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THE EFFECT OF RELAXATION AND STRETCHING EXERCISES ON PAIN AND QUALITY OF LIFE IN WOMEN WITH PRIMARY DYSMENORRHEA

MASTER THESIS

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İSTANBUL-2023

TEZ ONAYI FORMU

Kurum : Yeditepe Üniversitesi Sağlık Bilimleri Enstitüsü

Program : Fizyoterapi ve Rehabilitasyon Yüksek Lisans Programı

Tez Başlığı : The Effect of Relaxation and Stretching Exercises on Pain and Quality of Life in Women with Primary Dysmenorrhea

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Sınav Tarihi : 18.07.2023

Bu çalışma jurimiz tarafından kapsam ve kalite yönünden Yüksek Lisans Tezi olarak kabul edilmiştir.

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ONAY

Bu tez Yeditepe Üniversitesi Lisansüstü Eğitim-Öğretim ve Sınav Yönetmeliğinin ilgili maddeleri uyarınca yukarıdaki jüri tarafından uygun görülmüş ve Enstitü Yönetim Kurulu'nun ……tarih ve ..... sayılı kararı ile onaylanmıştır.

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DECLARATION

I hereby declare that this thesis is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material that has been accepted for the award of any other degree except where due acknowledgment has been made in the text.

Pelin Zöhre, PT.

DEDICATION

I dedicate my thesis to my family, who have supported me. My special thanks go out to my mother, Hülya Zöhre, and my father, Tamer Zöhre, whose moral and material support I felt for my education. I would also like to thank my siblings Kaan Zöhre and İdil Karen Zöhre, who cheered and supported me during my thesis writing process.

ACKNOWLEDGEMENTS

I want to thank my esteemed advisor, Ass. Prof. Dr. Elif Develi, for helping me pass my thesis process, which is a complex and challenging path, in the easiest way and for always showing her trust in me.

I would like to special thank my dear life partner PT. Şafak Özsönmez for always being with me and consistently trying to provide the necessary motivation to write my thesis.

I would like to thank my mother-half, Funda Zöhre and my father-half, Yusuf Zöhre for always being there for me, paving my way in every situation, and supporting me.

I want to thank my dear friend PT. Canan Eren, whom I have always spent shoulder-to-shoulder during my master's degree.

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LIST OF SYMBOLS AND ABBREVIATIONS

PD	Primary Dysmenorrhea
SD	Secondary Dysmenorrhea
HRQoL	Health-Related Quality of Life
PG	Prostaglandin
NSAIDs	Non-Steroidal Anti-Inflammatory Drugs
WHO	World Health Organization
cAMP	Cyclic Adenosine Monophosphate
PGF2α	Prostaglandin F(2α)
PGE2	Prostaglandin E_2
BMI	Body Mass Index
QoL	Quality of Life
REM	Rapid Eye Movement
TENS	Transcutaneous Electrical Nerve Stimulation
PSN	Presacral Neurectomy
LUNA	Laparoscopic Uterosacral Nerve Ablation
VAS	Visual Analog Scale
MSQ	The Menstrual Symptom Questionnaire
SF-12v2	Short Form 12v2 Health Survey
PPTs	Pain Pressure Thresholds
SP	Symphysis Pubis
SIAS	Spina Iliaca Anterior Superio

ABSTRACT

ZÖHRE, P. (2023). The Effect of Relaxation and Stretching Exercises on Pain and Quality of Life in Women with Primary Dysmenorrhea.
Yeditepe University, Institute of Health Science, Department of Physical Therapy and Rehabilitation Master Thesis, Istanbul.

The study aims to examine the effect of stretching and relaxation exercises on pain and quality of life in women with primary dysmenorrhea (PD). This randomized study included 20 volunteers divided into the Experimental Group (n=10) and Control Group (n=10). Although all participants did stretching exercises three days a week for four weeks, the Experimental Group also did relaxation exercises daily. Pain thresholds of all participants were measured with an Algometer before and after the intervention. Moreover, they filled Visual Analog Scale (VAS), Menstrual Symptom Questionnaire (MSQ), and Short Form 12v2 Health Survey (SF-12v2) before and after interventions. The study's results showed that while the pain experienced by the participants during their menstrual period decreased significantly in both groups, the decrease was more pronounced in the Experimental Group ($p<0.05$). Furthermore, the MSQ scores decreased in both groups, but the Experimental Group saw a more significant decrease ($p<0.05$). Quality of life (QoL) assessment using the SF-12v2 revealed a statistically significant improvement in both groups ($p<0.05$). Furthermore, we could not obtain a meaningful result from the measurements taken with the algometer device ($p>0.05$). In conclusion, it was found in the study that stretching exercises had positive effects on pain, menstrual symptoms, and quality of life in women with PD. Still, these effects were more effective in combining stretching and relaxation exercises. We can suggest combining stretching and relaxation exercises to improve quality of life, reduce pain, and alleviate symptoms experienced during the menstrual period.

Keywords: Primary Dysmenorrhea, Stretching Exercise, Relaxation Exercise, Menstruation, Menstrual Symptom, Pain, Quality of Life

ÖZET

ZÖHRE, P. (2023). Primer Dismenoreli Kadinlarda Germe ve Gevşeme Egzersizlerinin Ağrı ve Yaşam Kalitesi Üzerine Etkisi.
Yeditepe Üniversitesi Sağlık Bilimleri Enstitüsü, Fizyoterapi Ve Rehabilitasyon Anabilim Dalı Yüksek Lisans Tezi, İstanbul.

Bu çalışma, primer dismenoresi (PD) olan kadınlarda germe ve gevşeme egzersizlerinin ağrı ve yaşam kalitesi üzerine etkisini incelemeyi amaçlamaktadır. Bu randomize çalışma, Deney Grubu (n=10) ve Kontrol Grubu (n=10) olarak ayrılan 20 gönüllüyü içermektedir. Dört hafta boyunca tüm katılımcılar haftada üç gün esneme egzersizleri yapmasına rağmen Deney Grubu her gün gevşeme egzersizleri yapmıştır. Tüm katılımcıların ağrı eşikleri müdahalelerden önce ve sonrasında Algometre cihazı ile değerlendirildi. Ayrıca müdahalelerden önce ve sonra Görsel Analog Skala (VAS), Menstrüel Semptom Anketi (MSQ) ve Kısa Form-12v2 Sağlık Anketi (SF-12v2) doldurdular. Çalışmanın sonuçları, katılımcıların adet döneminde yaşadıkları ağrının her iki grupta da anlamlı olarak azaldığını gösterirken, Deney Grubundaki düşüşün daha belirgin olduğunu gösterdi ($p<0,05$). Ayrıca MSQ puanları her iki grupta da düşerken, Deney Grubunda daha fazla düşüş olduğu görüldü ($p<0.05$). SF-12v2 kullanılarak yapılan yaşam kalitesi (QoL) değerlendirmesi, her iki grupta da istatistiksel olarak anlamlı bir iyileşme gösterdi ($p<0.05$). Ayrıca algometre cihazı ile yapılan ölçümlerde anlamlı bir sonuç elde edilemedi ($p>0.05$). Sonuç olarak, çalışmada PD'li kadınlarda germe egzersizlerinin ağrı, adet semptomları ve yaşam kalitesi üzerine olumlu etkileri olduğu bulundu. Yine de bu etkiler, germe ve gevşeme egzersizlerini birleştirmede daha etkiliydi. Yaşam kalitesini artırmak, ağrıyı azaltmak ve adet döneminde yaşanan semptomları hafifletmek için esneme ve gevşeme egzersizlerini bir arada önerebiliriz.

Anahtar Kelimeler: Primer Dismenore, Germe Egzersizi, Gevşeme Egzersizleri, Menstruasyon, Menstruel Semptom, Ağrı, Yaşam Kalitesi

1. INTRODUCTION AND PURPOSE

The menstrual cycle refers to the monthly changes in the entire body, particularly in the reproductive organs, from menarche to menopause, for the reproductive functions to continue. An ovum grows, matures, and becomes ready for fertilization with each cycle. The endometrium is being prepared for the fertilized ovum in the meantime. If fertilization has not occurred, that is, pregnancy has not occurred, the functional layer of the endometrium is shed, and menstruation occurs (1). Furthermore, this cycle does not always occur as it should, leading to premenstrual syndrome, amenorrhea, abnormal uterine bleeding, and dysmenorrhea in women. Dysmenorrhea, characterized by uncomfortable cramping, is one of the most common issues among these problems (2).

The release of prostaglandins (PG) into the uterine tissue is assumed to cause dysmenorrhea. Among young and adult women, it is one of the most frequent causes of pelvic pain and temporary absences from work or school (3). Dysmenorrhea is divided into two categories based on its pathophysiology: Primary Dysmenorrhea and Secondary Dysmenorrhea (SD). While PD is typically seen in adolescents and young adults and does not have an underlying pathology, SD can be diagnosed with an underlying pathology (endometriosis, fibroids, adenomyosis, etc.) (4,5,6). The prevalence of SD is 10.5%, while the prevalence of PD is 63.3% (5). Many women with PD may experience daily activity restrictions, decreased academic achievement, and increased medical expenses for health care.

The prevalence of PD is highest in the 16-25 age group, and these crampy, painful menstrual periods often occur in the middle of the lower abdomen. However, they can also affect the inner thighs and lumbar region (9). Other symptoms like nausea, vomiting, diarrhea, headache, and back pain are related to dysmenorrhea (7). Disorders of the menstrual cycle and PD may be made worse by emotional and behavioral issues. For instance, PD and the functioning of the menstrual cycle are reportedly impacted by depression and/or anxiety symptoms. Adolescent women's health-related quality of life (HRQoL) may be compromised due to PD’s detrimental impact on a person's psychological state (8).

