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The Use of Ginger and Mineral Water to Reduce Delayed Onset Muscle Soreness at Post Anaerobic Exercises

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Abstract

Excessive anaerobic exercises might cause pain in the muscles or commonly called Delayed Onset Muscle Soreness (DOMS). One of the benefits of ginger can reduce pain. The purpose of this study was to determine the effect of giving mineral water and ginger drink to the reduction of DOMS after anaerobic excercises. Experimental research method was then conducted in this research. The respondents were students from the Faculty of Sports Science. The treatment consisted of providing mineral water, ginger drink and a 50-meter sprint test with 7 repetitions. Numerical Rating Scale was used to measure pain. T-test statistics was used as an analysis method. The results of this study indicate a significant difference between the use of mineral water and ginger drink in reducing DOMS in the sample group after anaerobic activity. The decrease in the group given ginger drinks was faster than those given mineral water. It can be summarized that there is a decrease in pain or DOMS by giving ginger drink and mineral water after doing anaerobic excercises.
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INTRODUCTION

Sports means the activities or excercises carried out by a person or society both consciously and without pressure to compete minimally with oneself (Skinner et al, 2008: 255). International sports researchers recommend that sports become a necessity to improve individuals, cultures, and society (Hancock, M.G. et al, 2013: 14). According to Schulenkorf (2013: 25) government agencies and NGOs around the world recognize the importance of sports to fill leisure time with playing some excercises to reduce problems and social disputes in society. In addition, there is also a association of sports contribution on self-esteem, physical and social competence (Wagnsson, S. et al. 2013: 37). Sports can also unite differences in race, religion, ethnicity, gender and also as a reliable drug to cure social ills (Russel Hoye, Nicholson, & Houlihan, 2017). In addition to the psycho-social impact, an important part of sporting activities is to achieve excellent physical appearance and fitness.

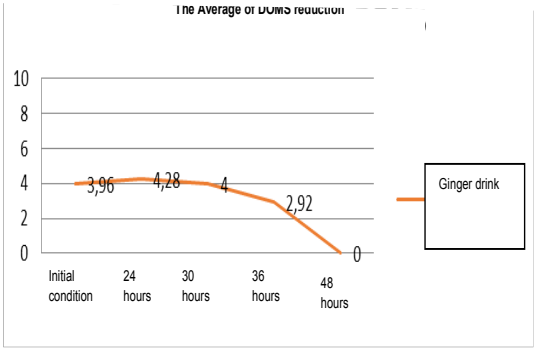
Regular and programmed exercise will be able to produce good physical appearance / fitness. The three-month physical fitness training program has an effect on one's muscular strength and endurance performance. (Belachew, Birtukan and Mengistu.S, 2018: 67). Physical training must meet the correct training criteria by adopting the concept of FITT (frequency, intensity, time, type). Anaerobic physical exercise which does not reach the threshold of sensitivity will not produce maximum training effect. On the other hand, anaerobic physical exercise in beginners will cause high fatigue. Anaerobic exercise as intense physical activity with a very short duration will lead to a buildup of lactic acid. Exercises that are usually considered anaerobic include running, high intensity training intervals, weightlifting, etc. (Patel, Harsh et al. 2017: 136). In the case of increased exercise intensity in beginner athletes and involving large muscles until the maximum load will cause symptoms of pain in the muscles or joints.

The onset of pain, lack of strength and range of motion in the joints and muscles is called delayed muscle pain (DOMS) or known as muscle fever. This situation usually starts 8-12 hours after activity, and peaks between 24-48 hours and can last 96 hours or more after activity. (Veqar, Zubia. 2013: 13206). According to Cheung et al, (2003) in Heru SL, Padli and Endang PB. (2017: 38) DOMS is an injury that occurs due to several factors. These factors include lactic acid buildup and excessive exercise intensity (overload). Lactic acid buildup that occurs due to the process of disposal that is not smooth can stimulate pain which is the initial symptom of DOMS. Unprogrammed training is most likely to overload. Exercise that is overloaded will cause muscle damage resulting in injury to the muscles. In addition, excessive exercise eccentric risk of experiencing DOMS. Various theories about DOMS show that DOMS is a buildup of lactic acid, muscle spasms, connective tissue damage, mechanical muscle damage, cellular inflammation, and enzymes (Contro et al. 2016). DOMS is associated with muscle damage that occurs several hours after unusual exercise, especially when eccentric muscle activity. Muscles that forcibly contract with a long duration such as running can trigger an inflammatory response and the production of reactive oxygen species (ROS) that cause inflammation and oxidative stress. Muscle pain due to DOMS increases passive stiffness, swelling, decreased strength, pain in certain areas. Symptoms will often occur within 24 hours after exercise and usually subside after 3-4 days. (Majeed M, et al. 2016: 1).

