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Contribution of squat jump, leg squat, and walking lunge to mawashi geri kicking ability skills

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Abstract

Muscle explosiveness is a physical component that contributes from technical ability to karate ability. The kicking technique in karate is a very important skill in attacking movements. It is necessary to provide training so that muscle explosive power, especially in the legs, increases so that technical ability can increase. Squat jump exercises, leg squats, and walking lunges are forms of exercise that can increase muscle explosive power and the ability of karate kicks. This study aimed to determine the contribution of squat jump exercises, leg squats, and walking lunges to the ability to kick in karate. The subjects of this study were 27 female Karate Dojo athletes, the subject collection technique was total sampling by recruiting all 27 female athletes. The instruments used in this study were for initial and final test measurements using Mawashi Geri's kick ability test. Data analysis using ANOVA test and statistical prerequisite test using SPSS 25. The results of this study from the results of data analysis with a comparative hypothesis test between posttest values showed a calculated t value < a significant level of 0.05, which means that the provision of squat jumps, leg squats, walking lunges significantly contributed to Mawashi Geri's kicking ability. The conclusion of the results of this study explains that leg muscle power training has contributed to Mawashi Geri's kicking ability, especially in walking lunges training the results of the research are very significant.

Keywords: Limb muscle power, physique, technique, kick, karate.

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Author's contribution: a – Preparing concepts; b – Formulating methods; c – Conducting research; d – Processing results; e – Interpretation and conclusions; f - Editing the final version

INTRODUCTION

Physical condition is the capacity of a person to perform physical work with graded ability. Physical conditions can be measured quantitatively and qualitatively (Mustofa & Sahri, 2022). Developing or improving physical condition means developing and improving the physical abilities of athletes. Physical ability includes two components, namely, the physical fitness component and the motor fitness component. Factors supporting the

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physical condition in karate skills, such as loads used to perform the initial techniques, require maximum power (Kadir et al., 2022). Flexibility factor flexibility is the flexibility of the body when doing movements, and this flexibility is needed to float in the air to maintain body balance when performing techniques, especially kicking in karate (Kabadayı et al., 2022). In addition to flexibility, there is the ability of physical strength, and strength is the ability of muscles to accept loads or provide contractions to loads. Strength is used to carry out pedestals because in doing the pedestal, the element of strength is needed to resist (Navickaitė & Thomas, 2023). To provide physical training and techniques to support performance in karate techniques, the right type of training method is needed, One of the most effective ways to improve the strength and endurance of the legs as a support for karate skills (Sasmita et al., 2022).

Kicks are one of the most effective techniques in scoring, compared to punches, the value of kicks is higher than punches (Przybylski et al., 2021). If the kick does not have good speed and form, then it will be difficult to hit the target and will not generate value. Therefore, programmed and effective training for athletes must be started early to achieve maximum results. Mawashi geri kick technique is a technique in karate that can be used in techniques in karate matches, and it is just that athletes still rarely use it (Irawan et al., 2021). Some facts showed that the mawashi geri kick technique was not done by athletes because of the athlete's lack of ability to lift their legs optimally, kicks were easily fended off by opponents, lack of balance, and kicks were still stiff, so in taking points against opponents did not reach the maximum (Nikmah & Suratman, 2019). So it requires good physical ability to do mawashi geri kicks for karate athletes (Mekic et al., 2020).

This stems from the need for mawashi geri kicking ability in karate athletes from a physical and technical point of view, and it results in many athletes not performing attacks, especially kicks (Simbolon & Siahaan, 2020). Therefore, to clarify this temporary assumption, practice is needed that can support the ability of the mawashi geri kick technique. Supporting

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exercises that can support mawashi geri kick techniques are providing physical training (Togatorop & Dewi Endriani, 2022). In doing mawashi geri kicks, good physical condition is needed because this kick must be done quickly to avoid the opponent's capture, it is necessary to form exercises that support the ability of mawashi geri kicks, such as leg muscle power exercises, balance exercises and flex exercises (Purba, 2017).

Squat jump is a form of exercise by lowering the body position to half squat, with both hands intertwined behind the head, moving up firmly, and keeping the head upright. Squat jump training consists of exercises that can strengthen the legs, which is the main ability to support the legs. Squat jump is an exercise that aims to increase the leg muscles' power (explosive power) by jumping up vertically with the position of the hands behind the head (Ojeda-Aravena et al., 2020). This exercise contributes to and affects the increase in speed and explosive power of martial arts kicks. According to Altavilla et al. (2019), Explosive power is the ability to display or release power explosively or quickly. Explosive power is one aspect of physical fitness. Because squat jump exercises are exercises to increase leg muscle strength. Leg squats are a form of exercise that can improve balance and improve mawashi geri kicking ability (Wong et al., 2010). Leg squats are an excellent way to improve balance and for faster results. Squat jump is a clinical test performed in a single-limb position, seen in many everyday functions, such as walking and running, or in sports such as martial arts, rugby, hockey, gymnastics, and football (Limpo & Tadrist, 2021).