As a result, the standard first-line treatment for dysmenorrhea is non-steroidal anti-inflammatory drugs (NSAIDs). In the literature, alternative therapies such as acupuncture, acupressure, yoga, and attending regular exercise programs are also recommended for women with PD (10). On the other hand, it has been suggested that exercise can also help dysmenorrhea (11).

Exercise has been recommended as a treatment for the physical symptoms of dysmenorrhea (12). Through several mechanisms, such as endorphin release, and increased blood flow, and a reduction in anxiety and stress, exercise, yoga, and attending regular exercise programs may also help to reduce the symptoms of dysmenorrhea (11). Moreover, aerobic and anaerobic exercise intervention studies have shown reductions in sadness, anxiety, and exhaustion and increases in positive mood and self-esteem (13).

Although there is a plethora of research on the effects of stretching exercises, there are comparatively few studies on relaxation exercises that involve the brain and body working together. Taking into account the muscle cramps associated with PD, relaxation exercises may be beneficial in diminishing muscle cramps and modulating the parasympathetic nervous system. Regarding these points, the study aimed to examine the effect of stretching and relaxation exercises on pain and quality of life in women with PD.

Two hypotheses of this study were:

H0: There is no significant difference in pain and quality of life in the comparison of the group with stretching exercises and the group with stretching and relaxation exercises.

H1: There is a significant difference in pain and quality of life in the group with stretching and relaxation exercises compared to the group with stretching exercises.

2. THEORETICAL INFORMATION AND LITERATURE

2.1. MENSTRUATION

“Health” is “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity,” according to the World Health Organization (WHO) (14). Between menarche and menopause, most women menstruate, and menstruation can considerably impact a woman's physical, emotional, and social well-being. Menstrual health is a crucial aspect of a woman's overall well-being (15).

Normal menstruation is characterized by cyclic bleeding from the uterine corpus that occurs between the onset of menstruation and the cessation of menstruation. 4 basic domains can be used to describe it:

- Frequency of bleeding episodes,
- Regularity or predictability of these events,
- Duration of bleeding episodes, and
- Volume or heaviness of bleeding (16).

Regular menstrual cycles typically last 2–7 days and range in length from 21–45 days in the first years following menarche. Due to anovulatory cycles, cycles are irregular in the first two to three years following menarche. Approximately six years following menarche, regular cycles start. The cycle typically lasts 28 days (17-18).

2.2 DYSMENORRHEA

A menstrual cycle characterized by painful uterine flow is referred to as dysmenorrhea. Besides headache, nausea, diarrhea, dizziness, exhaustion, and mood changes, it is often accompanied by lower pelvic discomfort or throbbing pain. Some women may also experience low back pain and pain extending down to the anterior thighs (19). It affects 16% to 90% of women and is the most prevalent gynecological disorder (20). College students frequently experience dysmenorrhea, which has numerous physical effects and corresponding activity restrictions (21).

The two subtypes of dysmenorrhea are primary and secondary dysmenorrhea. PD is painful menstruation that begins shortly after menarche and lacks a clear etiology. Nevertheless, secondary dysmenorrhea has a later onset and is caused by a pathological condition (22).

- **Primary Dysmenorrhea:** This condition persists throughout all ovulatory cycles and often starts 6–12 months after menarche. Menstrual pain often lasts between 48 and 72 hours and starts as soon as menstrual discharge starts or a few hours before it does. Cramping, menstrual discomfort usually starts in the suprapubic area and radiates to the back and inner thighs, but it never goes below the knees (6-18). In more than 50% of patients, pelvic discomfort is accompanied by one or more systemic symptoms. Symptoms include headaches, tiredness, diarrhea, nausea, and back pain. Anxiety, vertigo, and in some extreme situations, syncope can also happen. Generally speaking, increasing blood flow reduces pain (18-23).

- **Secondary Dysmenorrhea:** A specific illness or organic pathology causes painful periods in secondary dysmenorrhea (18-24). Compared to primary dysmenorrhea, secondary dysmenorrhea occurs later. Pain typically lasts for more than two to three days or happens during the menstrual cycle. Endometriosis, adenomyosis, myoma uteri, endometrial polyp, previous pelvic infections, intrauterine device use, congestion in internal genital organs, uterine position anomalies, cervical stenosis, right vena ovarian syndrome, traumas, and gynecological procedures are examples of organic causes of pain. There could be congenital uterine abnormalities and soft tissue injuries (18-25).

2.2.1. EPIDEMIOLOGY OF PRIMARY DYSMENORRHEA

Although it is likely greatly underestimated, PD is considered the most prevalent gynecological condition in young women and adolescents, with prevalence estimates reported in the literature ranging from 16% to 95% (20-26). While some women have mild menstrual discomfort, others have severe limitations on their daily activities. Lower abdomen and back discomfort are the menstruation symptoms most closely linked to absences from or reduced effectiveness at work and school (4). Up to 15% of women with PD have symptoms severe enough to keep them from going to work, school, or other

activities (26,27). Still, even for women who do not miss work or school due to menstrual-related symptoms, the decreased productivity and focus that such symptoms can bring can negatively affect performance (28). Absenteeism and decreased effectiveness at work or school may also be caused by a lack of access to feminine hygiene products. The literature that is currently available on the impact of menstruation on performance, however, does not explicitly address the significance of access to necessary resources. Inadequate management of PD will enhance the overall quality of life and reduce financial and academic obligations for many women. PD is frequently underreported and undertreated (24).

2.2.2. PATHOPHYSIOLOGY OF PRIMARY DYSMENORRHEA

An increase in PD leads to elevated levels of PG, leading to hypercontractility of the myometrium, uterine muscle ischemia and hypoxia, and pain (29). Arachidonic acid, a major component of phospholipids in cell membranes, is one of the long-chain polyunsaturated fatty acids employed in producing PG. The availability of free fatty acid components limits the synthesis of cyclic adenosine monophosphate (cAMP). Therefore, mechanical stimulation and tissue strain can also lead to PG production through the cAMP pathway, in addition to adrenaline, peptide, and steroid hormones (24).

The lysosomal enzyme phospholipase A2 produces arachidonic acid from phospholipids. Progesterone is one of the variables that regulate the stability of lysosomal activity. High progesterone levels reinforce lysosome activity. The stabilizing effect of the corpus luteum on endometrial lysosomes is reduced when it declines in the late luteal phase, the aforementioned event caused the activation of phospholipase A2 and the breakdown of cell membrane phospholipids, resulting in the generation of arachidonic acid and eicosatetraenoic acid. These substances serve as the foundation for the COX and lipoxygenase pathways. Hence, increased arachidonic acid availability, intracellular apoptosis, and tissue damage during menstruation stimulate PG synthesis. Also, it was able to deduce that dysmenorrhea only happens during ovulatory cycles (27,30,31).

Prostaglandin E2 (PGE2) and prostaglandin F(2α) (PGF2α) are two of the nine types of prostaglandins that have been associated with the cause of PD. PGF2α is more significant in dysmenorrhea than PGE2 because it promotes uterine vasoconstriction and myometrial contraction, whereas PGE2 only relaxes or contracts the myometrium. PG has several

effects, including pain, regulating sleep, body temperature, and inflammation. As PG levels increase, the intensity and severity of menstrual cramps and related symptoms also tend to increase (24). Dysmenorrhea is characterized by increased active intrauterine pressure (>120 mmHg), heightened uterine contractions, increased frequency of contractions, elevated resting tone (>10 mmHg), uncoordinated contractions, and increased prostaglandin levels. These abnormalities cause painfully low uterine perfusion (24,27).

There is considerable disagreement about whether or not women with dysmenorrhea are more sensitive to pain than healthy women (24). This is due to the heightened peripheral nociceptive input from the sexual organs during menstruation, which leads to increased excitability of somatovisceral convergent neurons in the spinal cord and, consequently, enhanced pain perception (31,32). Women with dysmenorrhea were found to have alterations in brain volume, including a decrease in gray matter volume linked to pain transmission and sensory processing, as well as an increase in gray matter volume in regions associated with pain modeling and endocrine function regulation. These modifications encourage the facilitation of pain to be amplified (33).

2.2.3 RISK FACTORS OF PRIMARY DYSMENORRHEA

Non-modifiable and behavioral risk factors are the two main risk factors for PD (34). Non-modifiable risk factors for dysmenorrhea include having a family history of the condition, particularly in a first-degree relative, being under the age of 20 and experiencing symptoms that are more severe during adolescence, having menarche before the age of 12 due to early onset of ovulatory cycles, experiencing menstrual flow lasting more than seven days, and being nulliparous (35,36,37). Body mass index (BMI) lower than 20 or higher than 30, inadequate intake of certain foods or overindulgence (insufficient consumption of foods such as fruit, eggs, fish (omega 3), vitamin E, B1, and B6 deficiency; high consumption of fast food, salt, coffee (causes vasoconstriction)), smoking (nicotine causes vasoconstriction), have malnutrition, and psychosocial symptoms like depression and anxiety are also behavioral risk factors. Moreover, primary dysmenorrhea may be favored by a complex relationship with the parents (35,36,38,39).

2.2.4 PRIMARY DYSMENORRHEA AND QUALITY OF LIFE

The symptoms of dysmenorrhea are reported to have negative consequences on various facets of women's personal lives in cross-sectional studies of various sizes, including thousands of women or teenagers with the condition globally. They comprise interpersonal links with family and friends, academic and professional performance, and social activities (40,41,42). In females with PD, the rate of school absence varied between 14% and 51%. It has been noted that student's attendance in class drops by 29% to 50% during their periods (43).

According to earlier research, PD is among the main reasons people miss out on school or jobs, costing the US economy $2 billion a year and 600 million lost hours annually (44). Young women with PD had the lowest QoL scores in the pain domain, according to a study from Hong Kong (45). A study conducted in Palestine found that more than half of university students with dysmenorrhea often skip classes due to the severe discomfort caused by their menstrual periods (46). A similar trend was observed in a Turkish study, which showed a decreased perception of quality of life among adult females, further supporting this finding (43).

