Research Paper
A Comparison of the Effect of Massage With Lavender Gel and Piroxicam Gel on Exercise-induced Muscle Soreness in Male Students of Gonabad University of Medical Sciences

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ABSTRACT

Aim: Muscular pain is a common complication of physical activity. The purpose of this study was to compare the effect of massage with lavender gel and piroxicam gel on exercise-induced muscle pain in male students of Gonabad University of Medical Sciences.

Methods & Material: This semi-experimental study was performed on 75 male students of Gonabad University of Medical Sciences in 2018. The samples were randomly divided into three groups of 25, including a lavender gel massage group, a piroxicam gel massage group, and a placebo gel massage group. The specimens were randomly divided into three groups of 25, including a lavender gel massage group, a piroxicam gel massage group, and a placebo gel massage group. The training program lasted for 45 minutes, including 10 minutes of warming up and doing stretching exercises, 30 minutes of exercises and the main exercises and 5 minutes for cooling. The research instrument was a checklist for the demographic characteristics of the samples and the Thalog malformation questionnaire. Samples completed the Thalog pain questionnaire after completing the exercise and also after the massage. The Mean±SD were used for descriptive statistics. Normality distributed data were analytically analyzed by paired t-test and ANOVA and non-normality distributed data were analytically analyzed by Wilcoxon and Kruskal-Wallis tests.

Findings: The results showed that muscle pain induced by exercise in all three groups after massage was significantly reduced compared to before massage (P<0.001). The results of Kruskal-Wallis test showed that the difference in muscle pain before and after massage with the three gels used (P=0.002) was statistically significant. Massage with lavender gel compared to piroxicam gel and placebo groups was able to reduce more the muscle pain.

Conclusion: Massage with lavender gel compared to the piroxicam gel and placebo gel can be a better way to reduce muscle pain after exercise.

Key words: Lavender, Piroxicam, Myalgia, Massage
Extended Abstract

1. Introduction

Exercise reduces several physical and psychological disorders, such as anxiety and depression, and increases self-confidence and self-esteem [1]. Considering the intensity, sports activities are divided into two types of aerobic and anaerobic. Aerobic exercise is performed with an intensity of less than 70% of the maximum heart rate. It usually takes more than 2 min of continuous activity, which is done both continuously and periodically. Fat burning and weight loss are the most important features of aerobic exercise. However, periodic physical activities performing with the intensity of more than 70% of a person’s maximum heart rate through less than 2 min are effective in reducing lactic acid accumulation and a delay the fatigue [2].

Muscle soreness (pain) is one of the most common sports injuries that occur frequently in people with different levels of physical fitness and is divided into the acute and delayed soreness depending on its severity and causes [3]. Acute muscle soreness is temporary and usually occurs a few minutes to a few hours after strenuous activity. The main cause of acute muscle soreness is ischemia, leading to the accumulation of metabolic products (lactic acid and potassium) [4]. Delayed soreness occurs about 8-12 h after strenuous exercise and reaches its maximum level after 24-48 h, followed by a gradual decrease and disappearing completely after 5-7 days. Following prolonged vigorous exercise, damage to muscle cell membranes triggers inflammatory responses and the release of the enzymes, such as Lactate Dehydrogenase (LDH), Creatine Kinase (CK), and aspartate aminotransferase [3].

Massage therapy is one of the treatments for muscle soreness. Massage is a series of regular and principled movements that are given to body tissues for specific purposes. Pain relief is one of the important usages of massage because, on the one hand, it increases blood flow and removes waste products from the tissues, and on the other hand, increases the pain threshold of neuroreceptors and reduces the sensitivity of pain receptors [5]. In addition to massage therapy, stretch therapy, cold therapy, and Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) are also used to reduce muscle soreness caused by exercise [6]. Piroxicam is one of the most effective nonsteroidal anti-inflammatory painkillers commonly used to treat inflammation and pain due to rheumatoid arthritis, osteoarthritis, and acute muscle soreness. Piroxicam topical gel is also commonly used for local inflammation and pain [7].

