The Effect of Yoga Exercise on Menstrual Pain Reduction

Wita Asmalinda1*, Leoni Ripayu Lukita1, Edy Sapada2
1Department of Midwifery Health Polytechnic Ministry of Health Palembang, Indonesia
2Siti Khadijah Institute of Health Science Palembang, Indonesia
*Email: wita_asmalinda@yahoo.co.id

ABSTRACT
Pain mechanism is an integrated process of sensory input, emotional and cognitive systems. The body responds to pain as a feeling of discomfort. Menstrual pain is caused by increased uterine contractions and angiospasm triggered by prostaglandins F2 and E2. This study aims to determine how yoga exercises reduce menstrual pain in high school students. This type of research is quasi-experimental with a comparison group (pre and post-test with control group design). The study was conducted at SMA Negeri 6 Palembang for 30 days, from October 10 to November 10, 2021. The study sample was all class XI students who met the inclusion and exclusion criteria of 50 respondents. The homogeneity of the respondents’ characteristics was assessed using the Kolmogorov-Smirnov test. Description analysis to determine the mean and standard deviation. The bivariate test used was Paired t-test with a significance degree of 0.05. From the results, it was found that the average score of menstrual pain was significantly decreased in the treatment group compared to the control group, with a p-value of 0.002. This study concludes that yoga exercise affects reducing menstrual pain.

Keywords: exercise; menstrual pain; yoga

ABSTRAK
kontrol dengan p-value 0,002. Simpulan dari penelitian ini adalah latihan yoga mempunyai pengaruh terhadap penurunan nyeri haid. 

**Kata Kunci:** latihan; nyeri haid; yoga

**INTRODUCTION**

Menstrual pain has become a common problem estimated to affect 50% of women's productivity (Sulaeman, R., 2019). Generally, adolescents who experience menstrual pain choose to rest and reduce or even stop their daily activities. (Sulaeman, R., 2019). According to the International Association for the Study of Pain (IASP), pain is defined as a sensory and emotional experience associated with a stimulus that has the potential to cause tissue damage. (Suwondo, BS., 2017; Adams MCB., 2021).

Pain mechanism is an integrated process of sensory input, emotional and cognitive systems. The body responds to pain as an uncomfortable feeling (Suwondo, BS., 2017). The body responds to pain as poison. The form of the response given by the body is to release pain mediators (Suwondo, BS., 2017). According to Horiba Y. (2015), menstrual pain is caused by increased uterine contractions and angiospasm triggered by prostaglandins F2 and E2. Adolescent girls who enter puberty experience pain in the supra-symphysis area during menstruation. The pain occurs because of the tension of the endometrial wall to drain menstrual blood (Arini, D., 2020).  

Menstrual pain (dysmenorrhea), according to Tataj-Puzyna U (2021), is a problem that requires intensive and specific treatment. Establishing the correct diagnosis and adequate treatment are the keys to successful treatment so that it does not develop into a more complex problem. Dysmenorrhea is divided into primary and secondary. Primary dysmenorrhea is mostly caused by hormonal factors and psychogenic factors (Ardhana., 2018). Secondary dysmenorrhea more often occurs due to abnormalities in the genital organs in the pelvic cavity. This dysmenorrhea is also called organic dysmenorrhea (Rahma, A., 2012). For women diagnosed with endometriosis, using contraceptives that are inserted into the uterus and tumors or polyps in the uterus can be a triggering factor for secondary dysmenorrhea (Rahma, A., 2012). According to Arini (2020), menstrual pain is caused by the effect of the hormone progesterone as an inhibitor of uterine contractility, in contrast to the effect of the hormone estrogen, which activates uterine contractility. The body's response to the work of these two hormones is the production of prostaglandin F2, which

DOI: 10.32668/jitek.v10i1.915
causes the contraction of the smooth muscle of the endometrial wall (Arini, D., 2020; Tataj-Puzyna U, 2021).

