concentration, elevating mood, improving sleep quality and improving health. Also exercise may act as a distraction from intrusive thoughts and promote positive thoughts.

On the other hand, **Akbaş and Erdem, (2019)** reported that social domain of SF-36 only significantly improved after interference in their study and also concluded from their findings that it would not be possible to entirely restore the participants' quality of life in a short period of time.

Conclusion

Based on the current study findings the three study hypotheses were accepted where the eight weeks of a group of merged exercise program was effective in reducing pain severity, improved quality of sleep and life among nursing students with primary dysmenorrhea.

Recommendations

- Designing and implementing efficient programs to raise awareness of adolescent girls about different benefits of exercises on primary dysmenorrhea symptoms.

Further studies

- Examining the effect of merged exercises versus warm compresses application is recommended.
- Different age groups can be selected as the group category and conduct long term follow up.

Conflict of interest

The authors affirm that they do not have any competing interests.

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References

Akbaş, E., & Erdem, E. U. (2019). Effectiveness of Group Aerobic Training on Menstrual Cycle Symptoms in Primary Dysmenorrhea. Medical Journal of Bakirkoy, 15(3).

Aktaş, D. (2015). Prevalence and factors affecting dysmenorrhea in female university students: effect on general comfort level. Pain Management Nursing, 16(4), 534-543.

Asher, A. (2022). Piriformis Stretching Routine for Intermediates. https://www.verywellhealth.com/intermediate-piriformis-syndrome-stretching-routine-4022709

Buysse, D. J., Reynolds III, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry research, 28(2), 193-213.

Carroquino-Garcia, P., Jiménez-Rejano, J. J., Medrano-Sanchez, E., De La Casa-Almeida, M., Diaz-Mohedo, E., & Suarez-Serrano, C. (2019). Therapeutic exercise in the treatment of primary dysmenorrhea: a systematic review and meta-analysis. Physical therapy, 99(10), 1371-1380.

Crichton, N. (2001). Visual analogue scale (VAS). J Clin Nurs, 10(5), 706-6.

De Sá Souza, H., Piovezan, R. D., Chagas Miranda, R. E., Silva, B. M., Tufik, S., Poyares, D., & D'Almeida, V. (2020). 0832 Physical Exercise Improves Sleep and Muscle Function in Sarcopenic Patients: A Randomized Controlled Trial. Sleep, 43(Supplement_1), A317-A317.

De Sanctis, V., Soliman, A. T., Elsedfy, H., Soliman, N. A., Elalaily, R., & El Kholy, M. (2016). Dysmenorrhea in adolescents and young adults: a review in different countries. Acta Biomed, 87(3), 233-246.

Esimai, O. A., & Esan, G. O. (2010). Awareness of menstrual abnormality amongst college students in urban area of Ile-Ife, Osun State, Nigeria. Indian journal of community medicine: official publication of Indian Association of Preventive & Social Medicine, 35(1), 63.

Fallah, F., & Mirfeizi, M. (2018). How is the quality and quantity of primary dysmenorrhea affected by physical exercises? A study among Iranian students. International Journal of Women's Health and Reproduction Sciences, 6(1), 60-6.

Gupta, A. (2021). Are you doing the cobra pose wrong? Here are 7 common mistakes you are likely to commit. https://www.healthshots.com/fitness/staying-fit/are-you-making-these-7-mistakes-in-the-cobra-pose/

Hashemi, N., Babakhani, F., & Sheikhhoseini, R. (2022). The Effect of Water Yoga Exercises on the Intensity and Pain Duration in Girls with Primary Dysmenorrhea. Women's Health Bulletin, 9(2).
https://learnmuscles.com/glossary/adductors-longus-stretching/

Itani, R., Soubra, L., Karout, S., Rahme, D., Karout, L., & Khojah, H. M. (2022). Primary Dysmenorrhea: Pathophysiology, Diagnosis, and Treatment Updates. Korean Journal of Family Medicine, 43(2), 101-108.

Kannan, P., Chapple, C. M., Miller, D., Claydon-Mueller, L., & Baxter, G. D. (2019). Effectiveness of a treadmill-based aerobic exercise intervention on pain, daily functioning, and quality of life in women with primary dysmenorrhea: A randomized controlled trial. Contemporary clinical trials, 81, 80-86.

Kaur, M. H., Sharma, K., & Joshi, M. U. (2019). A Pre-Experimental Study to Assess the Effectiveness of Aerobic Exercises on Dysmenorrhoea among Nursing Students at SGRD College Of

Nursing Vallah, Amritsar. International Journal of Health Sciences and Research (IJHSR), 9(10) 189-196.