Fatigue due to anaerobic excercises can cause DOMS, one of which is caused by the accumulation of metabolic waste in the form of lactic acid. So far, the efforts made have been using water as one of the media and efforts to reduce fatigue. Up to now, water can be used as a therapeutic medium to reduce fatigue. Water can be used as a therapeutic medium but it can also be consumed. According to Cochrane (2004); Vaile et al. (2007) in Suriani Sari (2016; 102) Elite athletes are often affected by muscle damage because their muscles are regularly subjected to repeated high muscular contractions. Presently, the use of various forms of hydrotherapy such as cold water immersion (CWI), hot water immersion (HWI), and contrast water therapy (CWT) as recovery interventions is a common practice in elite sports environments. Meanwhile scientific research shows that 3-4% water loss in the body will reduce muscle contractile strength by 30%, as well as muscle speed and explosive power by 8%. When excessive exercises and dehydration occur, muscles have residual glycogen metabolism product. All these conditions are very unfavorable for muscle performance. Rehydration (recovery) of fluid is one of the most important phases to maintain muscle performance (Okanovi , Dor e G. 2012; 70). The findings from the investigation show that all drinks tested were able to promote rehydration after one hour of excessive exercises, such as carbohydrate-electrolyte sports drinks, coconut water, and bottled mineral water. (Kalman, Douglas S. et al. 2012: 7)

In addition to using water, fatigue followed by DOMS can be overcome or reduced

by giving various treatments such as stretching, ice compresses, massage, vitamins C and E con-



sumption or herbal plants use such as ginger. Ginger has anti-inflammatory compounds that are useful to relieve muscle pain and even joints that can be used to ease DOMS. Besides being useful in maintaining muscle health, a study related to ginger found that the benefits of ginger can eliminate muscle discomfort due to pain in athletes. During this 6-week trial, those who consumed ginger experienced a significant decrease in muscle pain compared to those who did not consume ginger (Merdekadotcom Team, 2018). Based on the results of testing the effect of extract of fresh and dried red ginger water on DOMS reduction, it showed that they have effectiveness for 25 minutes, while in the 30th minute its effectiveness decreases. The ethanol extract of fresh and dried red ginger waste still has effectiveness as an analgesic until the 30th minute. (Yessi Febriani et al.2018: 57).

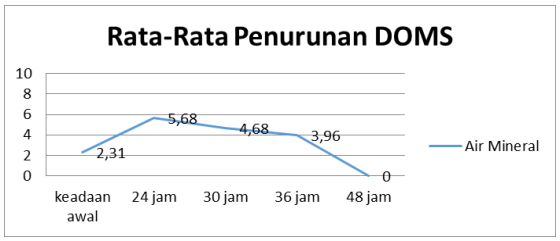
METHODS

Experimental research with Treatments-by-Subjects (T-S) design was conducted in this study. In the treatments-by-subjects design several types or variations of treatment are given consecutively to the same group of subjects. One group that can be used as a control group at one time and will also be used as an experimental group. As many as 26 students of Sports Science Faculty were selected as a sample through purposive sampling. The variable consisted of independent variable which include mineral water as the control and ginger drink as the experiment variable, while the dependent variable was DOMS as measured by NRS. The research treatments comprised 1) giving mineral water after 50 meters sprint, 2) giving ginger drink after 50 meters sprint. 3) 7 repetitions of 50 m sprint with a rest period of 1 minute of each.

The rest period between the first treatment (drinking mineral water) and the second treatment of drinking ginger and 50-meter sprint test was as long as 2 weeks. The aim was to minimize carry-over effects due to the prior treatment factors. The consumption of mineral water and ginger water was carried out after 50-meter sprint exercise, and one hour before measurement and given four times each of 330 ml. Numerical Rating Scale (NRS) was used to measure Delayed Onset Muscle Soreness (DOMS). DOMS measurements are carried out within 24 - 48 hours after 50-meter sprint. Pain measurement was focused on the muscle groups in the lower body (quadriceps femoris group, hamstring group, gluteus maximus, iliopsoas and gastrocnemius).

RESULTS AND DISCUSSION

Based on the results of data analysis, it showed that there was Delayed Onset Muscle Soreness (DOMS) decrease in both study groups. After 50 meters sprint carried out, DOMS initial measurements were taken before being treated with mineral water and ginger drinks. Furthermore, the consumption of drinking mineral water and ginger drinks are given 1 hour before the first measurement after 24 hours as many as 4 times in the span of 24-48 Hours. Distribution of data groups that were given drinking mineral water as shown in **Picture 1.**



Picture 1. Graph of DOMS reduction with mineral water treatmen

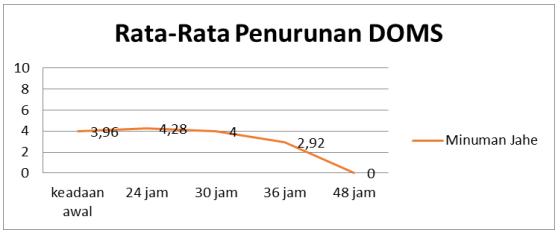
Meanwhile the average percentage of Delayed Onset Muscle Soreness (DOMS) reduction in the group that was given mineral water can be seen in **Table 1**.