According to Andreini D and Bettinelli C (2017), aquatic activity reduces the menstrual pain scale. Complaints of menstrual pain often require pain management interventions. Alternative and complementary therapies, such as yoga techniques, can be an effective alternative for pain management and have no risks or side effects when applied appropriately (Andreini D, Bettinelli C., 2017; Duma S., 2019; Sherman KJ, Cherkin DC, Erro J., Miglioretti DL, Deyo RA. 2005). Dysmenorrhea pain occurs in the form of intermittent spasms in the supra-symphysis region. Yoga techniques can help relax muscles and reduce pain. Yoga also helps reduce stress and induce positive thoughts by increasing psychological well-being (Hapsari, IP., 2020). Potent myometrial stimulants and myometrial vasoconstriction activate the secretion of prostaglandin F2α, which results in an increase in the degree of dysmenorrhea. An increase in the degree of dysmenorrhea can be seen from an increase in uterine tone and contractions as well as vasopressin secretion, which results in a decrease in the rate of menstrual blood flow (Aprilyadi, 2018; Grandi, 2012; Zhu, X., 2016; Taneja, 2014).

According to research by Da N, Shimizu K, Suzu Eki S, Tanabe Y, Lee E, and Akama T. (2013), yoga can induce a relaxing effect, which is known to increase mucosal immune function on the expression of human b-defensin 2 HBD-2. Yoga is part of the mind-body-spirit exercise, which significantly affects the atmosphere of relaxation. According to research by Da N, Shimizu K, Suzu Eki S, Tanabe Y, Lee E, and Akama T (2013), yoga can induce a relaxing effect, which is known to increase mucosal immune function on the expression of human b-defensin 2 HBD-2. Yoga is part of the mind-body-spirit practice, which significantly affects relaxation. Yoga practice helps relaxation, which improves sleep quality. Yoga practice consists of breathing exercises (pranayama) and postures (asanas and mudras) (Nivethitha, 2016; Saeed, SA., 2019; Talib RA., 2020). Yoga practice focuses on healthy posture and flexibility of the spine and muscles. Stretching exercises stretch the muscles of the body in harmony with the regulation of calm breathing (Doina M-D., 2013; Saxena., 2017). Yoga exercises guided by the posture, namely the chest knee, can support muscles to become
stronger and more elastic, relax and relax the pelvic muscles, help improve blood circulation and reduce the menstrual pain threshold (Rahma, A., 2012). Research related to the benefits of using yoga to reduce menstrual pain has not been done much. This study aims to determine the effect of yoga on reducing menstrual pain scale in high school students. This study is different from previous studies because the respondents did yoga with a yoga video guide that had never existed in similar studies.

METHOD
This type of research is quasi-experimental with a comparison group (pre and post-test with control group design). This research was conducted at SMA Negeri 6 Palembang for 30 days, from October 10 to November 10, 2021. The population of this study was all students of class XI SMA Negeri 6. To determine the inclusion criteria, the researchers conducted a selection by giving questionnaires to respondents using google forms shared in WhatsApp groups. Respondents had to answer the following questions: do you menstruate regularly every month? Have you had menstrual pain (at least the last three months)? If you have period pain, please provide a pain scale that you feel. Menstrual pain is mild to severe (scale of 1-10). The number of respondents who met the inclusion was 50 people. The exclusion criteria in this study were respondents who suffered from illness during the research process.

The sampling method used is simple random sampling. To determine whether the respondent belongs to the treatment group or the control group, this is done by drawing lots by asking the respondent to choose numbers 1 and 2 on the google formula link shared in the WhatsApp group. Respondents who chose number 1 were included in the treatment group, and respondents who chose number 2 were included in the control group (no treatment).

In the Google formula, there are several items, including an explanation of the research objectives, research procedures, benefits, and risks as respondents in this study. After giving consent, the respondent then filled out the informed consent link. In order to minimize confounding factors, each research subject was asked about her willingness not to take medication and not to take medication/herbal medicine to reduce menstrual pain. Measurement of pain scale using the Numerical Pain Intensity Scale according to Hayward (Numeric Rating Scale, scale 0-10) (Arini, D., 2020; Aprilyadi, N., 2018). The independent variable in this study was yoga
exercise. Respondents watched and observed yoga videos given in WhatsApp groups. Yoga videos are created by professionals using yoga facilitators certified by Prenatal Gentle Yoga. After understanding the yoga movements, respondents were asked to practice these yoga movements for 30 days at night before going to bed. Tools and materials used in doing yoga include; the comfortable yoga room is equipped with air conditioning, mattresses, pillows, blocks, gym ball ropes, dispensers, and aromatherapy. Respondents are advised to wear sports clothes, have a cellphone, a WhatsApp application, and can access the google formula link. The dependent variable of this research is menstrual pain (dysmenorrhea). To monitor and evaluate, mentoring was carried out in the treatment group using a logbook (in the form of respondents' notes about the date and time when doing yoga exercises which were filled out every day for 30 days), video recordings, and documentation of yoga practices.

