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Combination Therapy 1 (Dynamic Stretching & Cryotherapy) With Combination 2 (Dynamic Stretching & Massage) To Flexibility Hamstrings

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Abstract

The purpose of this study was to test combination therapy 1 (dynamic stretching & cryotherapy) with a combination of 2 (dynamicstretches & massages) on hamstring flexibility. The method used is researchquasi experimental. The total sample participating in this study were 20 Untad female volleyball athletes. Samples were divided into two groups using the matching technique. Data collection used testsit and reach. Data analysis techniques in this study used statistics with the help of SPSS 25. From the results of the different test it can be seen that the t-count value in the combination group 1(dynamic stretching & cryotherapy) as big18,419, combination group 2(dynamicstretches & massages) as big23,400. The effect obtained from the value of p = 0.000 <0.05 which means combination therapy 1 (dynamic stretching & cryotherapy) with a combination of 2 (dynamicstretches & massages) increase the flexibility of the hamstring of Tadulako University women's volleyball athletes.

Keywords: dynamic Stretching, Cryotherapy, Massage, Flexibility, Hamstrings

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A. Introduction

Stretching is often used during warm-up routines in sports settings to prepare one body part for the next performance task (Reiner et al., 2022). Stretching is a training method to increase the range of motion of the joints so that in carrying out activities or sports there is readiness to reduce the impact that is very prone to injury to athletes (Thomas et al., 2021). Stretching is a routine part of training and match preparation in competitive sports and is often considered a prerequisite for achieving optimal performance (Zmijewski et al., 2020). Principle dynamic stretchingis to move the agonist muscle as far as its maximum range of motion, while the antagonist muscle relaxes. The purpose of dynamic stretchingis to increase dynamic flexibility. Dynamic stretching only move the muscles that move certain body parts without any outside help (Reiner et al., 2022). The ability to achieve maximum range of motion is influenced by the ability to combine relaxation of the longitudinal muscles and contraction of the moving muscles. For example, the ability to flex the hip is influenced by the ability to relax the hamstring muscles and the contraction of the hip flexor muscles. Cryotherapyor use of cooling, is a non-pharmacological pain relief technique that has been used for centuries to lower the temperature over a painful/inflamed area of the skin to reduce the speed of nerve conduction in the C- and Adelta fibers, thereby slowing the transmission of pain signals (Attia & Hassan, 2017).

According to (Leroux et al., 2021) cryotherapy is a nonpharmacological therapy with analgesic properties that was first recognized by Hippocrates, and is generally used for the treatment and rehabilitation of acute musculoskeletal in athletes. The essence of cold therapy or cryotherapy is to absorb calories from the local area of injury so that a decrease in temperature occurs. In this regard, this type of therapy with ice is more effective at lowering temperature than ice in packs considering that in this condition more body calories are used to melt the ice. The longer the therapy time, the deeper cold penetration. In general, cold therapy at 3.50C for 10 minutes can affect temperatures up to 4 cm under the skin. Muscle tissue with a high water content is a good conductor while fat tissue is a temperature insulator thereby inhibiting cold penetration (Coelho et al., 2021).

Massageis a technique of manipulating soft tissues through pressure and rubbing. This technique can be done on the whole body or on certain parts (Konrad et al.,

2020). Massagehas many benefits for the human body. Under the influence of massage there is an increase in blood flow, muscle tension decreases, mood improves. Massage can increase range of motion in joints and reduce passive and active stiffness (Choroszewicz et al., 2020). Massagewith Swedish techniques it has a principal application in the form of movement techniques such aseffleurage, petrissage, vibration, Andtapotement. While flexibility is the most important component in fitness and physical performance. Massagecan be useful as an alternative to injury healing, fitness recovery, chronic disease healing, as well as supporting athlete achievement (Kong et al., 2018).

Flexibility and muscle length are often used synonymously when referring to the ability of the hamstring muscles to extend to their greatest final reach. For this purpose, the term muscle length will be used to refer to the final reach of the hamstring muscles (Hatano et al., 2022). In an effort to increase joint flexibility and avoid injury, the hamstrings are often stretched before exercise (Behm et al., 2016; Chen et al., 2018; Iwata et al., 2019; Takeuchi & Nakamura, 2020).

The ability to move the body or several groups of joints slowly and easily without resistance and with pain-free range of motion of the joints is also flexibility (Hatano et al., 2022). Flexibility is the ability of a joint, muscle and surrounding ligaments to move freely and comfortably within the expected maximum range of motion (Hatano et al., 2022).