Compared to healthy women, women with severe dysmenorrhea have shorter rapid eye movement (REM) sleep and decreased sleep quality. Comparatively, to a painless phase of the menstrual cycle, complaints of sleep disturbance were also reported to rise throughout the menstrual period (47).

Every menstrual cycle, albeit it lasts only a few days, pain in PD has features of both chronic and acute pain (48). Reduced quality of life is directly correlated with chronic pain (49). Compared to healthy women, it was discovered that women with dysmenorrhea had considerable QOL scores in physical and social functioning, physical discomfort, and general perceptions of health (43,50).

2.2.5 TREATMENT OF PRIMARY DYSMENORRHEA

The major goal of PD treatment is to give dysmenorrheic females sufficient pain relief so they may go about their daily lives pain-free, enhance their quality of life, and reduce their absence from school or work (51). Primary dysmenorrhea can be treated with three different approaches: pharmacological, non-pharmacological, and surgical (27).

2.2.5.1 Pharmacological

NSAIDs are excellent analgesics and anti-inflammatory drugs most frequently used to treat PD (52,53). As they impede the activity of cyclooxygenase, which hinders the production of PG, they are considered the foundation of PD management (54). Consequently, NSAIDs are recommended as the initial treatment for women who prefer taking analgesics or in circumstances where using contraceptives is not recommended (29,51). There are two mechanisms in action. PG synthesis is inhibited and, cyclooxygenase activity is stopped. Decreased levels of endometrial PG are associated with a return to regular uterine contraction patterns and reduced menstrual pain (55). It has few side effects, mostly related to digestive issues such as nausea, vomiting, and heartburn, which are well tolerated (31, 51, 55). There is limited evidence to suggest that one NSAID is superior to another; therefore, cost, side effect profiles, and dosing schedule are all valid factors to consider when selecting a medication to take (56,57).

Because nitric oxide causes smooth muscle relaxation, drugs that raise nitric oxide levels may lessen the pathological uterine contractions that cause dysmenorrhea (6). Nitric oxide generation is also decreased when progesterone levels fall (56).

In the treatment of primary dysmenorrhea, vitamin E may be helpful (46). Vitamin E (200–400 international units) considerably decreased dysmenorrhea, according to several small studies (58). However, a Cochrane Review found no solid supporting data for its effectiveness and concluded that more research is required (59).

Magnesium relaxes muscles, lowers menstrual fluid PGF2α, and increases vasodilation. Magnesium has been demonstrated in various studies to be a more effective pain reliever than a placebo; however, the formulations and amounts used in the research were very

different. There isn't enough data out there right now to only suggest magnesium therapy (60).

Unless contraindicated, for dysmenorrhea, hormonal contraceptives are generally recommended as the first-line treatment (25, 29, 51). These medications are usually recommended for women with dysmenorrhea who need contraception, are allowed to use contraceptives, or cannot tolerate or do not respond to NSAIDs (61). Hormonal contraceptives have been shown to inhibit ovulation and endometrial growth, hence preventing the formation of PG. When selecting a method, one must consider the patient's preferences, ease of administration, cycle control, cost, side effects, and availability, as each approach has its benefits and drawbacks (29,62).

For patients with dysmenorrhea who do not want to take hormonal contraceptives and cannot tolerate NSAIDs due to gastrointestinal issues, acetaminophen is a suitable pharmacological option for pain relief. It decreases production of prostaglandins and is considered safe as an analgesic with tolerable gastrointestinal side effects due to its mild inhibition of COX activity (64). Despite its lower efficacy than NSAIDs and hormonal contraceptives, multiple studies have found that paracetamol is still effective in managing PD. As a result, it is only chosen for mild to moderate dysmenorrheic pain (65,66).

2.2.5.2 Non-pharmacological

For women with dysmenorrhea, non-pharmacological therapies are frequently used. According to a recent meta-analysis of 12,526 dysmenorrheic females, 51.8% used non-pharmacological coping mechanisms to deal with their monthly pain (67). These therapies were thought to lessen menstruation pain through several processes, including boosting blood flow to the pelvis, preventing uterine contractions, triggering the production of endorphins and serotonin, and changing the brain's sensitivity to pain signals (67,68,69).

Topical heat is a simple, all-natural treatment that involves applying heat directly to the suprapubic area (29,55). Exercise and the application of topical heat were both shown to lessen menstruation pain greatly, and their effectiveness was on par with that of NSAIDs (69,70).

A non-invasive therapy method known as transcutaneous electrical nerve stimulation (TENS) has been demonstrated to be an effective way to reduce menstrual pain (29,71,72). It is a small, battery-powered, portable device that sends electrical currents to the pelvic skin surface via adhesive electrodes (71). TENS uses two different techniques to reduce pain. Initially, by repeatedly transmitting afferent impulses through the large-diameter sensory fibers of the same nerve root, it is possible to reduce the threshold for pain signals caused by uterine hypoxia and hypercontractility. The second mechanism for providing partial pain relief is the stimulation of endorphin release in the spinal cord and peripheral nerves (27,30). It might be an alternative for females who should not use NSAIDs because of their side effects. Low-frequency TENS (2 Hz) and high-frequency TENS (>50 Hz) are the two primary types of TENS, with the latter being the more commonly used one as it has been demonstrated to be more successful in relieving menstrual pain (73). Negative effects can include skin redness, burn, nausea, headaches, and muscle stiffness (29,30).

Through a complex relationship with endorphins and serotonins, acupuncture works by stimulating nerve fibers and receptors (30,55). Both acupuncture and acupressure are techniques for stimulating specific anatomic regions to reduce pain. Several locations on the ear and the inner calf have been found to be effective in relieving menstrual pain, including the SP6 point, located three thumb-widths above the medial malleolus, and the SP9 point, located three thumb-widths below the medial condyle of the tibia along the line connecting it to the medial malleolus (74,75). At these locations, acupuncture utilizes fine needles, whereas acupressure uses firm rubbing. Modifications in pain modulation, an increase in uterine blood flow caused by the ovarian sympathetic nerve reaction, and a drop in PG levels are all potential pain-relieving mechanisms (76). Although some evidence supports their usage as a treatment, it is currently insufficient to support their prescription, and more research is required to demonstrate their efficacy (76,77). A recent Cochrane Review found no well-designed randomized controlled studies, leading to insufficient data to determine whether acupuncture or acupressure effectively reduces symptoms of primary dysmenorrhea (76). If a woman is not interested in pharmaceutical treatment, they could be an option (27,29).

Arachidonic acid's function as a precursor to PG synthesis stimulated the idea that nutrition may have a role in managing dysmenorrhea. As a result, incorporating dietary modifications like a low-fat regimen and consuming beans, seeds, produce, and vegetables can help curtail arachidonic acid production. Incorporating a healthy lifestyle that involves proper nutrition, physical activity, quitting smoking, and moderate alcohol consumption can help alleviate the symptoms of dysmenorrhea and lessen its discomfort and inconvenience (35,55). Several research reveals a lack of safety information for these products and no evidence that any dietary supplements can reduce dysmenorrhea (59).

2.2.5.3 Surgical

Despite this, there are few studies on this topic, and the existing ones are outdated reports that have not been sufficiently replicated to advocate for these techniques confidently. These medications are only recommended in rare cases of women with severe and treatment-resistant dysmenorrhea, necessitating a re-examination of the diagnosis and investigation of secondary causes (78). The surgical procedures include hysterectomy, laparoscopic uterosacral nerve ablation (LUNA), and presacral neurectomy (PSN) (29, 51). LUNA damages the uterosacral ligaments' afferent pain fibers (78). Pelvic nerve fibers are directly severed by PSN (78).

In cases where conventional therapy has failed, and laparoscopy confirms normal anatomy and the lack of extensive endometriosis infiltration, the hysterectomy technique may be considered the last option (35).

However, these treatments are unlikely to be advised for treating PD because little data supports their efficacy and safety (79). Hysterectomy is also viewed as the last option in severe situations that are recalcitrant; however, it should be avoided in teenage and young females, as well as those who want to get pregnant (80).

2.2.6 PRIMARY DYSMENORRHEA AND PHYSICAL ACTIVITY

For the alleviation of dysmenorrhea, physical activity has been recommended as a non-medical remedy (81,12). In 1943, Billig was one of the earliest supporters of exercise for dysmenorrhea (82). He proposed stretching exercises that he said had a high success rate in relieving symptoms in women with dysmenorrhea because he believed they had tight ligamentous bands in the abdomen. The Billigs' exercise program stretches the muscles inside the thighs, the hip flexors, and the connective tissue around the pelvis. Although these activities were never considered standard of care, the idea that exercise was useful remained widely accepted, with most of the evidence being anecdotal (83).

Various mechanisms, such as improved blood flow, the release of endorphins, and the reduction of stress, and anxiety, exercise, and yoga may also reduce the symptoms of dysmenorrhea (84,85). In a Cochrane Review examining the impact of exercise on primary dysmenorrhea, there was just one low-quality randomized controlled study (84). This study demonstrated that exercise reduced dysmenorrhea symptoms and that this improvement persisted over the three menstrual cycles studied (86).

3. MATERIAL AND METHODS

3.1. SUBJECTS

The study sample (n=20) consisted of women with primary dysmenorrhea diagnosed by a gynecologist. This participant-blinded randomized controlled study was approved by the Yeditepe University Faculty of Health Sciences Ethical Committee (No: 202203Y0194) (Appendix 1). The study was also registered to ClinicalTrials.gov (NCT05960695).

The inclusion criteria of the study were:

- participants in the study voluntarily.
- participants in ages between 18-25 years of age.
- participants have a sedentary lifestyle.
- participant's pain intensity of more than 40 mm during the menstrual period according to the visual analog scale (VAS).