Yoga practice is done once a day with a duration of 20-25 minutes for 30 days. Respondents followed the yoga movements demonstrated by the yoga instructor from the video that was played during the exercise. Then the respondent did it independently while still playing the yoga video as a guide. The yoga movements are as follows: 1. One Warm-Up Movement; in a cross-legged sitting position in a relaxed position on the mat, regulate the breath using three breath cycles, hold the stomach with both palms, feel the breath, and the stomach will expand, inhale, exhale slowly, do it in a comfortable, relaxed and calm position. When you feel discomfort in your stomach, focus on switching to the breathing cycle, bringing the discomfort into the inhale, and releasing the discomfort along with the exhale. Repeat this movement several times. 2. 2nd Pressing Movement; Interlace your fingers in front of your chest, slowly push forward, continue to push up and hold for a moment (count 1-10), move your right side then left, feel this movement relaxes the tense abdominal wall, repeat for a few moments. Turn your arms back in front of your chest. Repeat this movement several times. The Movement to stretch the muscles; still, in a cross-legged sitting position, hold your right knee using the fingers of your left hand (crossed position), and pull your left hand towards the back of the body. Place your hands on the floor, slowly pull your body, and waist towards your hands, and hold for a few seconds for a count of 1-10. Perform the same Movement for the
opposite body parts, right and left, feel the stretch in the lower abdomen, relax more, and reduce menstrual pain complaints. Repeat this movement several times, 4. Movement for stretching; change the position of the feet; both feet are pulled back, parallel to the right and left feet, prepare two blocks, place them beside the right and left feet, and slowly pull the body back until both hands reach the blocks on the right and left feet. Hold both blocks using both fingers, head tilted upwards, hold for a few moments (counts 1-10), then slowly pull your right hand that is above the block forward, as well as your left hand, until now you are in a semi-sitting position, resting on both knees. In the next Movement, push your right hand forward, followed by your left hand; as far as possible, lower your head, face the mat, and hold for a moment. Pull your fingers to the side, like reaching for something, push both hands as far as possible; hold and repeat several times. 5. Cooling movement; in a sitting position, both in front, both legs dangling freely, place your hands on your knees, and move your toes around right and left. Movement relaxes your fingers; squeeze them, open them, and relax your body. For all samples, the degree of menstrual pain was measured using the Numerical Pain Intensity Scale according to Hayward (Numeric Rating Scale, scale 0-10). Next, a WhatsApp group was created for the treatment group and a WhatsApp group for the control group. In the treatment group, yoga videos were shared by certified yoga instructors, while in the control group, no yoga videos were shared. After 30 days of treatment, the degree of post-menstrual pain was measured for all samples. The data generated in this study is numerical. The homogeneity of the sample characteristic data and measurement results was assessed by using the Kolmogorov-Simov test (research samples were more than 30). The data shows that it is homogeneously distributed if the p-value > 0.05. If the data is not homogeneously distributed, then the data analysis uses a non-parametric test, namely the Wilcoxon test. The data obtained are data that, after treatment, were compared with the control group who were not treated with yoga practice. Therefore this study used an unpaired t-test (independent samples t-test). To facilitate data analysis using the SPSS (Statistical product and service solution) version 16 program. This research has received an ethical approval recommendation from the Palembang Health Polytechnic Research Ethics Commission Number. 0080 KEPK/Adm.2/II/2022.
RESULTS AND DISCUSSION

This research was conducted for 30 days. The results obtained are data before and after giving yoga videos. The data obtained in this study were then analyzed statistically which included a sample homogeneity test using the Kolmogorov-Simov test, descriptive analysis to determine the mean and standard deviation. The resulting data is homogeneously distributed.