The University of Tadulako Women's Volleyball Team is a volleyball team under the guidance of the University which actively conducts routine training three times a week on campus. Achievement development at this club is carried out by providing a form of training or coaching that leads to an increase in the appearance and achievements of the players. The achievements of the Untad Women's volleyball team in 2022 often win regional events, one of which is winning (1st Place) the Governor's Cup championship between Clubs in Central Sulawesi. Constraints at this club are frequent hamstring injuries that every player gets in participating in championships or matches. Due to the frequent constraints of hamstring injuries in athletes, research will be carried out combination therapy 1(dynamic stretching & cryotherapy) with a combination of 2 (dynamic stretching & massage) toflexibility hamstring volleyball athlete from Tadulako University.

B. Method

This research method isquasi-experimental with 2 unpaired groups (unrelated), to study and know the addition of effects cryotherapy and massage on dynamic stretchingon the flexibility of the hamstring muscles. Before being given treatment, a screening process was carried out first to find out that the sample was included in the inclusion criteria. If the sample does not meet the inclusion criteria and has exclusion criteria, then the sample cannot receive the treatment that will be given. After that, the sample was given information about the procedures and types of treatment given during the study. If the sample agrees with the type of treatment, the next step is to carry out an assessment process to diagnose the decreased flexibility of the hamstring muscles.

To find out how far the level of hamstring flexibility in patients has decreased, it was carried outsit and reach testto measure the flexibility of the hamstring muscles. Examination of hamstring muscle flexibility was evaluated before and after treatment. Then the results will be analyzed between the treatment group I and the treatment group II before and after treatment as evaluation data. Overall the number of samples is 20 people, namely the treatment group I and the treatment group II, each of which is 10 people after grouping the samples.

Flexibility test

Sit and Reach performed to assess the mobility and flexibility of the lower back and hamstrings. Participants sit with their legs extended forward, feet together and bent at the hip joints as far as possible without bending the knees. The farthest distance from the finger tips to the bench was recorded as the best performance of the three occasions (Zhang et al., 2020). After the results were obtained, the treatment group I did a warm-up to avoid cramps or spasms during exercise, after which the sample diddynamic stretchingwith 30 reps for 3 sets. After doing the exercises, samples are givencryotherapyin the form of an ice pack right on the hamstring muscle belly for 15 minutes. After training, the sample was asked to take measurements with the same procedure. This is the result that occurs after the intervention is given. Any reduction or addition of numbers is measured in centimeters (cm).

C. Results

Data acquisition was obtained from the results of tests and measurements of flexibility, both pre-test and post-test. The tests carried out on the variables consisted of one combination group 1 (dynamic

stretching & cryotherapy) with combination group 2 (dynamic stretching & massage). The initial test results from the two groups before being given treatment can be seen in the following table:

Table 1. Preliminary Test Results

Group	N	Means	std. Deviation	Minimum	Maximum
Combination 1	10	3.6100	.40675	3.00	4.20
Combination 2	10	3.5100	.34785	3.00	4.10

The results of the table above are the results of the flexibility test before treatment, both groups, both the combination group 1 and the combination group 2 both carried out the initial test with an average result of 3.6100 for the combination group 1 and an average result of 3.5100 for the combination group 2, while the standard deviation results show 0.40675 for the combination group 1 and 0.34785 for the combination group 2. It can also be seen that the minimum value is 3.00 and the maximum value is 4.20 for the combination group 1, for the combination group 2 the minimum value is 3.00 and the maximum value is 4.10.

After the initial test, the two treatment groups were different, in the combination group 1 with the treatment using (dynamic stretching & cryotherapy) and combination group 2 with treatment (dynamic stretching & massage). The final test results can be seen in the following table 2:

Table 2. Final Test Results

Group	N	Means	std. Deviation	Minimum	Maximum
Combination 1	10	4.6300	.38601	4.10	5.10
Combination 2	10	6.9100	.49318	6.40	7.80

From the results of the table above, it can be interpreted that there are different results from each group, the differences can also be seen in the initial test table. The results in the two tables are not enough to stop there, it is necessary to call a hypothesis test, the requirements for testing the hypothesis that must be fulfilled first are the normality test and homogeneity test. The normality test can be seen in the following table.