Table 1. Percentage of DOMS reduction with mineral water treatment

Time of Observation	Mineral Water
Initial condition	23 %
24 hours	57 %
30 hours	47 %
36 hours	39 %
48 hours	0 %

The distribution of data on the decrease of Delayed Onset Muscle Soreness (DOMS) in the

group that was given ginger drink can be found in **Picture 2**.



Picture 2. Graph of DOMS reduction with ginger drink treatment.

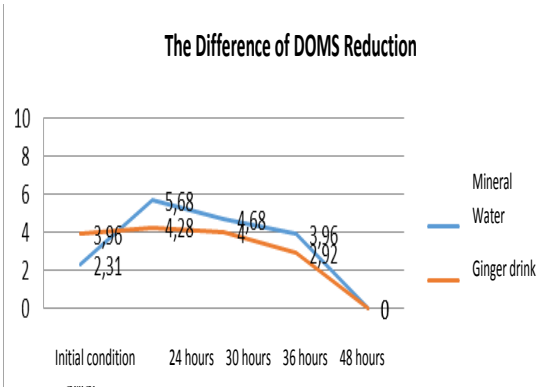
While the percentage of the average Delayed Onset Muscle Soreness (DOMS) reduction in the group that was given ginger drink displayed in **Table 2**.

Table 2. Percentage of DOMS reduction with ginger drink treatment

Time of Observation	Ginger Drink
Initial condition	40 %
24 hours	43 %
30 hours	40 %
36 hours	29 %
48 hours	0 %

Based on the results of T-test between the use of mineral water and ginger drink on the decrease of Delayed Onset Muscle Soreness (DOMS), there was significant difference between them.

Based on the results of T-tests of the two research groups, the progress of the Delayed Onset Muscle Soreness (DOMS) was found. the decrease that occurs in groups that are given ginger drinks are relatively faster than those that are only given mineral water. The graphic of the DOMS reduction difference can be seen in **Picture 3**.



Picture 3. Delayed Onset Muscle Soreness (DOMS) reduction in both groups.

Delayed Onset Muscle Soreness (DOMS) is muscle pain and stiffness that develops 24-48 hours after doing sports activities (Zondi et al. 2015). Various theories about DOMS show that DOMS is a buildup of lactic acid, muscle spasms, connective tissue damage, mechanical muscle damage, cellular inflammation, and enzymes (Contro et al. 2016). DOMS occurs mostly in beginner sportsmen who do unusual activities with relatively heavy loads so that the muscles are very burdened. Complaints due to DOMS can trigger someone's discomfort to do physical activities afterwards. Alternative treatments are then needed to help minimize or speed up the process of healing the pain that occurs. Ginger as a plant that has benefits for reducing pain has a good prospect of becoming one of the solutions for reducing DOMS.

The results of this study confirm that the content contained in ginger is able to provide healthy solutions for all people who perform various heavy sports activities. An excessive burden placed on an untrained muscle group will cause pain 24-48 hours afterwards. Ginger as an alternative herbal medicine can be a solution to overcome and or accelerate the recovery process from pain. The results of this study empirically prove that ginger can be functioned as a medicine that help reduce pain due to microscopic injuries from physical exercises such as DOMS. This is in line with previous studies which have shown that ginger can have an effect on pain reduction due to Delayed Onset Muscle Soreness (DOMS). Ginger contains carbohydrates, free fatty acids, amino acids, protein, phytosterol, niacin, oleoresin (gingerol, shogaol, zingeron) as much as 2.5-3.72% of dry weight, essential oils (cineol, linalool, limonene, zingiberol, zingiberen, kamfena) of 2.58-3.90% of dry weight, caprylic acid, capsaicin, chlorogenic acid, farnesal, farnesene, farnesol, and starch elements such as starch. The results a research conducted by Christopher D et al. (2010: 900) confirm the that ginger has a function as an analgesic for pain. This study shows that daily consumption of raw ginger and heat can reduce moderate to large muscle pain after muscle injury due to exercises. This study shows that daily consumption of raw ginger and heat can reduce moderate to severe muscle pain after muscle injury due to exercises.

In proportion to the previous research, Matsumura, MD et al. (2015: 1) determine that ginger (Zingiber officinale Roscoe) as an anti-inflammatory agent that can help reduce inflammation, such as muscle damage caused by sports activities. In addition, Ginger has anti-inflam-

matory and analgesic properties so that it can be used to reduce pain or DOMS after exercise or sports activities with high intensity. The results of this study increasingly provide wider knowledge to the public that ginger provides many health benefits, including being able to reduce the pain that occurs in the body including DOMS. Furthermore, there needs to be a more thorough research to the next researcher to examine the benefits of ginger in reducing pain levels from the perspective of the type of ginger, the dosage, the form of serving, and the level of DOMS.

CONCLUSION

Through this study, the researchers concluded that there was a decrease in Delayed Onset Muscle Soreness (DOMS) by giving ginger drinks and mineral water after anaerobic exercises.

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