The use of medicinal plants has increased in recent years due to their lower side effects and several effective compounds. Lavender (lavandula angustifolia) [8] is a perennial and evergreen plant of Lamiaceae (the mint family) with blue, purple, and very fragrant flowers that has been used in traditional medicine. It has more than 40 different compounds, of which linalool, linalyl acetate, cineole, nerol, borneal, butyric acid, propionic acid, hydrochloric acid, free linalool, geraniol, tannins, and flavonoids are the most important [9, 10]. The effectiveness of Lavender on the body organs and cells as well as its analgesic and anti-inflammatory effects have been reported [11-13].

The analgesic effects of lavender due to its linalool content have been evaluated and confirmed in several studies [14]. Back massage with lavender essential oil as one of the non-pharmacological methods with side effects on mother and fetus shortened the duration of the first and second stages of labor and the severity of active labor pain [15]. Lavender has antioxidant [13], anti-anxiety [16], anti-epileptic [17], antidepressant [18], anticancer [21] and antifungal [23] effects. It is also used to treat insomnia [19], reduce morphine tolerance and dependence on morphine [20], and regulate the immune system [22]. This study aimed at comparing the effect of massage with lavender gel and piroxicam gel on muscle soreness caused by exercise in male students of the Gonabad University of Medical Sciences.

2. Materials and Methods

In this semi-experimental study, the needed data for measuring the dependent variables were collected by the pre-test and post-test method, and the effect of independent variables on dependent variables in experimental subjects was investigated. The used sampling method was convenience sampling. First, the male students of Gonabad University of Medical Sciences, who had chosen the “General Physical Education 1” course in the first semester of the academic year of 2018-19 who met the inclusion criteria, were selected as the sample and signed the informed consent. The inclusion criteria were personal and informed consent to participate in the study, physical health, no history of smoking, no allergies and underlying diseases, no drug use, and no history of professional sports.

Then, the subjects were randomly divided into three groups of 25 cases, including a group receiving the massage with placebo (lubricant gel), a group receiving the massage with lavender (topical gel, 60 g, Kimia Shafa Pharmaceutical Company) and a group receiving the massage with piroxicam (topical gel, 60 g, 0.5%, Razak Pharmaceutical Company). The subjects randomly selected one of the three balls marked 1, 2, and 3 and were placed in the group...
corresponding to that number (No. 1: The lavender massage group; No. 2: The piroxicam massage group; and No.: 3 The placebo massage group). The research samples participated in a training program designed by a physical education instructor in three different days of the week and answered the Muscle Soreness Questionnaire (MSQ) before and after the massage. The training program consisted of 10-15 min for warm-up (stretching exercises), 30-40 min for main activity (strength and endurance exercises), and 10 min for cooling (stretching exercises and light stretches).

The subjects in all three groups using the massage technique reduced their muscle soreness for 10-20 min under the supervision of the masseur (before starting the study, the subjects were informed how to perform the massage correctly). In this study, classical massage was performed on large muscles of the body, especially muscles of the lower torso, including the quadriceps femoris muscle, calf, gastrocnemius muscle, and hamstrings, because there were more pain and fatigue in these muscles. In this massage, up and down, circular, and tapping techniques were applied.

After the exercise, each group rubbed 2-3 g (a thin layer) of their exclusive gel on the target area and began massaging under the supervision of the masseur. At the end of the massage, the subjects reanswered the MSQ. This questionnaire is scored from 0-6 (0: Complete absence of pain, 1: Vague and unknown feeling of pain, 2: Light and continuous pain, 3: more pain than before, 4: Excruciating pain, 5: Severe pain, and 6: unbearable pain that might result from bruising of muscle damage). The validity and reliability of the questionnaire confirmed in Arefinia study (1).