The exclusion criteria of the study were:

- using regular drugs like NSAIDs
- presence of SD
- having an irregular menstrual cycle
- presence of chronic disease.

Participants were involved in the study voluntarily. The aim and plan of the study were explained, and informed written consent was obtained from each patient (Appendix 2). The study was conducted according to the Declaration of Helsinki. Furthermore, participants were informed that they were free to withdraw from the study at any time.

Power analysis was performed to indicate the minimum number of participants required for the study using the G*Power version 3.1.9.7. According to the result of power analysis, the number of participants to be included in the study with %90 power with alpha error prob 0.05 and beta 0.10 was determined to be at least 20 individuals.

3.1.1. Flow Chart of the Study Process

Participants consist of university students at Yeditepe University from January 2023 to March 2023. We invited all the members of Yeditepe University by sending a text message to their mobile phones to attend the study (N=50). Members who responded to

the invitation were assessed for eligibility (n=35). Fifteen of the thirty-five responders were excluded due to meeting the inclusion criteria. Thus, the research group included 20 women with PD. A total of 20 participants participated in the study in compliance with the inclusion criteria. Participants consist of those who have a sedentary lifestyle and pain intensity of more than 40 mm during the menstrual cycle, according to the VAS. As for the first step, participants were briefed on the study's main purpose. Once the baseline assessments were completed, patients were randomized to either the superimposed Experimental Group (n=10) or the Control Group (n=10) by the block randomization method. Microsoft Excel was utilized to create randomized blocks with RANDBETWEEN(1;20) code, and created first four blocks were chosen. Patients were assigned to one of two possible sequences by block randomization, and each group included 10 women with PD, and during the test procedure, none of the patients were dropped from the study. (Figure 3.1)

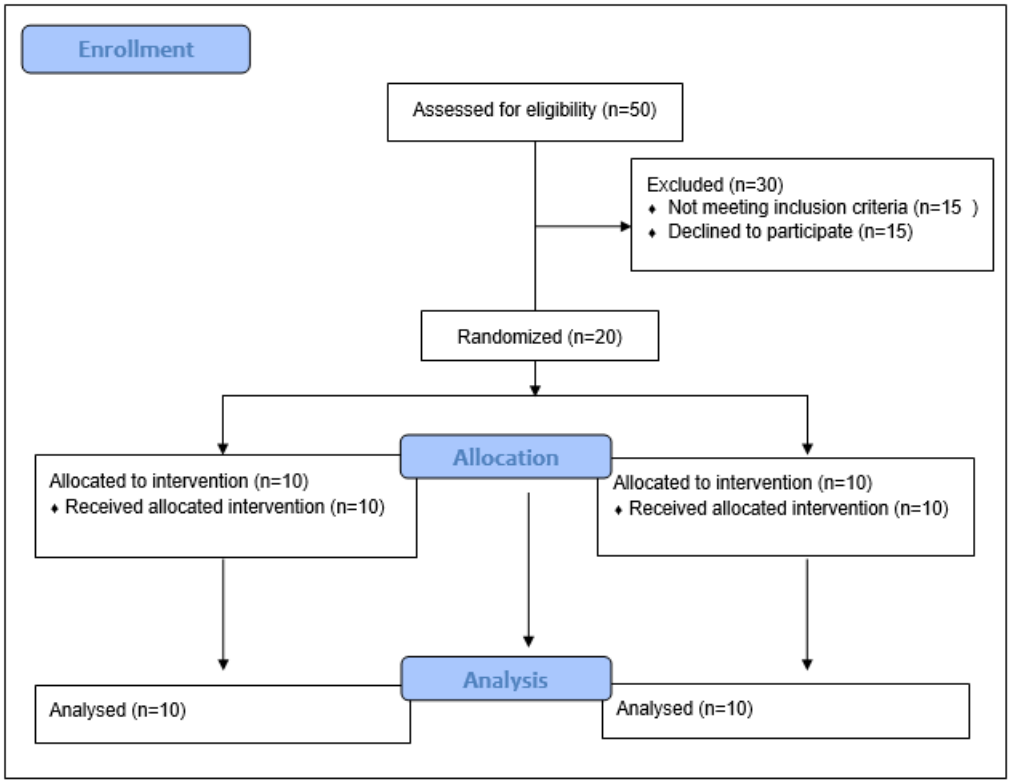

Figure 3.1. Flow Chart of The Study

3.1.2. Study Protocol

Stretching exercises for all volunteers were given 3 times a week for 4 weeks. In addition to stretching exercises, relaxation exercises were also given to the patients in the Experimental Group.

The pain threshold of all participants was evaluated with the Algometer device. In addition, all participants were evaluated regarding pain level during the menstrual period, physical activity level, and symptoms they experienced during the menstrual period. Data were collected from all patients at baseline and the end of the study (4 weeks) (Figure 3.2).

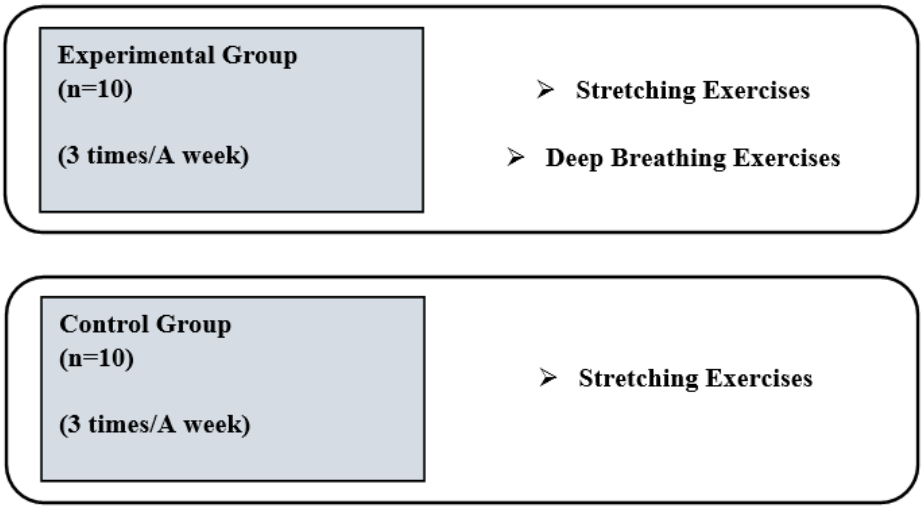

Figure 3.2 Study Protocol for Experimental and Control Group

3.2. ASSESSMENT METHODS

3.2.1. Structured Questionnaire

A face-to-face interview was conducted for the structured questionnaire prepared by the researcher. The initial part of the questionnaire included age, weight, height, educational background, marital status, medications, and chronic diseases to grasp the socio-demographic conditions of the participants. The second part of the questionnaire was about exercise behaviors, age at menarche, pain level during a menstrual period,

menstrual cycle, presence of secondary dysmenorrhea, and whether she used painkillers during the menstrual period of patients (Appendix 3).

3.2.2. Menstrual Symptom Questionnaire

The MSQ was designed to determine the problems experienced by women during the menstrual period. MSQ is an itemized scale validated in Turkish by Güvenç et al. in 2014 (87). The scale has 3 sub-dimensions; these are menstrual pain symptoms, negative effects/somatic complaints, and coping methods. The scale is scored from 22 to 110; A rise in the average score signifies that the intensity of menstrual symptoms escalates. Survey questions were asked face-to-face to the participants, and the answers were recorded (Appendix 4).

3.2.3. Short Form 12v2 Health Survey

It was planned to evaluate the HRQOL of the volunteers with SF-12v2. There are 8 subdomains in total: physical functioning, coping with physical health problems, general health, bodily pain, vitality, coping with emotional health problems, social functionality, and mental health (9). The survey has 12 questions. Validity and reliability of SF 12v2 in Turkey, Gündüz et al. provided in 2021 (88). Higher scores reflect better HRQOL (89). The researcher personally asked the survey questions to the participants and recorded their answers. (Appendix 5).

3.2.4. VAS

VAS is a linear scale used to measure subjectively perceived pain. On one end, it is written "0", which means that there is no pain, and "10", which means unbearable pain, on the other end. The person determines the severity of his/her pain on a 0-10 cm scale by marking the appropriate place on the scale according to his/her pain perception level. The determined value is used as numerical data for the pain perception level. The severity of dysmenorrhea of the women was marked on the scale; 1 to 4 were considered mild, 5 to 6 moderate, and 7 to 10 severe (90). VAS is a valid and reliable method used to evaluate menstrual pain in women with PD (91).

3.2.5. Pain Pressure Thresholds

Pain Pressure Thresholds (PPTs) were evaluated using an algometer. An algometer is a device that assesses pain threshold and pain tolerance objectively. JTECH Commander Echo Algometer was used to measure the pain threshold (Figure 3.3). The algometer used in this study (Algometer Commander JTECH ™ Salt Lake City, Utah) consists of a metal piston with a 1 cm diameter round rubber disc attached to a dial to measure pressure in pounds (Lb).

Figure 3.3 JTECH Commander Echo Algometer

According to a study on healthy women 2012, both inner sides of the iliac bone and the top of the symphysis pubis (SP) were more sensitive (92). Therefore, in this study, a total of 4 measurements were taken, two measurements on both inner sides of the iliac bone (two finger sides of the spina iliaca anterior superior (SIAS)) and two measurements above the SP of women with PD (Figure 3.4).

Figure 3.4 Zones Measured with an Algometer

First, the study participants explained the application. The participant was then instructed to identify when he felt pain for the first time and not to attempt to stand. At the same time, the algometer's probe was positioned perpendicular to the participant's skin. The participant's initial pressure at the moment of expression was assessed. Three measurements were taken, each with a 15-20 second rest period in between, and the averages were recorded (93).