Table 3. Normality Test

Variable	test	Sig	Information	Status
Combination 1	Preliminary Test	0.903	P > 0.05	Normal
	Final Test	0.519	P > 0.05	Normal
Combination 2	Preliminary Test	0.997	P > 0.05	Normal
	Final Test	0.977	P > 0.05	Normal

Based on the results of the normality test using assistanceSPSS version 25, then the results obtained from both groups during the pre-test and post-test have the meaning that the data is normally distributed. The statistical test rule states that if sig> 0.05, then the data is in normal status. In the table above, it can be seen that sig is more than 0.05. Next, namely the homogeneity test, the homogeneity test takes place to announce that the two groups come from populations that have the same variance. More details can be seen in the table below

Table 4. Variance Homogeneity Test

Levene Statistics	df1	df2	Sig.
.893	1	18	.357
.207	1	18	.655

In the table above, it can be said that the two groups have a homogeneous variant. This meaning refers to the significance value in statistical rules, if the sig value is > 0.05, then it is said that the variance in each group is the same or homogeneous. If you can already know the normality test and homogeneity test as contained in the table above, then the next step is the t-test. In the t-test working to determine the effect of treatment on the combination 1 and combination 2 groups, the t-test in the SPSS is referred to as a paired test. In processing data regarding the t-test can be seen in the following table.

Table 5. Difference Test Results

Paired Sample Test			
	t	df	Sig. (2-tailed)
Combination 1	18,419	9	.000
Combination 2	23,400	9	.000

Based on the table above, from the results of the different test it can be seen that the t-count in the combination group 1 with a value of 18,419, the combination group 2 with a value of 23,400. so does the sig value. (2-tailed) in the combination group 1 was 0.000 and in the combination group 2 was 0.000. because the sig value is

0.000 <0.05 then Which means combination 1 (dynamic stretching & cryotherapy) and combination 2 (dynamic stretching & massage) giveeffecton hamstring flexibility ball athlete Untad Princess Volleyball.

Discussion

Research has shown that dynamic stretching and foam rolling can benefit a person's performance in sports (Macdonald et al., 2014; Opplert & Babault, 2018). The results of the study had an effect on the level of pain before and after administration cryotherapy and stretching exerciseswith a significant level for motion pain p = 0.003 and for tenderness p = 0.003 (p<0.001) (Rovendra, 2021). Meanwhile according to (Tassignon et al., 2018) it is said that the application of ice can reduce the risk of injury after exercise, so that the sample does not feel excessive pain. The exercise is proven to provide increased results insit and reachtests (p<0.001). Scientific evidence has shown that acute stretching increases RoM and length of the musculotendinous unit and enhances mechanoreceptor reflexes (Behm et al., 2016).

Research result (Huang et al., 2022) that dynamic stretching (soleus and regular conditioning) is effective in increasing ankle flexibility, maximum plantar strength, and soccer-specific performance compared to no-stretching control. Providing training for 4 weeks can increase one's flexibility. Dynamic stretching facilitating muscle spindle receptors i.e. alpha motor neurons. When active there will be a reflex elongation motion when doing dynamics due to power forces forcibly so as to increase the ability of the muscles to lengthen and shorten and possibly endanger because the muscles will lengthen quickly and briefly which can result in injury to the muscle fibers. Based on research (Kaneda et al., 2020) It was found that the dynamic stretching was more or less the same aspassive stretching, but due to the low level of stretching, there is an overstretch reflex in the agonist muscles so that the increase in flexibility is no better than passive stretching. While research (Iwata et al., 2019) found that giving massage before exercise can reduce muscle stiffness and vasodilation in blood vessels, which is one of the important components to achieve good flexibility. Other results show that dynamic stretching and foam rolling can improve various aspects of athletic performance, with dynamic stretching benefiting flexibility and foam rolling benefiting agility and strength. (Anderson et al., 2021).

D. Conclusion

Based on the results of data analysis, testing of research results and discussion it

can be concluded that there is a significant effect both in the combination group 1 (dynamic stretching & cryotherapy) and combination 2 (dynamic stretching & massage) on the flexibility of the hamstring of female volleyball athletes from Tadulako University. There seems to be a difference but not too big between combination 1 (dynamic stretching & cryotherapy with the combination of 2 (dynamic stretching & massage) in increasing hamstring flexibility in female volleyball athletes from Tadulako University.

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F. Conflict of Interest

There is no conflict of interest in this research.

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