### Statistical analysis

In this study, SPSS software V. 22 was used to analyze the data and the results were analyzed using descriptive and analytical statistical methods. After checking the accuracy of the data, central (Mean) and dispersion (Standard Deviation) measures were used for quantitative variables. For describing qualitative variables, “frequency” and “frequency percentage” were used. In the analytical analysis, Analysis of Variance (ANOVA) was used to compare weight, height, and Body Mass Index (BMI) variables in three groups of lavender, piroxicam, and placebo due to the normal distribution of variables. Regarding age, due to non-normally distributed data, the Kruskal-Wallis test was used. The Wilcoxon test was applied to compare the pain variables before and after the intervention in the groups. The Kruskal-Wallis test was employed to compare the effect of massage with lavender gel, piroxicam gel, and placebo gel on muscle soreness. All tests considered P<0.05 as the significance level.

### 3. Results

In this study, 75 male students of Gonabad University of Medical Sciences participated. The Mean±SD of age, height, weight, and BMI of the participants were 19.36±0.96, 175.20±6.58, 72.99±11.40, and 23.78±3.45, respectively. The results showed that height (P=0.296), weight (P=0.791), BMI (P=0.840), and age (P=0.261) showed no statistically significant difference among the groups.

Muscle soreness after massage with lavender gel was significantly lower than before massage (P<0.001). Also, muscle soreness after massage with piroxicam gel was significantly lower than before massage (P<0.001). In the placebo group (ECG gel), the muscle soreness after massage with placebo significantly decreased compared with before

### Table 1. Comparison of the mean soreness score based on the Muscle Soreness Questionnaire

| Soreness (Pain) | Median | Interquartile Range | P * | P # |
|----------------|--------|---------------------|-----|-----|
| Groups         |        |                     |     |     |
| Lavender       | Before the massage | 3 | 2 | <0.001 |
|                | After the massage | 1 | 1 |     |
| Piroxicam      | Before the massage | 3 | 2 | <0.001 |
|                | After the massage | 0 | 1 | 0.002 |
| Placebo        | Before the massage | 2 | 1 | <0.0901 |
|                | After the massage | 0 | 1 |     |

* Wilcoxon test;
# Kruskal-Wallis test.
the massage (P<0.001). Also, by subtracting the median muscle soreness after a massage from the median muscle soreness prior to massage in each group, it was found that the difference in muscle soreness in the lavender group was significantly greater than the placebo group and significantly less than the piroxicam group (P=0.002) (Table 1).

4. Discussion

Muscle soreness is one of the most common sports complications that occur in intense and prolonged physical activity [3]. Exercise-induced muscle soreness results from the accumulation of acids, ions, proteins, and hormones. Also, due to the damage to the cell membrane, its activity is disturbed leading to the entry of calcium from the extracellular space to the intracellular space. This also causes the release of proteases 3 and various enzymes, such as phospholipase A2.

Phospholipase A2 releases arachidonic acid from cell membrane phospholipids, thereby increasing inflammatory mediators, such as thromboxane, prostaglandins, and leukotrienes. Prostaglandins are produced by cyclooxygenase 2 and increase the sensitivity of the afferent nerve fibers in cranial nerve III and IV to chemical and mechanical stimuli, resulting in an increase in the sensation of pain in the muscles [3].

The results of our study showed that in all three groups studied, massage reduced muscle soreness in the research samples, which is consistent with the results of other relevant studies. For example, the research on the effects of massage on Delayed Onset Muscle Soreness (DOMS) and physical performance in female college athletes. The results of this study showed that through massage, DOMS reduced and improved vertical jump in the subjects [25].

In a study that examined the effect of massage on reducing pain and anxiety during childbirth, the results showed that massage is an effective and inexpensive nursing intervention that can reduce pain and anxiety during childbirth and nursing massage is effective on labor experience [26]. Another study was conducted on the effect of pre-dressing massage on pain and anxiety in burn patients, and the results showed that pre-dressing massage reduces post-dressing pain and anxiety [27].