3.3 INTERVENTION

The volunteers who met the inclusion criteria were divided into 2 groups. The patients have informed about 2 different groups, but they were not told which of them. Stretching exercises were taught regardless of which group the patients were in. In addition, relaxation exercises were taught to the patients in the Experimental Group.

3.3.1 Exercise Training

Exercise training; consisted of stretching exercises and relaxation exercises. While stretching exercises were given to the patients in both groups, the participants in the Experimental Group were taught deep breathing exercises as relaxation exercises. After the physiotherapist taught the exercises, people were told to do it 3 days a week for 4 weeks. After the relaxation exercise was taught, the participants were asked to do it daily.

3.3.1.1 Stretching Exercises

First, we told the patient to stand on her knees. Then we told her to take one leg forward and stand at 90-90 degrees. In this position, we put her hands on her waist and told her to go forward as far as she could go. We wanted it to be done in this position for 4 weeks, 3 times a week with 10 repetitions and each repetition for 20 seconds bilaterally (Figure 3.4)

Figure 3.5 Iliopsoas muscle stretching

First, we told the patient to sit down. Afterwards, we told her to extend the leg to be stretched and to bend the other leg. We told her to reach as far as she could on the leg she was going to be stretching and pull her toes toward herself. We wanted it to be done in this position for 4 weeks, 3 times a week with 10 repetitions and each repetition for 20 seconds bilaterally (Figure 3.5).

Figure 3.6 Hamstring muscle stretching

First, we told the patient to sit down and the soles of their feet to touch each other as much as possible. Afterward, we told her to press his hands down on her knees as much as she could tolerate. We wanted to do this position for 4 weeks, 3 times a week with 10 repetitions and 20 seconds each (Figure 3.6).

Figure 3.7 Adductor muscle stretching

First, we told the patient to lie in the supine position. Then we pulled both legs to herself and told her to hold it in that position with her hands. We wanted to do this position for 4 weeks, 3 times a week with 10 repetitions and 20 seconds each (Figure 3.7).

Figure 3.8 Lumbal region stretching

First, we told the patient to lie in the prone position. Then we asked her to come on her hands and stretch her abdominal part as much as possible. We wanted to do this position for 4 weeks, 3 times a week with 10 repetitions and 20 seconds each (Figure 3.8).

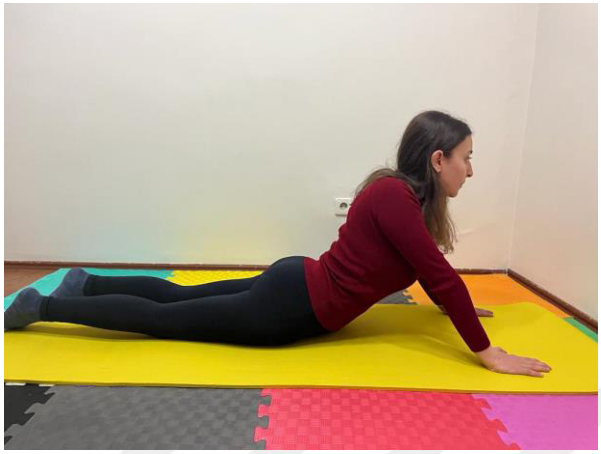

Figure 3.9 Abdominal region stretching

3.3.1.2 Relaxation Exercise

Deep breathing exercise was taught to the participants as a relaxation exercise. She was asked to lie in the supine position to perform the exercise. In this position, he was asked to perform the exercise with one hand on the chest and one hand on the abdomen. In this position, the participant was asked to breathe in a way that goes both to the chest, to the abdomen, to the back and to the pelvic floor. The participants were taught that this exercise should be slow and deep. Participants were asked to do this exercise 2-3 minutes before going to bed each day.

4. RESULTS

4.1. SOCIODEMOGRAPHIC AND BASELINE VARIABLES

A total of 20 women (22.75 ± 1.20 years old) who were students at Yeditepe University and had PD participated in this study. Comparing the two study groups, there was no significant difference according to the basic sociodemographic parameters, age, body mass index (BMI), age at menarche, period of menstruation, and menstrual cycle independent sample t-test or chi-square test results ($p>0.05$), (Table 4.1).

Table 4.1 Comparison of The Baseline Sociodemographic Parameters Between Study Groups

Variables	Experimental Group (n=10)	Control Group (n=10)	Z	P
Age (years)	23.10 ± 1.10	22.40 ± 1.26	-1.221	0.222
BMI (kg/m²)	20.57 ± 2.87	21.00 ± 2.40	-0.38	0.970
Menarche (age)	13.60 ± 1.17	13.40 ± 1.07	-0.319	0.749
Period of Menstruation (days)	5.20 ± 0.91	5.90 ± 0.73	-1.802	0.072
Menstrual Cycle (month)	28.50 ± 3.13	30.30 ± 3.52	-1.102	0.270

Data expressed as mean ± standard deviation or number (percentage), BMI: Body Mass Index, kg: kilogram, m: meter, kg/m²: kilograms/meter square

An independent sample t-test was used to compare pain thresholds and VAS score in the baseline study between the two groups. It was shown that it was not statistically significant in the measurements made from 4 different places among the data ($p>0.05$) (Table 4.2)

Table 4.2 Comparison of VAS Scores and Pain Threshold Results Between The Experimental Group and The Control Group

Variables		Experimental Group (n=10)	Control Group (n=10)	Z	P
VAS		7.20 ± 1.68	6.60 ± 1.34	-1.127	0.260
SIAS	**Left**	5.13 ± 1.47	5.44 ± 1.83	-0.341	0.733
	Right	5.86 ± 1.89	5.11 ± 1.53	-1.135	0.256
SP	**Left**	5.54 ± 1.61	4.53 ± 1.48	-1.969	0.049
	Right	5.82 ± 1.82	4.83 ± 1.75	-1.061	0.289

Data expressed as mean ± standard deviation or number (percentage), VAS: Visual Analog Scale, SIAS: Spina Iliaca Anterior Superior, SP: Symphysis Pubis

An independent sample t-test was used to compare baseline study variables between the two groups. The data underlined that it was not statistically significant in terms of MSQ, and SF-12v2 ($p>0.05$) (Table 4.3).

Table 4.3 Comparison of MSQ and SF-12v2 Scoring Results Between The Experimental Group and The Control Group

Variables	Experimental Group (n=10)	Control Group (n=10)	Z	P
MSQ	69.50 ± 20.10	66.30 ± 12.06	-0.984	0.325
SF-12v2	35.50 ± 3.80	35.20 ± 4.77	-0.038	0.971

Data expressed as mean ± standard deviation or number (percentage), MSQ: The Menstrual Symptom Questionnaire, SF-12v2: Short Form 12v2 Health Survey

4.2. CHANGES IN PRIMARY OUTCOMES

A mixed between-subject ANOVA test and Tukey post-hoc were used to analyze within-group changes. Table 4.4 showed a statistically significant difference in the menstrual pain levels of the participants in the study group after the interventions ($p<0.05$). Although the pain levels of all participants decreased over time, it was observed that there was no statistical difference between the pain levels of the CG (Table 4.4).

There was no statistically significant difference in the evaluations made in the EG and CG ($p>0.05$). In the evaluation of the SIAS performed in front of 2 fingers, it was observed that the pain thresholds of all participants increased on both the right and left sides. However, in the evaluations made on SP, while the pain threshold of the left side

of the body of all participants increased, the pain threshold of the right side decreased ($p>0.05$) (Table 4.4).

Table 4.4 In-Group Changes in VAS Scores and Pain Threshold Values on The First and Second Period

Variables		Experimental Group (n=10)				Control Group (n=10)			
		First Period	**Second Period**	**Z**	**P**	**First Period**	**Second Period**	**Z**	**P**
VAS		7.2 ± 1.68	3.8 ± 1.22	-2.873	**0.004**	6.60 ± 1.34	4.0 ± 0.94	-2.873	**0.004**
SIAS	**Left**	5.13 ± 1.47	6.29 ± 1.68	-2.295	**0.022**	5.54 ± 1.83	5.59 ± 1.62	-1.790	0.074
	Right	5.86 ± 1.89	6.04 ± 1.43	-0.358	0.721	5.11 ± 1.53	5.27 ± 1.48	-2.388	**0.017**
SP	**Left**	5.54 ± 1.61	5.70 ± 1.38	-0.508	0.611	4.53 ± 1.48	4.80 ± 1.50	-2.536	**0.011**
	Right	5.82 ± 1.82	5.50 ± 1.41	-0.237	0.812	4.83 ± 1.75	4.82 ± 1.48	-1.133	0.257

Data expressed as mean ± standard deviation or number (percentage), VAS: Visual Analog Scale, SIAS: Spina Iliaca Anterior Superior, SP: Symphysis Pubis

All participants showed a decrease in MSQ questionnaire scores. Although there was a statistical decrease in the EG, no statistically significant difference was observed in the CG (Table 4.5).

Increases were observed in the SF-12v2 questionnaire scores of all participants, but no significant difference was observed in either group (Table 4.5).

Table 4.5 In-Group Changes in MSQ and SF-12v2 Scores on The First and Second Period

Variables	Experimental Group (n=10)				Control Group (n=10)			
	First Period	Second Period	Z	P	First Period	Second Period	Z	P
MSQ	69.5 ± 20.10	56.10 ± 13.67	-2.805	**0.005**	66.30 ± 12.06	59.30 ± 12.70	-2.809	**0.005**
SF-12v2	35.5 ± 3.80	39.5 ± 3.10	-2.809	**0.005**	35.20 ± 4.77	38.30 ± 4.83	-2.836	**0.005**

Data expressed as mean ± standard deviation or number (percentage), MSQ: The Menstrual Symptom Questionnaire, SF-12v2: Short Form 12v2 Health Survey

Considering the differences between the CG and the EG in Table 4.6, it was observed that although positive effects were observed on VAS scoring in both groups, the change in the EG was more. Statistically significant changes were not observed in both groups in the evaluations made on SIAS and SP (Table 4.6).