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>Min</th>
<th>Maks</th>
<th>Mean</th>
<th>Median</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Menarche (year)</td>
<td>25</td>
<td>10</td>
<td>15</td>
<td>12.20</td>
<td>12.00</td>
<td>1.190</td>
</tr>
<tr>
<td>- Menstrual cycle (month)</td>
<td>25</td>
<td>1</td>
<td>2</td>
<td>1.20</td>
<td>1.00</td>
<td>0.464</td>
</tr>
<tr>
<td>- Duration of dysmenorrhea (day)</td>
<td>25</td>
<td>1</td>
<td>3</td>
<td>1.84</td>
<td>2.00</td>
<td>0.764</td>
</tr>
</tbody>
</table>

Table 1: Respondent characteristic

Table 1 Shows that of the 50 respondents, the lowest age at first menstruation (menarche) is ten years, and the highest is 15 years. The average menstrual cycle of the respondents was 1.20, the average length of dysmenorrhea in the treatment group was 1.84, and the control group was 1.80. The results of the normality test on the menstrual pain scale variable (dysmenorrhea) obtained data with normal distribution, then continued with Paired t-test. From the results of the study, it was found that most of the respondents experienced menstrual pain (dysmenorrhea) with a duration of between 3-5 days. From the results of interviews conducted with respondents in the intervention group, it was found that several respondents used analgesic drugs and non-steroidal anti-inflammatory drugs (NSAIDs) (Adams MCB; 2021; Suwondo, BS. 2017). It is important to understand the pain pathways and chemical mediators that play a role in the noxious stimulation of the perception of pain associated with the body. There are at least five electrophysiological processes, including; the transduction process, i.e., the process in which a noxious stimulus (mechanical, thermal, or chemical) is converted into electrical activity in nociceptors located at the nerve endings of C fibers or Aß fibers. Nociceptor activation begins with the depolarization of Ca++ ions, which is immediately followed by the entry of Na+ ions into the cell, generating an action potential that is believed to be the beginning of nociceptive propagation (Adams MCB; 2021; Suwondo, BS. 2017).
Damage to cells activates the release of hydrogen ions (H+) and potassium (K+), and arachidonic acid (AA) as a result of cell membrane lysis. This accumulation of arachidonic acid (AA) will trigger the secretion of the enzyme cyclooxygenase-2 (COX-2), which can convert arachidonic acid into prostaglandin E2 (PGE2), Prostaglandin G2 (PGG2), and prostaglandin H2 (PGH2). Prostaglandins, intracellular H+, and K+ ions are thought to be activators of peripheral nociceptors. They also initiate an inflammatory response and peripheral sensitization leading to edema and pain at the site of injury. Actually, besides being important in the inflammatory process, prostaglandins also sensitize nociceptors which help lower the pain threshold. The more prostaglandins formed, the more sensitive the nociceptors are, and the pain will increase. Conduction refers to the propagation of action potentials from peripheral nociceptive endings (nociceptors) through myelinated and unmyelinated nerve fibers. The central ends of these nerve fibers form synapses that communicate with second-order neuron cells in the spinal cord (Adams MCB; 2021; Suwondo, BS. 2017).

Nociceptive and non-noxious nerve fibers are grouped according to the presence or absence of myelin, diameter, and conduction velocity. The cell bodies of neurons are located in the central nervous system (e.g., anterior horn of the spinal cord, cranial nerve nuclei in the brainstem). Nerve cells are surrounded by satellite cells and surrounded by Schwann cells. The size of the cell body varies greatly, and dendrites are the nerve fibers that carry impulses away from the neuron. Neurological abnormalities are rare in dendrites but often involve axons. Axons can be very long and reach over a meter, and can conduct impulses at speeds of up to 100 meters per second. Most of the axons are visible to the naked eye. Axons are wrapped by an adhesive from a mixture of fat and protein called myelin, which can increase the speed of conduction of nerve impulses traveling along the axon (Adams MCB; 2021; Suwondo, BS. 2017).

Table 2. Differences in the Mean Value of Menstrual Pain Scale Before and After Yoga Exercise (Treatment Group)

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>Mean± SD</th>
<th>Min-Maks</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-menstrual pain scale</td>
<td>25</td>
<td>6.16±2.809</td>
<td>1.00-10.00</td>
<td>0.000</td>
</tr>
<tr>
<td>Post-menstrual pain scale</td>
<td>25</td>
<td>2.84±2.211</td>
<td>0.00-7.00</td>
<td></td>
</tr>
</tbody>
</table>