Comparison of three methods of aromatherapy, massage therapy, and aromatherapy massage on muscle soreness in female athletes in Isfahan city also showed that there was a significant difference between the level of muscle soreness before and after the intervention in the massage and aromatherapy massage groups, whereas no significant difference was found in the aromatherapy group [1]. In another study, massage reduced DOMS by about 30% and was effective in reducing swelling, but did not affect muscle function [28].

During the massage, the pressure is placed on the capillaries and blood vessels and this pressure helps the material and blood to return from the muscles to the heart that prevents the stopping waste products across the blood and lymph. On the other hand, as a result of the pressure on the tissues, the blood vessels dilate reflexively and the amount of blood exchanged between the tissues increases [29]. Massage also improves the elasticity of muscle fibers and helps to contract muscles. It also increases the amount of oxygen in the muscle and improves the function of food absorption in muscle fibers. In general, massage is effective in gaining the lost strength of tired muscles and restores muscles to rest [30]. It reduces pain and discomfort in the area by removing waste products. Also, when the massage movements start gently followed by a gradual increase in the intensity of the movements, the sensitivity of the pain receptors may decrease and the pain threshold can increase. Also, massage by stimulating Aß fibers can reduce the transmission of pain to higher areas of the spinal cord and brain [27].

The results of our study showed that the difference in muscle soreness before and after massage by three gels used was statistically significant. Bazrafkan examined the effect of lavender on muscle soreness in athletes and concluded that lavender has a significant effect on reducing muscle soreness in female handball players, and during a match, aromatherapy and massage techniques can be used to reduce the pain of the players [31].

The analgesic effects of lavender extract due to its linalool content have been evaluated and confirmed in several studies. The analgesic effects of linalool on the spinal cord have also been reported [32]. The effectiveness of lavender fragrance has been confirmed to reduce anxiety in patients in the dental [16] and maternity wards [33]. The results of another study showed that lavender oil and polyphenolic extracts have anti-inflammatory and analgesic effects [12]. In addition, the analgesic effects of lavender essential oil on pain caused by the entry of a hemodialysis needle were investigated [34]. In acupressure, lavender oil significantly reduced low back pain [35]. Aromatherapy with lavender oil extract reduces anxiety and insomnia in patients with dementia [36]. The results of other studies also showed that this plant can be used to increase the accuracy and stress relieving and analgesic effects in the treatment of healthcare staff and patients [37].

Linalool and linalool acetate in lavender can stimulate the parasympathetic system. Therefore, this plant has sedative,
analgesic, and anticonvulsant effects. Linalool, as the most active part of the plant, has also been observed in non-central nervous system cells and tissues, indicating its spasmylytic and sedative effects. Linalyl acetate and linalool have narcotic and sedative effects, respectively. Potassium channels play a key role in the effectiveness of lavender, and they are likely to be triggered by stimulation of muscarinic M2, opioid, or dopamine D2 receptors [38].

The inhibition of nitric oxide synthesis by lavender can be one of the main mechanisms to exert its analgesic effects [14]. However, linalool, which is a competitive antagonist of NMDA receptors, inhibits the activity of these receptors and exerts its analgesic effects [39]. In another study, the analgesic effects of linalool were inhibited by atropine, naloxone, glibenclamide, and sulpiride, but were not inhibited by pirenzepine and SCH-23390. It can be concluded that these results are consistent with the pharmacological characteristics of the plant, the effects of cholinergic analgesia, and the blocking effect of NMDA channels [38]. The results of a study showed that linalool acetate, which is one of the main components of lavender, relaxes the muscles of the rabbit’s vascular wall. It was also found that this effect was achieved by dephosphorylation of the light chain of myosin and producing nitric oxide [40].

According to the proven role of calmodulin in the process of contraction and relaxation of the single- and multi-unit smooth muscles, the effect of lavender, and more precisely, the linalool acetate in this process can be attributed to the separation of calcium from calcium-activated protein kinase and muscle relaxation. Considering the effect of lavender on tolerating the analgesic effects of morphine and reducing its dependence, it has shown that inhibiting the action of calmodulin can reduce tolerance to the analgesic effects of morphine and reinforce the possible effect of lavender to reduce tolerance to morphine analgesic effects and dependence by affecting calmodulin and related kinases [20, 41].