Table 4.6 Comparison of VAS Scores and Pain Threshold Results Between The Experimental Group and The Control Group

Variables		Experimental Group Δ (n=10)	Control Group Δ (n=10)	F	P
VAS		3.4 ± 0.84	2.60 ± 0.84	4500	**0.048**
SIAS	**Left**	1.16 ± 1.39	0.15 ± 0.83	3866	0.065
	Right	0.18 ± 1.55	0.16 ± 0.15	0.002	0.968
SP	**Left**	0.16 ± 1.23	0.27 ± 0.35	0.073	0.790
	Right	0.32 ± 1.62	0.01 ± 0.55	0.326	0.575

Data expressed as mean ± standard deviation or number (percentage), VAS: Visual Analog Scale, SIAS: Spina Iliaca Anterior Superior, SP: Symphysis Pubis

In Table 4.7, it was observed that the change in MSQ scores in the Experimental Group was higher than in the Control Group. Although the QoL was greater in the Experimental Group, a change was also observed in the Control Group (Table 4.7).

Table 4.7 Comparison of MSQ and SF-12v2 Scores Results Between The Experimental Group and The Control Group

Variables	Experimental Group Δ (n=10)	Control Group Δ (n=10)	F	P
MSQ	13.40 ± 12.19	7.0 ± 3.8	2510	0.131
SF-12v2	4.0 ± 3.16	3.10 ± 0.87	0.752	0.397

Data expressed as mean ± standard deviation or number (percentage), MSQ: The Menstrual Symptom Questionnaire, SF-12v2: Short Form 12v2 Health Survey

5. DISCUSSION

The findings of this study showed that when women with PD performed regular stretching and relaxation exercises 3 days a week for 4 weeks, there was a decrease in pain, menstrual symptoms, and an improvement in QoL.

The study showed that the VAS score decreased statistically in both groups, and women in the Experimental Group had a higher decrease compared to both groups. The algometer-measured pain threshold revealed a statistically significant difference between the right SIAS and left SP regions of the Control Group and the left SIAS region of the Experimental Group. Azima et al. demonstrated the effects of massage therapy and isometric exercises over 8 weeks in 102 women with PD. A total of 3 groups were used in the study. In the massage group, the area of the SP and umbilicus was massaged with lavender oil for 15 minutes on the first day of the menstrual period. While nothing was done to the control group, participants in the exercise group did isometric exercise 5 days a week, 2 times a day, and 10 times in each session for 8 weeks. As a result of the study, although the decrease in pain intensity was greater in the massage group, significant differences were observed in the exercise and massage groups (94). In another study, 83 students with PD between the ages of 18-22 were given a physiotherapy program, 3 days a week, 50 minutes each session, for 3 months. The physiotherapy program includes overall stretching, specific stretching, jogging, contraction of pelvic floor muscles and relaxation exercises. On the other hand, no application was made in the control group with 77 participants. While a statistically significant decrease was observed in the pain of the participants included in the physiotherapy program; there was no statistically significant difference in the pain of the participants in the control group (95). Chen et al. investigated the effects of modified stretching exercises on menstrual low back pain with 127 students with PD. In the experimental group, modified stretching exercises were applied 3 days a week (50 minutes each session) for 12 months; Participants in the control group continued their daily activities. While a statistically significant reduction in pain was observed in the experimental group, no statistically significant difference was observed in the control group (96). Tharani et al. compared the effects of stretching exercises and aerobic dance in 30 students with PD. Participants in group A performed stretching exercises for 45 minutes each session, 3 days a week, for 8 weeks. Participants in group B performed an aerobic dance for 45 minutes (10 minutes warm-up, 25 minutes

dance training, and 10 minutes cool-down) 3 days a week for 8 weeks. Although there was a statistically significant decrease in the participants' pain in both groups, aerobic dance was more effective in menstrual pain (97). Ibrahim et al. investigated the effect of active stretching exercises in women with PD. The study was conducted with 3 groups (33 participants), 11 people in each group. In Group A, the participants performed active stretching exercises with a supervisor; participants in Group B did their exercises without a supervisor. Participants in Group C continue their daily activities. Participants in Group A performed active stretching exercises for 30-45 minutes 3 days a week for 4 weeks, accompanied by a physiotherapist. Participants in Group B did the same exercises given to Group A themselves. In the results of the study, although there are statistically significant results in the participants' pain in Group A and Group B, it was observed that the exercises performed with the supervisor were more effective. No changes were observed in Group C (98). Although we could not observe the significant change pain assessment with algometer, VAS scores were more improved in Experimental Group. The algometer searches for localized pain, while the VAS gauges the individual's overall pain intensity (104). Stretching exercises reduce the load on the body, as there are hormonal changes with the onset of the menstrual period in women with PD and pain, especially in the lower abdominal, waist, and pelvic regions. Considering that hormonal fluctuations and pain impact the body and the mind, we concluded that relaxation exercises should be combined with stretching exercises. Since relaxation exercises have an impact on the parasympathetic nervous system by increasing well-being, relaxation, and duration of the recovery phase in the body, thus, relaxation exercises may have total physical and mental effects among women with PD. There was not much difference in the measurements made with the Algometer. As a result, a greater reduction in pain levels occurred in the participants in the Experimental Group.

The current study also showed that the MSQ score in the Experimental Group decreased more; however, a statistically significant decrease was observed in both groups. Özgül et al. investigated the short-term effects of connective tissue manipulation on PD in 40 women. There were 2 groups in total in the study. While the participants in the control group were advised on lifestyle and 30-minute general stretching exercises; In addition to these, the participants in the treatment group underwent connective tissue manipulation. As a result of the study, a statistically significant improvement was observed in the treatment group; deterioration was observed in the control group (99).

Kırmızıgil et al. investigated the effects of functional exercises on pain and sleep quality in 28 women with PD. There are 2 groups in the study, namely, the combined exercise group and the control group. While the participants in the control group continued their daily living activities, Participants in the exercise group combined exercise 3 days a week for 8 weeks. The exercises consisted of 5 minutes of warm-up exercises, a total of 45 minutes of two core-strengthening exercises, two stretching exercises, two pelvic area exercises, one yoga position, and Kegel exercises. Although no statistically significant change was observed in the control group in MSQ scoring, statistically significant improvement was observed in the exercise group (100). Elbandrawy et al. They compared the effects of aerobic and isometric exercises in 105 women with PD. There are 3 groups in the study: aerobic exercises group, isometric exercises group, and control group. While the participants in the aerobic and isometric exercise groups exercised for 8 weeks, 3 days a week, and 45 minutes in each session, nothing was applied to the participants in the control group. As a result of the study, no change was observed in the MSQ scores of the control group. Statistically significant improvements were observed in the aerobic and isometric exercise groups. The improvement in the aerobic exercise group was greater than in the isometric exercise group (101). Regular stretching and relaxation exercises are beneficial for improving cognitive functions, forming a healthier body composition, and reducing stress levels. As a result, we believe there is more difference than the Control Group, as stretching and relaxation exercises positively change menstrual symptoms.

We also found that the exercises performed in both groups significantly increased the QoL of the participants. It was observed that the exercises performed increased the mental and physical well-being of the person. Bazarganipour et al. evaluated the effects of the acupressure protocol on QoL in 90 women with primary dysmenorrhea. The three groups in the study were applied at different locations. In the first group (control group), the application was made from the point between the 3rd and 4th toes, which was not on the meridian line, called the placebo point. In the second group, an application was made from one of the hepatic meridians located at the junction of the bones, called the LIV3 point (3rd hepatic acupuncture point). In the third group, the application was made on the dorsal surface of the hand, called the LI4 point (HUGO), between the thumb and forefinger, in the middle of the second metacarpus bone. At the end of the study, although there was a statistically significant improvement in SF-12v2 scores in the three groups, the improvement in the placebo group was worse than in the other groups (102). Zecchillo

et al. looked at the efficacy of osteopathic manipulative treatments in primary dysmenorrhea in 26 women. While applying osteopathic manipulative treatment to one group, light-touch treatment was applied to the other group. At the end of the treatments applied, the SF-12v2 score of the light-touch treatment group almost did not change; a statistically significant improvement was observed in the quality of life of the participants in the osteopathic manipulative treatment group (103). Pain and menstrual symptoms experienced by women with PD reduce their QoL. In the study, the effect of stretching and relaxation exercises on reducing menstrual symptoms and pain positively affected women's QoL.

Among the strengths of this research is the validity and reliability of the scales and methods used. In addition, the fact that the study was conducted in the form of telerehabilitation and none of the participants dropped out indicates that telerehabilitation is easy to adjust to.

The limitations of this study were that during the measurements taken with the algometer device, the psychological state of the person, her view of pain, and similar problems affected the sensitivity of the measurement. In addition, the intervention time was relatively short, so we could not collect data on long-term follow-up.

In conclusion, it was found in the study that stretching and relaxation exercises had positive effects on pain, menstrual symptoms, and QoL in women with PD. Therefore, women with PD should be provided with relaxation and stretching exercises.

Funding

No external or internal funding was received for this work.

Conflict of interests

The author declares no conflict of interest.

