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ORIGINAL RESEARCH

PILATES EXERCISE EFFECTIVELY REDUCES MENSTRUAL PAIN IN ADOLESCENTS

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ABSTRACT

Dysmenorrhea, or menstrual pain, is a disruption in the flow of menstrual blood/pain during menstruation. If left untreated, dysmenorrhea can affect an individual's mental and physical function, necessitating non-pharmacological interventions. One such intervention is Pilates exercise. Pilates exercise can relax contracting muscles, stimulate the hypothalamus to produce endorphins as natural painkillers, resulting in a sense of comfort and reduced pain. This quasi-experimental study employed a non-equivalent control group design. The sample consisted of 15 adolescent girls selected through simple random sampling. Statistical analysis was conducted using the Wilcoxon test. The Wilcoxon test results showed a significant p-value of 0.001 < 0.05 ($p < \alpha$). Pilates exercise leads to increased elasticity of abdominal muscles and elevated oxygen levels. Additionally, prostaglandin hormones are released during menstruation, resulting in reduced pain. The body also stimulates the hypothalamus to produce endorphins as natural painkillers, inducing a sense of comfort. Pilates exercise has an effect on reducing menstrual pain in adolescents in the Luksongo hamlet of Tugurejo village, Ngasem district, Kediri regency. Therefore, adolescents are advised to incorporate Pilates exercise to alleviate dysmenorrhea without causing side effects.

Keywords

Pilates Exercise, Dysmenorrhea, Adolescents

INTRODUCTION

Reproductive health is of paramount importance and requires special attention, especially among adolescents. Adolescence signifies a transitional phase from childhood to adulthood, characterized by a broad spectrum of mental, emotional, social, and physical maturation (Elfira et al., 2017). Typically, adolescents undergo puberty, a phase marked by the maturation of the ovaries and regular menstrual cycles. Puberty is defined as the onset of sexual maturity, signified by the occurrence of menarche, the first menstruation, indicating a healthy reproductive system (Husna et al., 2021). The adolescent population in Indonesia reached 64.92 million in 2021, accounting for 23.90% of the country's total population according to the Central Statistics Agency (BPS).

Menstruation, a monthly shedding of the uterine lining, is a natural part of a woman's reproductive cycle regulated by hormonal interactions. Many women experience physical

discomfort several days before their menstrual period, a condition known as premenstrual syndrome (Fernindi & M.Ridwan, 2021). Menstrual disorders such as amenorrhea, dysmenorrhea, menorrhagia, metrorrhagia, oligomenorrhea, and premenstrual syndrome can occur, with dysmenorrhea being one of the most common complaints (Cahyanto et al., 2021). Dysmenorrhea, derived from the Greek words "dys" meaning difficult or painful, and "meno" meaning month, refers to painful menstrual periods. If left unaddressed, dysmenorrhea can significantly affect an individual's mental and physical function, necessitating prompt pharmacological or non-pharmacological interventions.

Non-pharmacological treatments, such as physical exercise, including Pilates, have been explored as alternatives for alleviating menstrual pain. Pilates, developed by Joseph Hubert Pilates in the early 20th century in Germany, has shown promise in improving symptoms associated with dysmenorrhea (Maharani, 2020). According to El-Kholy & Shalaby (2022), Pilates has been associated with improvements in primary dysmenorrhea symptoms. The aim of Pilates exercise is to engage contracting muscles and stimulate the hypothalamus to produce endorphins, providing pain relief and inducing a sense of comfort, thus reducing pain intensity.

Pilates exercises involve coordinated movements to enhance strength, flexibility, and endurance, with a focus on the core muscles, lower back, and pelvis. By engaging both superficial and deep muscles, Pilates promotes changes in muscle size, improves the muscle pump mechanism, enhances blood circulation, and reduces peripheral nerve hypersensitivity, leading to a change in pain quality (Saetikho & Ambarwati, 2017). Therefore, Pilates is considered a promising non-pharmacological intervention for managing dysmenorrhea, offering adolescents an alternative approach to alleviate menstrual pain effectively.

METHOD

The research adopts a quasi-experimental design with a non-equivalent control group, aiming to assess the effectiveness of Pilates exercise in alleviating dysmenorrhea among female adolescents in the Luksongo hamlet of Tugurejo village, Ngasem district, Kediri. Conducted in December 2023, the study population comprises 100 female adolescents, with a sample size of 15 selected using simple random sampling. Data collection involves pain assessment during menstruation and intervention through Pilates exercise sessions held three days a week over four weeks. Statistical analysis, including variance equality tests and bivariate analysis using SPSS software, will determine the impact of Pilates exercise on dysmenorrhea reduction, ensuring a comprehensive understanding of the intervention's efficacy in addressing menstrual pain among adolescents.

RESULTS

Table 1 Frequency Distribution Based on Adolescent Characteristics at the Luksongo hamlet of Tugurejo village, Ngasem district, Kediri.