5. Conclusion

In all three groups studied, there was a significant relationship between massage and pain reduction in the research samples so that the samples felt less pain after exercising and massage therapy. The results also showed that massage with lavender gel had a greater effect than piroxicam gel and placebo gel on reducing muscle soreness caused by exercise.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Vice Chancellor for Research and Technology of Gonabad University of Medical Sciences (Ethical Code: IR.GMU.REC.1397.043).

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Authors’ contributions

Writing-original draft, final review: All authors; Conceptualization: Mohammad Reza Mottaghy, Abbasali Abbasnezhad; Final proof: Mohammad Reza Mottaghy; Results interpretation: Saeed Erfanpoor, Hossein Mohammadzade Moghaddam, Zahra Rouhani; Design, data gathering: Mohammad Reza Arbaghaei.

Conflicts of interest

The authors declared no conflict of interest.

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مقایسه اثر ماساژ با ژل اسطوخودوس و ژل پیروکسیکام بر درد عضلانی ناشی از ورزش

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کوفتگی و درد عضلانی یکی از عوارض شایع و معمول ناشی از فعالیت جسمانی شدید است. این امر با حضور حالت باز

کوفتگی و درد عضلانی در مردان و زنان در مراحل مختلف عمر و در فعالیت‌های جسمانی بروز می‌کند. در این مطالعه، با هدف مقایسه اثر این دو دارو بر درد عضلانی ناشی از ورزش، دانشجویان دانشگاه علوم پزشکی گناباد به مدت 6 هفته مورد مطالعه قرار گرفتند.

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همچنین برای بررسی تاثیر این دو دارو، دانشجویان به مدت 4 هفته مطالعه بر روی این دو دارو که با ژل اسطوخودوس و ژل پیروکسیکام در دو گروه ماساژ مورد مطالعه قرار گرفتند. در این مطالعه، دانشجویان به ترتیب به دو گروه ماساژ با ژل اسطوخودوس و ژل پیروکسیکام اختصاص یافتند. در هر گروه 20 نفر حضور داشتند. در این مطالعه، دانشجویان به ترتیب به دو گروه ماساژ با ژل اسطوخودوس و ژل پیروکسیکام اختصاص یافتند. در هر گروه 20 نفر حضور داشتند.

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نتایج نشان داد درد عضلانی ناشی از ورزش بعد از ماساژ در مقایسه با قبل از ماساژ به طور معنی‌داری کاهش یافته است و ماساژ با ژل اسطوخودوس در مقایسه با ژل پیروکسیکام و ژل دارونما توانسته است کاهش بیشتری در درد عضلانی ایجاد کند.

ماساژ با ژل اسطوخودوس در مقایسه با ژل پیروکسیکام و ژل دارونما می‌تواند روش بهتری برای کاهش درد عضلانی بعد از ورزش باشد.

کلیدواژه‌ها: اسطوخودوس، پیروکسیکام، درد عضلانی، ماساژ
پیش‌سپاری‌های نشاندهنده میزان انقباض درد در دو گروه ایجاد شده گزارش نشده است. در این مطالعه به‌عنوان تزیین ای، تعداد کلیه نمونه‌های مورد بررسی در گروه‌بندی شده بر پایا و رنگ‌های مختلف مشخص شدند. در این مطالعه نیمه‌تربیتی اطلاعات مورد نظر برای انجام تحقیق و بررسی از طرف یک تیم پزشکی در گروه‌بندی شده مورد بهره‌برداری قرار گرفت و جدول‌های سایر وابسته بر اساس گزارشات مدیران و نهایتاً ارائه می‌گذارد. این مطالعه به‌عنوان درمان‌کننده برای کاهش انقباض درد در زنان در مراحل پیشرفته‌تری آغاز می‌شود.