DOI: 10.32668/jitek.v10i1.915
Table 2 shows that the average value of the menstrual pain scale before treatment is 6.16 + 2.809 and after treatment is 2.84 + 2.211 with a mean difference of 3.32. The statistical test results obtained p-value 0.000 meaning there is a significant difference in the menstrual pain scale before and after yoga exercise. According to Raina M (2018), yoga is thought to be able to improve cardiovascular function and benefit mental and physical health by regulating access to the hypothalamic-pituitary-adrenal cortex (HPA) and hypothalamic-pituitary-sympathetic adreno-medullary (SAM) system, improving balance and fatigue. The average value of the menstrual pain scale before treatment is 6.16 + 2.809 and after treatment is 2.84 + 2.211, with a mean difference of 3.32. Statistical test results obtained p-value 0.000, meaning that there is a significant difference in the menstrual pain scale before and after doing yoga. According to Raina M (2018), yoga is considered to improve cardiovascular function and benefit mental and physical health by regulating access to the hypothalamic-pituitary-adrenal (HPA) and hypothalamic-pituitary-sympathetic-adreno-medullary (SAM) systems which promote balance and relaxation reduce fatigue.

According to Cholifah (2015), yoga that is done regularly has an impact on increasing b-endorphins up to 5 times. The initial process of yoga is to focus on controlling the breath while inhaling, relaxing the muscles, causing pain, and diverting it to exhale slowly between the noses (Doina, 2013; Doulatabad, S., 2013; Aprilyadi, N., 2018; Jeon, SH., 2016). Feelings of comfort will activate the hypothalamus to release endorphins which have a natural sedative effect (natural painkillers), thereby spreading a sense of comfort (Nivethitha, 2016; Talib, 2019; Hapsari, 2020; Arini, D., 2020). Maximum stretching exercises of the muscles around the spine, waist, and pelvis in harmony with calm breathing are believed to support the reduction of tension in the endometrial muscles and connective tissue (Doina, M-D., 2013; Saeed, SA., 2019; Saxena, 2013). 2017; Maheswari, PD., 2021). According to Arini, D (2020) and Doina, M-D (2013), yoga activities that are done regularly can increase the vital capacity of the lungs, reduce body, mind, and mental tension, and, most importantly, reduce menstrual pain.

The effect of yoga, according to Da N and Shimizu K (2013), is to increase alpha waves and reduce serum cortisol levels, which are included in the catabolic

DOI: 10.32668/jitek.v10i1.915
glucocorticoid (stress hormone) group. According to Da N’s research, Shimizu K (2013), there was a significant difference in HBD-2 expression levels in respondents after being given yoga practice for two weeks. The stressors experienced by adolescent girls stimulate the release of cortisol, a catabolic glucocorticoid from the hypothalamic-pituitary-adrenal (HPA) axis and the hypothalamic-pituitary-sympathetic-adrenal-medullary (SAM) system, which activates the sympathetic nervous system to secrete the hormones epinephrine, norepinephrine, and dopamine, which the body expresses as physical stress (Asmalinda, W., 2018). The body's response is to increase heart rate, cardiac contractility, increase cardiac, smooth muscle contraction, and blood pressure (Wang, YJ., 2013). Lysosomal membrane labilization, which activates the secretion of the enzyme phospholipase A2, which in turn will hydrolyze phospholipid compounds present in the endometrial cell membrane and produce arachidonic acid (Hapsari, 2017).

Secretion of arachidonic acid and damage to the endometrial wall will activate the arachidonic acid cascade and produce prostaglandins PGE2 and PGF2, which are biomarkers for increasing uterine myometrial dysrhythmias, vasoconstriction of blood vessels (Rahma, A., 2012), which in turn reduces blood flow to the uterus and causes ischemia. Tissue that is suspected as a trigger for menstrual pain (Hapsari, 2017; Ardhana, M., 2018) and tissue hypoxia which can interfere with the reoxidation of nicotinamide adenine dinucleotide-hydrogen (NADH) (Ardhana, M., 2018). Prostaglandin PGF2 secretion has an effect on intense vasoconstriction, increases spasm of blood vessel walls, and causes changes in pulse waves (Jean, SH., 2017), causing sensitization, lowering the pain threshold at the afferent nerve endings of the pelvic nerves (Hapsari, 2017; Huang, Aj., 2017).