Cathegory	F	(%)
Age		
13 Years	8	53.3
14 Years	6	40
15 Years	1	6.7
Age at Menarche		
10 Years	3	20
11 Years	6	40
12 Years	3	20
13 Years	3	20
Total	**15**	**100**

Source: Primary Data

According to Table 1, the majority of Based on the data in Table 1, it is known that the majority of respondents are 13 years old, totaling 8 individuals (53.3%), and nearly half

of the respondents experienced menarche at the age of 11, with 6 individuals (40%).

Table 2. The Level of Menstrual Pain Before Doing Pilates Exercise in Adolescents at the Luksongo hamlet of Tugurejo village, Ngasem district, Kediri.

Level of Menstrual Pain	F	(%)
Moderate Pain	10	66.7
Severe Pain	5	33.3
Total	**15**	**100**

Source: Primary Data

Based on the data in Table 2, it is known that the majority of respondents experienced moderate pain, totaling 10 individuals (66.7%) before undergoing Pilates Exercise.

Table 3 The Level of Menstrual Pain After Doing Pilates Exercise in Adolescents at the Luksongo hamlet of Tugurejo village, Ngasem district, Kediri.

Level of Menstrual Pain	F	(%)
Mild Pain	10	66.7
Moderate Pain	5	33.3
Total	**15**	**100**

Source: Primary Data

Based on the data in Table 3, it is known that the majority of respondents experienced mild pain, amounting to 10 individuals (66.7%), after undergoing Pilates Exercise.

Table 4 Analysis of the Effect of Pilates Exercise on Decreasing Menstrual Pain in Adolescents at the Luksongo hamlet of Tugurejo village, Ngasem district, Kediri.

Category	n	Median (Min-Max)	Mean ± s.d.	Mean Difference ± s.d.	p
Menstrual Pain Level Before Pilates Exercise	15	6 (5-8)	6.13 ± 0.915	3.067 ± 0.961	0.001
Menstrual Pain Level After Pilates Exercise	15	3 (1-5)	3.07 ± 1.163		

Source: Wilcoxon Sign Rank Test Statistical Test

Data in table 4 indicates that there is a difference in the mean pain score before treatment, which is 6.13, and after treatment, which is 3.07. The difference in mean pain score before and after treatment is 3.067. The Wilcoxon test results yielded a significant p-value of $0.001 < 0.05$ ($p < \alpha$), indicating that Pilates exercise has an effect on reducing menstrual pain in adolescents.

DISCUSSION

The data in table 2 shows that the majority of respondents experienced moderate menstrual pain, with 10 individuals (66.7%) before engaging in Pilates Exercise. Table 4.6 illustrates that the mean pain score before treatment was 6.13. The pain scale experienced by adolescent girls before treatment ranged from moderate to severe.

Consistent with Meidiana's research (2022), most of the female adolescents at Pondok Pesantren As Sa'adah experienced minor menstrual pain before being given Pilates exercise intervention. The majority experienced moderate pain, with 17 respondents (28.3%) during the pre-test phase, while the majority experienced mild pain after the intervention (post-test) with 20 respondents (33.3%). The Mann-Whitney test showed a mean difference value of 1.7000 with a result of 0.70221 in the intervention group and 2.0333 with a result of 0.66868 in the control group. Both groups showed a p-value of 0.000 after treatment. With a p-value greater than 0.05, the null hypothesis is rejected, indicating a significant effect of Pilates exercise on reducing dysmenorrhea pain in female adolescents at Pondok Pesantren As Sa'adah, Kaligawe, Semarang.

Dysmenorrhea is felt by adolescent girls during menstruation. Saputra's research (2020) explains that menstruation (periods) is a cyclic bleeding from the uterus as a sign that a woman's reproductive organs function. Normal menstruation function is the result of interaction between the hypothalamus, pituitary gland, and ovaries with related changes in target tissues in the normal reproductive tract. The ovaries play a significant role in this process because they are responsible for regulating cyclic changes and the duration of the menstrual cycle.

Every woman will experience problems during menstruation. One of them is called dysmenorrhea. Dysmenorrhea is pain during menstruation. Dysmenorrhea consists of a complex of symptoms such as lower abdominal cramps that radiate to the back or legs and are usually accompanied by gastrointestinal symptoms and neurological symptoms such as general weakness. Dysmenorrhea is the most commonly reported problem, occurring in 60%-90% of adolescents, and becomes a cause of reduced daily activities (Meidiana, 2022).

The endometrium experiences an increase in prostaglandins during menstruation, causing strong myometrial contractions and narrowing of blood vessels, resulting in pain. Several factors can cause dysmenorrhea, namely psychological factors, constitutional factors, and endocrine factors. Each factor has its role as a cause of dysmenorrhea pain (Elfira, 2017).

Destyaningrum's research (2017) on dysmenorrhea risk factors states that heavy menstrual flow, long menstruation periods, and a family history of dysmenorrhea are contributing factors. Adolescent girls experiencing menstrual pain may experience muscle cramps, especially in the lower abdomen, caused by strong and prolonged contractions of the uterine wall, leading to muscle fatigue and physical inactivity, thus requiring exercise. Muscle abdominal elasticity will be affected by the oxygen levels supplying the organs, resulting in pain reduction.