1. Lactate Dehydrogenase (LDH)
2. Creatine Kinase (CK)
آزمون کروکسکال و ویلکاکسون برای مقایسه نتایج قبل و بعد از درآمد، به عنوان آزمون‌های چند نمایشگری استفاده شد.

کوکسکال و ویلکاکسون برای مقایسه نتایج قبل و بعد از درآمد، به عنوان آزمون‌های چند نمایشگری استفاده شد.

### نتایج

#### قبل از ماساژ

| گروه | درد | میانگین | نرمال | نامعلوم | شدید |
|------|------|---------|-------|--------|------|
| اسطخودوس | 3 | 2 | 1 | 0 | 0 |
| پیروکسیکام | 3 | 2 | 1 | 0 | 0 |
| دارونما | 3 | 2 | 1 | 0 | 0 |

#### بعد از ماساژ

| گروه | درد | میانگین | نرمال | نامعلوم | شدید |
|------|------|---------|-------|--------|------|
| اسطخودوس | 3 | 2 | 1 | 0 | 0 |
| پیروکسیکام | 3 | 2 | 1 | 0 | 0 |
| دارونما | 3 | 2 | 1 | 0 | 0 |

### نتایج پرسش‌نامه

#### قبل از ماساژ

| گروه | درد | میانگین | نرمال | نامعلوم | شدید |
|------|------|---------|-------|--------|------|
| اسطخودوس | 3 | 2 | 1 | 0 | 0 |
| پیروکسیکام | 3 | 2 | 1 | 0 | 0 |
| دارونما | 3 | 2 | 1 | 0 | 0 |

#### بعد از ماساژ

| گروه | درد | میانگین | نرمال | نامعلوم | شدید |
|------|------|---------|-------|--------|------|
| اسطخودوس | 3 | 2 | 1 | 0 | 0 |
| پیروکسیکام | 3 | 2 | 1 | 0 | 0 |
| دارونما | 3 | 2 | 1 | 0 | 0 |

### نتایج تحلیل آماری

#### قبل از ماساژ

| گروه | درد | میانگین | نرمال | نامعلوم | شدید |
|------|------|---------|-------|--------|------|
| اسطخودوس | 3 | 2 | 1 | 0 | 0 |
| پیروکسیکام | 3 | 2 | 1 | 0 | 0 |
| دارونما | 3 | 2 | 1 | 0 | 0 |

#### بعد از ماساژ

| گروه | درد | میانگین | نرمال | نامعلوم | شدید |
|------|------|---------|-------|--------|------|
| اسطخودوس | 3 | 2 | 1 | 0 | 0 |
| پیروکسیکام | 3 | 2 | 1 | 0 | 0 |
| دارونما | 3 | 2 | 1 | 0 | 0 |

### نتایج تحلیل آماری

#### قبل از ماساژ

| گروه | درد | میانگین | نرمال | نامعلوم | شدید |
|------|------|---------|-------|--------|------|
| اسطخودوس | 3 | 2 | 1 | 0 | 0 |
| پیروکسیکام | 3 | 2 | 1 | 0 | 0 |
| دارونما | 3 | 2 | 1 | 0 | 0 |

#### بعد از ماساژ

| گروه | درد | میانگین | نرمال | نامعلوم | شدید |
|------|------|---------|-------|--------|------|
| اسطخودوس | 3 | 2 | 1 | 0 | 0 |
| پیروکسیکام | 3 | 2 | 1 | 0 | 0 |
| دارونما | 3 | 2 | 1 | 0 | 0 |

### نتایج تحلیل آماری

#### قبل از ماساژ

| گروه | درد | میانگین | نرمال | نامعلوم | شدید |
|------|------|---------|-------|--------|------|
| اسطخودوس | 3 | 2 | 1 | 0 | 0 |
| پیروکسیکام | 3 | 2 | 1 | 0 | 0 |
| دارونما | 3 | 2 | 1 | 0 | 0 |