Table 3. Differences in the Mean Value of Menstrual Pain Scale (Control Group)

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>Mean ± SD</th>
<th>Min-Max</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-menstrual pain scale</td>
<td>25</td>
<td>5.24±2.538</td>
<td>1.00-10.00</td>
<td>0.022</td>
</tr>
<tr>
<td>Post-menstrual pain scale</td>
<td>25</td>
<td>5.04±2.458</td>
<td>1.00-10.00</td>
<td></td>
</tr>
</tbody>
</table>

From Table 3 it is known that the average value of the menstrual pain scale in the beginning of menstruation is 5.24 ± 2.538 and at the end of menstruation is 5.04 ± 2.458 with a mean difference of 0.2. Statistical test results obtained p-value 0.022 meaning that there is a significant difference in the menstrual pain scale before and after yoga in
the control group. From the results of measuring the degree of pain in the control group before and after the measurement, it was found that about 32% of respondents experienced a decrease in pain level, and 78% of respondents did not experience a decrease in pain level. Some of the control group respondents had a high degree of pain in the pre-data, so the post-measurement results also remained high. There are many ways to deal with menstrual pain such as distraction exercises from menstrual pain. Respondents are in their teens who have the ability to shift the focus of attention to fun things and busy themselves with school tasks so that painful stimuli are not the main focus. There are two types of distraction measures, active and passive. The difference between the two types is the degree to which the respondent engages in diverting the action to the painful stimulus. Active distraction techniques will make teenagers actively participate in the given distraction activities, such as singing. In contrast to the passive distraction technique, adolescents only follow the given distraction method passively, for example listening to music. For this reason, even though no intervention was given to the control group, the level of pain can also be reduced. According to Lee's research (2014), regular yoga practice three times a week for 12 weeks can significantly increase serum levels of Brain-derived neurotrophic factor (BDNF) and serotonin, which have an important role in central nervous system neuroplasticity, which is important in regulating sensory neurotransmission, brain and spinal cord modulating neuropathic pain.

Table 4. Differences in the Mean Value of Menstrual Pain in The Yoga Treatment Group with Control Group

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>Mean± SD</th>
<th>Min-Max</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-menstrual pain scale</td>
<td>25</td>
<td>2.84±2.211</td>
<td>0.00-7.00</td>
<td>0.002</td>
</tr>
<tr>
<td>Treatment group</td>
<td>25</td>
<td>5.04±2.458</td>
<td>1.00-9.00</td>
<td></td>
</tr>
<tr>
<td>Post-menstrual pain scale</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From Table 4. above, it is known that the average value of the postmenstrual pain scale in the treatment group is 2.84+2.211, and the average value of the postmenstrual pain scale in the control group is 5.04+2.458 with a difference in mean 2.2. Statistical test results obtained p-value 0.002, which means that there is a significant difference in the average menstrual pain scale in the treatment group with the average value of the control group. According to Ardhana (2018), many factors trigger the occurrence of dysmenorrhea, including the imbalance of adolescent girls'
emotional factors which tend to increase before entering the menstrual cycle, in addition to constitutional, hormonal factors, and finally allergic factors which also predispose them to the occurrence of dysmenorrhea. The constitutional factor is a state of hormonal imbalance or the presence of a chronic disease experienced by young women. The condition that is often experienced is iron anemia. Adolescent girls who apply an inappropriate diet have the potential for iron assimilation (Ardhana, 2018). Under such conditions, the effect of decreasing blood flow and activation of the myometrium results in uterine hypoxia. This hypoxic condition is thought to be able to lower the pain threshold and ultimately increase the menstrual pain scale (Ardhana, 2018).

CONCLUSION
Based on the results of the analysis, there was a significant decrease in the average value of menstrual pain in the treatment group compared to the control group. It can be concluded that yoga exercise has an effect on decreasing the menstrual pain scale in high school students. It is recommended to conduct further research on menstrual cycle variables and at the molecular level on prostaglandin parameters.

ACKNOWLEDGEMENT
The members of this research team grateful to the Director of Health Polytechnic Ministry of Health Palembang and the Principal of SMA Negeri 6 Palembang for their support during the research process.

REFERENCES


DOI: 10.32668/jitek.v10i1.915


Duma, S. (2019). 'Is exercise and yoga a panacea for recovery from sexual violence?: Knowing the risks and benefits of yoga and exercise is important', *Journal Evidance Based Nursing*, 22(2), pp. 56. doi:10.1136/ebnurs-2018-103045


DOI: 10.32668/jitek.v10i1.915


Rahma, A. (2012) 'Description of the degrees of dysmenorrhea and treatment efforts in arjuna vocational high school students, Depok, West Java', Thesis at the Faculty of Medicine UIN. Sharif Hidatullah.


DOI: 10.32668/jitek.v10i1.915


DOI: 10.32668/jitek.v10i1.915