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APPENDIX 1: ETHICAL COMMITTEE APPROVAL

KARAR FORMU

8.04.2022

ETİK KURUL BİLGİLERİ	Etik Kurulun Adı	Yeditepe Üniversitesi Girişimsel Olmayan Klinik Araştırmalar Etik Kurulu
	Açık Adres	Yeditepe Üniversitesi Kayışdağı Kampüsü, Tıp-Mühendislik Binası, Sağlık Bilimleri Enstitüsü, İnönü Mah. Kayışdağı Cad. 326A, 26 Ağustos Yerleşimi 34755 Ataşehir, İstanbul
	İnternet Sayfası	http://goetik.yeditepe.edu.tr/
	Telefon	0216 578 00 00
	E-posta	goetik@yeditepe.edu.tr

DEĞERLENDİRİLEN BELGELER	Islak imzalı başvuru dosyası, CD'si ve elektronik başvuru	☒
	Araştırma başlığı ve araştırmacıların isimleri	☒
	Başvuru dilekçesi	☒
	Başvuru Formu- Araştırmanın;	☒
	• Niteliği	☒
	• Önemi ve özgün değeri	☒
	• Amaç ve hedefleri	☒
	• Yöntemi	☒
	• Yönetimi	☒
	• Yaygın etkisi	☒
	• Araştırma bütçesi (Mevcutsa)	☒
	• Süresi ve uygunluğu (Zaman cetveli)	☒
	• Kaynakları	☒
	Bilgilendirilmiş Gönüllü Olur Formu (yapılan araştırmaya özel olarak hazırlanmış)	☒
	Taahhütname-1 Araştırmanın yapılacağı kurumdan izin alma sorumluluğunun araştırmacılara ait olduğuna dair taahhüt	☒
	Taahhütname-2 Dünya Tıp Birliği Helsinki Bildirgesinin son versiyonunun ve Sağlık Bakanlığı'nın ilgili tüm kılavuzlarının okunmasına dair taahhüt	☒
	Taahhütname-3 Daha önce yapılmış etik kurul başvuruları mevcut olup olmadığına dair taahhüt	☒
	Taahhütname-4 Araştırma sırasında araştırma bütçesinde yer almayan ve gönüllünün kendisine veya Sosyal Güvenlik Kurumuna ek yük getirecek hiçbir işlem uygulanmayacağına dair taahhüt	☒
	Taahhütname-5 COVID-19 hastalarında tedavi yaklaşımları ve bilimsel araştırmalar genelgesi okunmasına dair taahhüt	☒
	Taahhütname-6 Milli Eğitim Bakanlığı Araştırma Uygulama İzinleri konulu yazının okunmasına dair taahhüt	☒
	Araştırmacıların her birisine ait özgeçmiş formu	☒
	Ek belgeler (Varsa kullanılan ölçek izinleri vb.)	☒

KARAR BİLGİLERİ	Başvuru Numarası	202203Y0194
	Toplantı Tarihi	11.03.2022
	Toplantı Yeri	Çevirim içi (Google Meet)
	Karar No	8

Araştırmanın Başlığı	Gevşeme ve Germe Egzersizlerinin Primer Dismenoreli Kadınlarda Ağrı ve Yaşam Kalitesi Üzerine Etkisi
Araştırmacılar	Fzt.Pelin Zöhre,Dr.Öğr Üyesi Elif Develi,Prof.Dr.Rukset Attar

BAŞVURU NUMARASI: 202203Y0194

8.04.2022

KARAR

☒ **KABUL**	☐ **RET** ☐ *KAPSAM DIŞI (GİRİŞİMSEL)* ☐ *BİLİMSEL VE/VEYA ETİK KURALLARA AYKIRI* ☐ *BİR SORUMLU ARAŞTIRMACININ (TEZ İSE DANIŞMAN), BİR TOPLANTIYA **İKİ (2) ADETTEN FAZLA ÇALIŞMA BAŞVURUSUNDA** BULUNMASI* ☐ *KURUM İÇİ BAŞVURULARINDA **KURUMSAL E-POSTA HESABI** İLE GİRİŞ YAPILMAMIŞ OLMASI* ☐ *ŞARTLI KABULDE BELİRTİLEN REVİZYONLARIN ZAMANINDA VE/VEYA İSTENİLDİĞİ ŞEKİLDE YAPILMAMIŞ OLMASI*

Yeditepe Üniversitesi Girişimsel Olmayan Klinik Araştırmalar Etik Kurulu adına
Prof.Dr.Didem Özdemir ÖZENEN
Başkan

Araştırmanın Başlığı	Gevşeme ve Germe Egzersizlerinin Primer Dismenoreli Kadınlarda Ağrı ve Yaşam Kalitesi Üzerine Etkisi
Araştırmacılar	Fzt.Pelin Zöhre,Dr.Öğr Üyesi Elif Develi,Prof.Dr.Rukset Attar

APPENDIX 2: INFORMED WRITTEN CONSENT

YEDİTEPE ÜNİVERSİTESİ

BİLGİLENDİRİLMİŞ OLUR FORMU

Araştırmanın Adı: Gevşeme ve Germe Egzersizlerinin Primer Dismenoreli Kadınlarda Ağrı ve Yaşam Kalitesi Üzerine Etkisi

Sayın Katılımcı,

Yukarıda adı yazılı araştırmaya katılmak üzere davet edilmiş bulunmaktasınız. Çalışmaya katılıp katılmama kararı tamamen size aittir. Katılmak isteyip istemediğinize karar vermeden önce araştırmanın neden yapıldığını, bilgilerinizin nasıl kullanılacağını, çalışmanın neler içerdiğini, olası yararları ve risklerini ya da rahatsızlık verebilecek yönlerini anlamanız önemlidir. Lütfen aşağıdaki bilgileri dikkatlice okumak için zaman ayırınız. Sorularınız olursa sorunuz ve açık yanıtlar isteyiniz.

Bu araştırma ile gevşeme ve germe egzersizlerinin primer dismenoreli kadınlarda ağrı ve yaşam kalitesi üzerine etkisinin araştırılması amaçlanmıştır. Ağrı eşiğinizin belirlenmesi için algometre denilen bir cihaz ile ölçüm yapılacaktır. Ek olarak sizlerin fiziksel aktivite düzeyinizi belirlemek, menstrüel dönemde ağrınızın şiddetini belirlemek ve menstrüel dönemde hangi semptomların olduğunu belirlemek amacıyla belirlediğimiz anketleri doldurmanız istenecektir. Araştırma için Yeditepe Üniversitesi'nden izin alınmıştır. Araştırmaya sizin dışınızda 19 kişi katılacaktır. Sizden bu çalışmaya 5 hafta (haftada 2 saat) ayırmanız istenecektir. Bunun size ve yakınlarınıza hiçbir zararı olmayacaktır. Çalışmaya katılmakta parasal yük altına girmeyeceksiniz ve size de herhangi bir ödeme yapılmayacaktır.

Bu araştırmaya katılıp katılmamakta tümüyle özgürsünüz. Gerek duyduğunuz tüm bilgileri istemeye ve doğru, açık, anlaşılır bilgi almaya hakkınız vardır. Araştırmaya katılmayı istemezseniz burada size verilen hizmet olumu veya olumsuz şekilde etkilenmeyecektir. Gerekli gördüğü takdirde araştırmanın herhangi bir kısmında katılımcı araştırmadan çıkabilir, araştırmacı çalışmayı sonlandırabilir. Araştırmanın tüm aşamalarında kimlik bilgileriniz gizli tutulacaktır. Araştırma kapsamında elde edilen bilgiler bilimsel amaçlarla kullanılabilir, gizlilik kurallarına uyulmak kaydıyla sunulabilir ve yayınlanabilir.

Araştırma ile ilgili daha fazla bilgiye ihtiyaç duyarsanız araştırma yürütücüsüne pelin.zohre@std.yeditepe.edu.tr e-posta adresi veya 0534 492 50 05 numaralı telefondan ve sorumlu araştırmacıya elif.ustun@yeditepe.edu.tr e-posta adresi veya 0555 593 62 93 numaralı telefondan ulaşabilirsiniz.

Yukarıda yer alan ve araştırmaya başlanmadan önce katılımcılara verilmesi gereken bilgileri içeren metni okudum (ya da sözlü dinledim). Araştırma kapsamında elde edilen şahsıma ait bilgilerin bilimsel amaçlarla kullanılmasını, gizlilik kurallarına uymak kaydıyla sunulmasını ve yayınlanmasını, hiçbir baskı ve zorlama altında kalmaksızın, kendi özgür irademle kabul ettiğimi beyan ederim.

Katılımcı;	**Araştırma Yürütücüsü;**
İmza/Tarih:	İmza/Tarih:
Adı-Soyadı:	Adı-Soyadı:
Adres:	Adres:
Telefon No:	Telefon No:
Tanık:	
İmza/Tarih:	Ad-Soyadı:
Adres:	Telefon No:

APPENDIX 3: STRUCTURED QUESTIONNAIRE

SOSYO-DEMOGRAFİK BİLGİLER

Ağrılı adet, gençlik döneminde en sık karşılaşılan bir durumdur. Bu çalışma, primer dismenoreli kadınlarda (herhangi bir patoloji bulunmayan ağrılı adet dönemi yaşayan kadınlar) germe ve gevşeme egzersizlerinin ağrı ve yaşam kalitesi üzerindeki etkisini inceleme amaçlı olup, katılımcılara ait özel bilgiler, hiçbir şekilde araştırma dışında kullanılmayacaktır. Katıldığınız için teşekkür ederim.