#### بعد از ماساژ

| گروه | درد | میانگین | نرمال | نامعلوم | شدید |
|------|------|---------|-------|--------|------|
| اسطخودوس | 3 | 2 | 1 | 0 | 0 |
| پیروکسیکام | 3 | 2 | 1 | 0 | 0 |
| دارونما | 3 | 2 | 1 | 0 | 0 |

### نتایج تحلیل آماری

#### قبل از ماساژ

| گروه | درد | میانگین | نرمال | نامعلوم | شدید |
|------|------|---------|-------|--------|------|
| اسطخودوس | 3 | 2 | 1 | 0 | 0 |
| پیروکسیکام | 3 | 2 | 1 | 0 | 0 |
| دارونما | 3 | 2 | 1 | 0 | 0 |

#### بعد از ماساژ

| گروه | درد | میانگین | نرمال | نامعلوم | شدید |
|------|------|---------|-------|--------|------|
| اسطخودوس | 3 | 2 | 1 | 0 | 0 |
| پیروکسیکام | 3 | 2 | 1 | 0 | 0 |
| دارونما | 3 | 2 | 1 | 0 | 0 |

### نتایج تحلیل آماری

#### قبل از ماساژ

| گروه | درد | میانگین | نرمال | نامعلوم | شدید |
|------|------|---------|-------|--------|------|
| اسطخودوس | 3 | 2 | 1 | 0 | 0 |
| پیروکسیکام | 3 | 2 | 1 | 0 | 0 |
| دارونما | 3 | 2 | 1 | 0 | 0 |

#### بعد از ماساژ

| گروه | درد | میانگین | نرمال | نامعلوم | شدید |
|------|------|---------|-------|--------|------|
| اسطخودوس | 3 | 2 | 1 | 0 | 0 |
| پیروکسیکام | 3 | 2 | 1 | 0 | 0 |
| دارونما | 3 | 2 | 1 | 0 | 0 |
در مطالعه ما نشان داده که کاهش درد عضلانی قبل و بعد از ماساژ با ماساژ اسطوخودوس و اکسیره روغنی آن در دو روش مداوم ممسنی می‌باشد. در مطالعه اصلی به ماساژ اسطوخودوس می‌تواند باعث کاهش درد عضلانی در نمونه‌های پژوهش شده باشد. همچنین اکسیره روغنی نیز مؤثر بوده است.

نتایج تحقیقات دیگر نشان داده که آرام‌بخشی از ماساژ با اسطوخودوس می‌تواند باعث کاهش درد عضلانی در ورزشکاران دانشگاهی شود. در مطالعه‌ای که بررسی حساسیت گیرنده‌های درد کاهش یابد و آستانه درد بالا رود، در مطالعه ما نشان داده شد که اکسیره روغنی و بسته به شرایط و نسبت آن دارای اثرات ضد دردی است.

در مطالعه‌ای که بین اثرات ماساژ بر کاهش درد و اضطراب در طول زمان پرداخته شده، نتایج نشان داده که ماساژ می‌تواند باعث کاهش درد و اضطراب بین اثرات ماساژ بر کاهش درد و اضطراب در طول زمان بوده و باعث کاهش درد و اضطراب بر اثر فشاری که روی عضلات به سمت قلب می‌شود و در نتیجه از توقف مواد زاید همراه با اسید تروموکسانت و پروستاگلاندین‌ها می‌باشد.

مقايسه سه روش آزمون‌های ماساژ و آزمون‌های ماساژ بر مبنای درد عضلانی در میدان ورزش و در اثرات ماساژ در میدان ورزش و در اثرات ماساژ در ورزشکاران دانشگاهی شود.

کلمه کلیسی ماساژ در میدان ورزش و در اثرات ماساژ در ورزشکاران دانشگاهی شود.