Kirmizigil, B., & Demiralp, C. (2020). Effectiveness of functional exercises on pain and sleep quality in patients with primary dysmenorrhea: a randomized clinical trial. Archives of gynecology and obstetrics, 302(1), 153-163.

Konar, H. (2018). DC Dutta's Textbook of obstetrics.9th edition. New Delhi: Jaypee brothers medical publisher Ltd. P 569-70**.**

Kovacevic, A., Mavros, Y., Heisz, J. J., & Singh, M. A. F. (2018). The effect of resistance exercise on sleep: A systematic review of randomized controlled trials. Sleep medicine reviews, 39, 52-68.

Kushwah, B., K. (2019). 3 Benefits of Kegel Exercises. Accessed at **https:// www.lybrate. com/topic/3-benefits-of-kegel exercises /46a467d9b9b263edf 7493f3 7b7 eab22a**

Mohamed, H., & Hafez, A. (2017). Effect of practicing Pelvic rocking Exercises on Primary Dysmenorrhea among Adolescent Girls: A Randomized Controlled Trial. Egyptian Journal of Health Care, 8 (2).

MUSCOLINO, J. (2017). Adductor Longus – Stretching.

Onur, O., Gumus, I., Derbent, A., Kaygusuz, I., Simavli, S., Urun, E., ... & Cakirbay, H. (2012). Impact of home-based exercise on quality of life of women with primary dysmenorrhoea. South african journal of obstetrics and gynaecology, 18(1), 15-18.

Ortiz, M. I., Cortés-Márquez, S. K., Romero-Quezada, L. C., Murguía-Cánovas, G., & Jaramillo-Díaz, A. P. (2015). Effect of a physiotherapy program in women with primary dysmenorrhea. European Journal of Obstetrics & Gynecology and Reproductive Biology, 194, 24-29.

Rafique, N., & Al-Sheikh, M. H. (2018). Prevalence of primary dysmenorrhea and its relationship with body mass index. Journal of Obstetrics and Gynaecology Research, 44(9), 1773-1778.

Ramaiah, P., & Albokhary, A. (2021). Muscle Relaxation Strategies on Dysmenorrhea: An Interventional Study. Journal of Pharmaceutical Research International (JPRI), 33(25A): 79-85. DOI: 10.9734/JPRI/2021/v33i25A31454

Ramaiah, P., Aly, S., & Albokhary, A. (2020). Integrative Health Care Shift-Benefits and Challenges among Health Care Professionals. International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, 4 (2), 425-428. Available at: **www.ijtsrd.com/papers/ijtsrd30044.pdf**

Sandhiya, D. M., kumari, D. P., Arulya, A., Selvam, D. P. S., Abraham, D. M. M., & Palekar, D. T. J. (2021). The Effect of Pelvic Floor Muscles Exercise on Quality of Life in Females with Primary Dysmenorrhea. Annals of the Romanian Society for Cell Biology, 25(6), 3111-3117.

Sandhiya, M., & Senthil Selvam, P. (2022). Efficacy of Core Stability Exercise and Aerobic Exercise in Improve In Quality Of Life in Underweight Female with Primary Dysmenorrhea.-A Pilot Study. Specialusis Ugdymas, 1(43), 1106-1114.

Shehata, N., Arafa, A., El Wahed, H., Fahim, A. S., & Hussein, G. K. (2018). Epidemiology of dysmenorrhea among university students in Egypt. Int J Womens Health Wellness, 4(1), 073.

Stafford, T., Hall, K. (2020). How to Do Sit Ups. **https://www.wikihow.com/Do-Sit-Ups**

Steber, C. (2022).7 Glute Bridge Exercises That'll Work All the Muscles In Your Butt. https:// www. bustle. com/ wellness/ glute-bridge-exercises

Tartibian, B., Heidary, D., Mehdipour, A., & Akbarizadeh, S. (2021). The effect of exercise and physical activity on sleep quality and quality of life in Iranian Older Adults: A systematic review. Journal of Gerontology, 6(1), 18-31.

Wang, W. L., Chen, K. H., Pan, Y. C., Yang, S. N., & Chan, Y. Y. (2020). The effect of yoga on sleep quality and insomnia in women with sleep problems: a systematic review and meta-analysis. BMC psychiatry, 20(1), 1-19.

Ware Jr, J. E., & Sherbourne, C. D. (1992). The MOS 36-item short-form health survey (SF-36): I. Conceptual framework and item selection. Medical care, 473-483.

Yuldasheva, A., Shokirova, S., Turaeva, G., Yusupova, U., & Parpieva, D. (2021). Risk Factors, Clinical Characteristics Juvenile Dysmenorrhea. Annals of the Romanian Society for Cell Biology, 737-745.