Non-pharmacological therapy to manage dysmenorrhea includes physical exercise (sports), warm compresses, massages, orgasms, dietary changes: reducing salt, getting enough rest, and relaxation exercises or yoga. One of the latest trends in the fitness world that can be used to reduce menstrual pain is Pilates exercise. Pilates Exercise is a workout that involves stretching and strengthening muscles in the core area, including the pelvic area, abdomen, and waist. Pilates movements are developed with controlled movements to build resilience, strength, and flexibility (Rani, 2022).

The main purpose of pilates is to improve spinal alignment and overcome potential problems, including reducing pain during menstruation. After completing the exercise, nerve impulses gradually slow down, heart function decreases, metabolism decreases, lower abdominal muscle elasticity increases, and sympathetic nerve fibers are stimulated to stimulate receptors in the hypothalamus and limbic system in the brain to produce and release hormones. Endorphins function to provide relaxation effects so that pain decreases (Meidiana, 2022).

The study assumes that the menstrual pain experienced by respondents is categorized as moderate to severe because the respondents have not yet received intervention in the form of Pilates exercises. Pilates exercises slow down nerve impulses, reduce heart rate, increase lower abdominal muscle elasticity, and stimulate the parasympathetic nerves to stimulate receptors in the hypothalamus and limbic system to produce relaxation hormones.

The data in table 3 shows that the majority of respondents experienced a decrease in pain level, with 10 individuals (66.7%) after doing Pilates Exercise. Table 4.6 shows that the mean pain score after treatment was 3.07. These results are consistent with Rani's research (2022), which suggests that Pilates exercise has

a positive effect on reducing primary dysmenorrhea pain in adolescent girls.

The Pilates method has been proven to be effective in preventing and treating various pathologies, as a form of physical conditioning, and to provide general well-being, strength, flexibility, postural harmony, motor control, body awareness, and body perception and can be an alternative non-drug in the treatment of Primary dysmenorrhea. This is because when doing Pilates exercises, nerve impulses are quickly received, heart rate increases, sympathetic nerves are stimulated. After doing Pilates exercise, nerve impulses slow down gradually, heart rate decreases, metabolism decreases, lower abdominal muscle elasticity increases, and sympathetic nerves stimulate receptors in the hypothalamus and limbic system in the brain to produce and release endorphins.

When endorphins are released, they will be captured by receptors in the hypothalamus and limbic system, which function to regulate emotions, provide relaxation effects so that pain decreases. Regular exercise increases blood circulation and oxygen levels so that blood flow and oxygen to the uterus become smooth and reduce pain during menstruation.

Table 4 shows that there is a difference in the mean pain score before treatment of 6.13 and after treatment of 3.07. The difference in mean pain scores before and after treatment is 3.067. The Wilcoxon test results yielded a significant p-value of $0.001 < 0.05$ ($p < \alpha$), meaning there is an effect of Pilates exercise on reducing menstrual pain in adolescents.

Pilates exercises focus on pelvic muscles and surrounding areas, which are believed to increase metabolism, hydroelectric balance, and hemodynamic condition adjustments, thereby increasing pelvic blood flow and reducing the level of primary dysmenorrhea in adolescent girls. Rani's research (2022) suggests that the best time for Pilates is in the afternoon without specific days and can be done before or during menstruation because in the afternoon, endorphin concentration is stable, as explained by Cahyanto (2021), in the afternoon, endorphin is higher, and in the evening, endorphin decreases, so the right time to do Pilates is in the afternoon.

The research results are in line with Joeng's research (2019), which obtained a p-value of 0.000. There is a significant difference before and after Pilates exercise. This can be seen from the increase in intensity before and after Pilates exercise from a mean of 42.50 to 48.13. The increase in skill in doing Pilates exercise also indicates accurate training doses in improving participant skills.

Furthermore, Meidiana's research (2022) found that Pilates exercises have an effect on reducing minor pain with a Mann-Whitney test result of -4.001 and a significant value of 0.000. The effectiveness of Pilates exercise on reducing Dysmenorrhea pain is the mean difference value in the intervention group was 1.7000 with a result of 0.70221 and the control group was 2.0333 with a result of 0.66868. There was no difference in the intervention and control groups, so both treatments had the same effect on the level of minor pain in adolescent girls at Pondok Pesantren As Sa'adah, Kaligawe, Semarang.

The research assumes that Pilates exercises can reduce pain experienced by respondents. Pilates exercises stimulate the limbic system and hypothalamus to produce endorphins, which are relaxation hormones. This is supported by the fact that respondents routinely do Pilates exercises every afternoon before menstruation the following month. In the afternoon, endorphin levels increase, so the relaxation effect can be felt by respondents.

CONCLUSIONS

Based on the research findings, it can be concluded that Pilates Exercise has a positive effect in reducing menstrual pain in adolescent girls. This exercise helps improve blood flow, correct muscle imbalances, and stimulate the release of endorphins, all of which contribute to reducing pain during menstruation. Therefore, Pilates Exercise can be considered an effective non-pharmacological therapy for alleviating discomfort experienced by adolescent girls during their menstrual periods.

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