کلمه کلیسی ماساژ در میدان ورزش و در اثرات ماساژ در ورزشکاران دانشگاهی شود.
مشارکت‌کنندگان

نوشتن نسخه اولیه: همه نویسندگان؛ ایده اصلی: محمودرضا متقی، عباسعلی عباس نژاد؛ تأیید نهایی: محمودرضا متقی؛ بازبینی نهایی: عباسعلی عباس نژاد، سعید علیزاده، حسین محمدزاده، زهرا روحانی و محمودرضا اربقایی؛ تفسیر نتایج: سعید علیزاده، حسین محمدزاده و زهرا روحانی؛ طراحی مطالعه: رضوانی خامنه‌ی، محمودرضا اربقایی

تشریح موانع

تهیه‌گونه تهیه‌گونه توضیحی توسط نویسندگان بیان نشد است.

تشکر و قدردانی

مطالعات اخلاقی

پیروی از اصول اخلاق پژوهشگر

مطالعه مجوز شماره IR.GMU.REC.1397.043 مبنای محققی تحقیقاتی و فناوری شناخته شده‌که در منطقه مطالعاتی، تیپ و چرخه‌ی تحقیقاتی صورت می‌گیرد. این تحقیقات شامل، درک مبنا تحقیق، معرفی تجربیات نمایش داده که مطالعه با ارتضو‌کننده‌های محلول، است. در این مطالعه بر پرداخت از شناخت اهداف محقق و بالاترین مصوبه‌های اخلاقی تحقیقات نشان داده که مطالعه با ارتضو‌کننده‌های محلول، است.

توجه‌گری

به طور خلاصه، در سه سطح مورد استفاده اثرات مطالعاتی، مباحثی در مورد استیفاده و پژوهش وجود داشته‌بود. در این مطالعات کردن، موجه شده است که مطالعه با ارتضو‌کننده‌های محلول، است. در این مطالعه بر پرداخت از شناخت اهداف محقق و بالاترین مصوبه‌های اخلاقی تحقیقات نشان داده که مطالعه با ارتضو‌کننده‌های محلول، است.

ملاحظات اخلاقی

ملاحظات مربوط به مطالعه و فناوری شناخته شده‌که در منطقه مطالعاتی، تیپ و چرخه‌ی تحقیقاتی صورت می‌گیرد. این تحقیقات شامل، درک مبنا تحقیق، معرفی تجربیات نمایش داده که مطالعه با ارتضو‌کننده‌های محلول، است.

مشارکت‌کنندگان

نوشتن نسخه اولیه: همه نویسندگان؛ ایده اصلی: محمودرضا متقی، عباسعلی عباس نژاد؛ تأیید نهایی: محمودرضا متقی؛ بازبینی نهایی: عباسعلی عباس نژاد، سعید علیزاده، حسین محمدزاده، زهرا روحانی و محمودرضا اربقایی؛ تفسیر نتایج: سعید علیزاده، حسین محمدزاده و زهرا روحانی؛ طراحی مطالعه: رضوانی خامنه‌ی، محمودرضا اربقایی

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مطالعات اخلاقی

پیروی از اصول اخلاق پژوهشگر

مطالعه مجوز شماره IR.GMU.REC.1397.043 مبنای محققی تحقیقاتی و فناوری شناخته شده‌که در منطقه مطالعاتی، تیپ و چرخه‌ی تحقیقاتی صورت می‌گیرد. این تحقیقات شامل، درک مبنا تحقیق، معرفی تجربیات نمایش داده که مطالعه با ارتضو‌کننده‌های محلول، است. در این مطالعه بر پرداخت از شناخت اهداف محقق و بالاترین مصوبه‌های اخلاقی تحقیقات نشان داده که مطالعه با ارتضو‌کننده‌های محلول، است.

توجه‌گری

به طور خلاصه، در سه سطح مورد استفاده اثرات مطالعاتی، مباحثی در مورد استیفاده و پژوهش وجود داشته‌بود. در این مطالعات کردن، موجه شده است که مطالعه با ارتضو‌کننده‌های محلول، است. در این مطالعه بر پرداخت از شناخت اهداف محقق و بالاترین مصوبه‌های اخلاقی تحقیقات نشان داده که مطالعه با ارتضو‌کننده‌های محلول، است.
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