Fzt. Pelin Zöhre

1. Ad-Soyad:
2. Doğum tarihiniz: ……/……./……..
3. Boyunuz:…… Kilonuz:……
   VKİ:……..
4. Öğrenim durumunuz?
   a. İlkokul
   b. Ortaokul
   c. Lise
   d. Üniversite
   e. Yüksek lisans
   f. Diğer (Belirtiniz)……..
5. Medeni durumunuz?
   a. Evli
   b. Bekar
6. Kronik bir rahatsızlığınız var mı?
   a. Evet (ise açıklayınız)……
   b. Hayır
7. Sürekli kullanmak zorunda olduğunuz bir ilaç var mı?
   a. Evet (ise açıklayınız)……
   b. Hayır
8. Kaç yaşında ilk adetinizi gördünüz?.....
9. Kaç günde bir adet görüyorsunuz? (Bir adetin başlangıcından diğer adetin başlangıcına kadar olan süreyi göz önüne alınız.)
   ….....…...günde bir adet oluyorum.
10. Adetiniz kaç gün sürüyor?.....
11. Adet döneminizde ağrınız oluyor mu?
    a. Evet
    b. Hayır
12. Evet ise şiddeti nedir? 0 (Ağrı yok) 10 (Dayanılmaz ağrı)

    0 1 2 3 4 5 6 7 8 9 10

13. Adet döneminizdeki ağrı kaç gün sürer?
    a. Adet dönemim boyunca sürer
    b. Adetin ilk 2-3 günü
    c. Adet olduğum gün
    d. Diğer (Belirtiniz)……..

14. Ağrılı adet görmeye ne zaman başladınız?
    a. Adet olduğumdan beri
    b. İlk adetimden 6 ay – 2 yıl sonra
    c. Üreme organları ile ilgili bir ameliyat geçirdikten sonra
    d. Sadece stresli dönemlerimde
    e. Diğer (Belirtiniz)……..
15. Ağrılı adet sebebi ile doktora başvurdunuz mu?
    a. Evet
    b. Hayır
16. Aşağıdaki jinekolojik hastalıklardan herhangi birinin tanısı kondu mu?
    a. Endometriozis
    b. Yumurtalık kisti/tümörü
    c. Pelvik enfeksiyon hastalığı
    d. Myom/Rahim tümörü
    e. Rahimde yapışıklıklar
    f. Enfeksiyon
    g. Diğer (Belirtiniz)……..
17. Adet ağrınızın kontrolü için ağrı kesici kullanıyor musunuz?
    a. Evet
    b. Hayır
18. Hangi ağrı kesiciyi/kesicileri ne sıklıkta kullanıyorsunuz?
    Ağrı kesici:…….. Sıklık:……
    Ağrı kesici:…….. Sıklık:……
19. Egzersiz yapıyor musunuz?
    a. Evet
    b. Hayır
20. Eğer egzersiz yapıyorsanız, egzersizin türü ve sıklığını belirtiniz.
    Egzersiz türü:……..
    Sıklık:……

APPENDIX 4: MENSTRUAL SYMPTOM QUESTIONNAIRE

MENSTRÜASYON SEMPTOM ÖLÇEĞİ

	Asla	Nadiren	Bazen	Sıklıkla	Her zaman
1. Adetimin başlamasından bikaç gün önce kendimi sinirli hissederim, kolayca öfkelenirim ve sabırsız olurum.					
2. Adetimin birinci gününde karnımda kramp tarzı kasılmalar olur.					
3. Adetimin başlamasından birkaç gün öncesinde kendimi depresif hissederim.					
4. Adetimin başlamasından bir gün önce karnımda ağrı ya da rahatsızlık olur.					
5. Adetimin başlamasından günler öncesinde halsiz, keyifsiz ya da yorgun hissederim.					
6. Adetim sırasında doktorun ağrı için yazdığı bir ilaç kullanma ihtiyacı hissederim.					
7. Adetim sırasında güçsüzlük ve baş dönmesi hissederim.					
8. Adet olmadan önce kendimi gergin ve sinirli hissederim.					
9. Adet dönemimde ishal olurum.					
10. Adetim başlamadan birkaç gün öncesinde bel ağrım olur.					
11. Adetim süresince kendi kendime ağrı kesici ilaç kullanırım.					
12. Adetimden birkaç gün önce göğüslerimde gerginlik ve ağrı hissederim.					
13. Adetimin ilk günü belimde, karnımda ve kasıklarımda gerginlik ve acı hissederim.					
14. Adetim boyunca ya da adetimin ilk günü karnımın üzerine, sıcak su torbası ya da sıcak havlu kullanarak yatakta kıvrılırım veya sıcak duş alırım.					
15. Adetim başlamadan önce kilo artışım olur.					
16. Adetimin ilk günü başlayan, zaman zaman azalan veya kaybolan ve tekrar başlayan ağrım olur.					
17. Adetim boyunca yoğun olmayan, fakat sürekli hafif hafif devam eden ağrım olur.					

18. Adetim başlamadan önce karnımda bir günden uzun süren rahatsızlık olur.					
19. Adet günü başlayan bel ağrım olur.					
20. Adetim başlamadan birkaç gün önce karnımın şiştiğini hissederim.					
21. Adetim boyunca ya da adetimin ilk günü mide bulantısı hissederim.					
22. Adetim başlamadan birkaç gün önce baş ağrım olur.					

APPENDIX 5: SHORT FORM 12V2 HEALTH SURVEY
SF-12v2 SAĞLIK ANKETİ

A. Genelde, sağlığınız;
   1. Mükemmel
   2. Oldukça iyi
   3. İyi
   4. Orta
   5. Kötü

Aşağıdaki maddeler, tipik bir gün sırasında yapabileceğiniz etkinlikler hakkındadır. Sağlığınız, bu etkinlikleri yaparken size kısıtlıyor mu? Eğer kısıtlıyorsa, ne kadar?

B. Öncelikle orta düzeydeki etkinlikler sırasında; örneğin: Masayı çekerken, elektrik süpürgesi kullanırken, yürüyüş yaparken sağlığınız sizi ne ölçüde kısıtlıyor?
   1. Çok kısıtlıyor
   2. Az kısıtlıyor
   3. Hiç kısıtlamıyor

C. Merdiven çıkarken sağlığınız sizi ne ölçüde kısıtlıyor?
   1. Çok kısıtlıyor
   2. Az kısıtlıyor
   3. Hiç kısıtlamıyor

D. Son dört hafta boyunca, fiziksel sağlığınıza bağlı olarak beklenenden daha az iş yaptığınız oldu mu?
   1. Hayır
   2. Evet

E. Son dört hafta boyunca, fiziksel sağlığınıza bağlı olarak, düzenli etkinlikleriniz veya işinizde kısıtlandığınız oldu mu?
   1. Hayır
   2. Evet

F. Son dört hafta boyunca, kendinizi depresif (çökkün) veya kaygılı hissetmek gibi duygusal bir sorun sonucunda beklenenden daha az is yaptıgınız oldu mu?
   1. Hayır
   2. Evet

G. Son dört hafta boyunca, kendinizi depresif (çökkün) veya kaygılı hissetmek gibi duygusal bir sorun sonucunda düzenli etkinlikleriniz veya isinizde her zamanki kadar dikkatli olamadığınız oldu mu?
   1. Hayır
   2. Evet

H. Son dört hafta boyunca, evde ve iste ne ölçüde agrı normal islerinize engel oldu?
   1. Hiç
   2. Hafif
   3. Orta
   4. Oldukça fazla
   5. Aşırı derecede

Asagıdaki sorular son dört haftada kendinizi nasıl hissettiginiz ve islerin nasıl gittigi ile ilgilidir. Her bir soru için size en yakın seçenegi isaretleyiniz.

İ. Son dört hafta boyunca ne kadar sıklıkla kendinizi sakin ve huzurlu hissettiniz?
   1. Her zaman
   2. Çoğu zaman
   3. Ara ara
   4. Bazen
   5. Zamanın çok az bir kısmında
   6. Hiçbir zaman

J. Son dört hafta boyunca ne kadar sıklıkla enerji doluydunuz?
   1. Her zaman
   2. Çoğu zaman
   3. Ara ara
   4. Bazen
   5. Zamanın çok az bir kısmında
   6. Hiçbir zaman

K. Son dört hafta boyunca ne kadar sıklıkla kendinizi çökkün hissettiniz?
   1. Her zaman
   2. Çoğu zaman
   3. Ara ara
   4. Bazen
   5. Zamanın çok az bir kısmında
   6. Hiçbir zaman

L. Son dört hafta boyunca ne kadar sıklıkla fiziksel saglıgınız veya duygusal sorunlarınız, arkadas veya akraba ziyareti gibi sosyal etkinliklerinizi olumsuz etkiledi?
   1. Her zaman
   2. Çoğu zaman
   3. Bazen
   4. Zamanın çok az bir kısmında
   5. Hiçbir zaman

APPENDIX 6: CURRICULUM VITAE

Kişisel Bilgiler

Adı	Pelin	**Soyadı**	Zöhre

Öğrenim Durumu

Derece	Alan	Mezun Olduğu Kurumun Adı	Mezuniyet Yılı
Doktora			
Yüksek Lisans			
Lisans	Fizyoterapi ve Rehabilitasyon	**Yeditepe Üniversitesi**	2020
Lise	Matematik-Fen	**Sungurbey Anadolu Lisesi**	2015

Bildiği Yabancı Dilleri	Seviye
Ingilizce	İyi

İş Deneyimi (Sondan geçmişe doğru sıralayın)

Görevi	Kurum	Süre (Yıl - Yıl)
Fizyoterapist	Prof. Dr. Mehmet Bülent Çetinel Muayenehanesi	2021-Devam ediyor
Fizyoterapist/Teknik Destek Elemanı	Mc-Med Danışmanlık Sağlık Pazarlama İç ve Dış Ticaret Limited Şirketi	

Bilgisayar Bilgisi

Program	Kullanma becerisi
Microsoft Office	Iyi

*Çok iyi, iyi, orta, zayıf olarak değerlendirin

Bilimsel Çalışmaları

SCI, SSCI, AHCI indekslerine giren dergilerde yayınlanan makaleler

Diğer dergilerde yayınlanan makaleler

Uluslararası bilimsel toplantılarda sunulan ve bildiri kitabında (*Proceedings*) basılan bildiriler

Hakemli konferans/sempozyumların bildiri kitaplarında yer alan yayınlar

Diğer (Görev Aldığı Projeler/Sertifikaları/Ödülleri)