Leg squat exercises are often used clinically to provide a simple and convenient neuromuscular control assessment for the Lumbo-Pelvis region. It assumed the performance of single leg movements that might occur during more complex tasks such as gait. Leg squats focus on the strengthening effect on the knees (Wong et al., 2010). Developing leg squat exercises into test leg squat exercises is considered a test and may indicate a lot of movement dysfunction in the kinetic chain, including pelvic release, overexerting valgus of the knee and subtalar hyperpronation.

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According to research (Wahyuddin et al., 2019; Wanda et al., 2018), physical ability is needed in techniques in karate, so it greatly contributes to technical ability. The physical training model must be highly adjusted to the characteristics of the ability in the sport so that the ability to kick in karate is to pay attention to the explosive physique of the leg muscles in accordance with the characteristics of kicking in karate. Departing from these results, the exercise methods of squat jumps, leg squats, and walking lunges that are in accordance with the explosive characteristics of the muscles can increase. Increasing the explosive physical ability of leg muscles by using squat jumps, leg squats, and walking lunges can be a breakthrough for athletes to develop their abilities. The characteristics of squat jump exercises, leg squats, and walking lunges in accordance with explosives are expected to increase the physical ability to kick kicking ability.

Lunges are a form of exercise to increase hip flexibility and strengthen abdominal and back muscles (Hutanty, 2013), This exercise is very supportive in increasing the frequency of kicks during Kumite number matches. Based on the test results, researchers are interested in researching leg muscle strength using squat jump exercises, balance leg squat exercises and waist muscle flexibility using walking lunges exercises. This exercise is a form of exercise that can help improve the ability of mawashi geri kicks.

METHOD

The research method in this study uses quantitative with an experimental approach, the experimental method is defined as a systematic method to build a relationship between after and before. Because there is a relationship between cause and effect. The basis for using this research method is an activity that begins with a test before giving treatment and ends with a posttest measurement form to determine the effect of treatment or experimental forms of exercise. The sample in this study was 27 female Karate Dojo athletes. The number of samples came from the application of inclusion criteria in taking research subjects, which included ages 18-22 years, healthy conditions and not undergoing injury treatment, cooperative

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and willing to participate in the study by signing a participation form to become research subjects. As well as the application of exclusion criteria, including no previous history of injury so as not to impede his movement.

The design in this study uses the static Group Pretest-Posttest Design. The independent variables in this study were squat jumps, leg squats and walking lunges. While the dependent variable is in the form of mawashi geri kicking ability skills. The first thing to do is to pretest to determine the initial ability of the difference between the first experimental group, the second experimental group, and the third experimental group. Then, the first experimental group was given squat jump training (X_1), the second experimental group was given leg squat training (X_2), and the third group was given walking lunges (X3). After the three experimental groups were given treatment within 6 weeks, the three experimental groups would be given a posttest.

Group division by random division into 3 treatment groups. Previously, the division of sample groups was given an initial test or pretest to determine the initial ability. The test instrument used in this study for initial and final test measurements is the mawashi geri kick ability test, which aims to measure the ability of mawashi geri kick ability karate athletes.

From the data obtained in the study, the following kick speed test norms can be produced:

Table 1. Mawashi geri kick ability test norms

Man	Category	Girl
>25	Very Good	>23
20-24	Good	19-22
15-19	Average	14-18
10-14	Less	8-13
<9	Very Less	<7

This study was carried out for 6 weeks with a frequency of exercise 3x a week. On February 2023 - March 2023, at Sipirok Arena, North Sumatra. Data analysis technique using Anava test. Before the Anava test, a paired t-test is carried out to determine the average difference or effect of the three treatments, after which a post hoc test is carried out so that the effectiveness of the most effective treatment can be known.

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RESULT

The results of the data description in the squat jump training group before and after treatment on the variable ability of mawashi geri kick speed are shown in Table 2 below.

Table 2. Description of the average data of the initial test and the final test of group 1

Variable	Average Pretest	Average posttest	Gain Score
Test Mawashi Geri's kicking ability	28,2	33	4,8

The results concluded that squat jump (X_1) training could improve mawashi geri's kicking ability. The average results of the initial and final tests of group 1 on the variables can be illustrated in Figure 1.

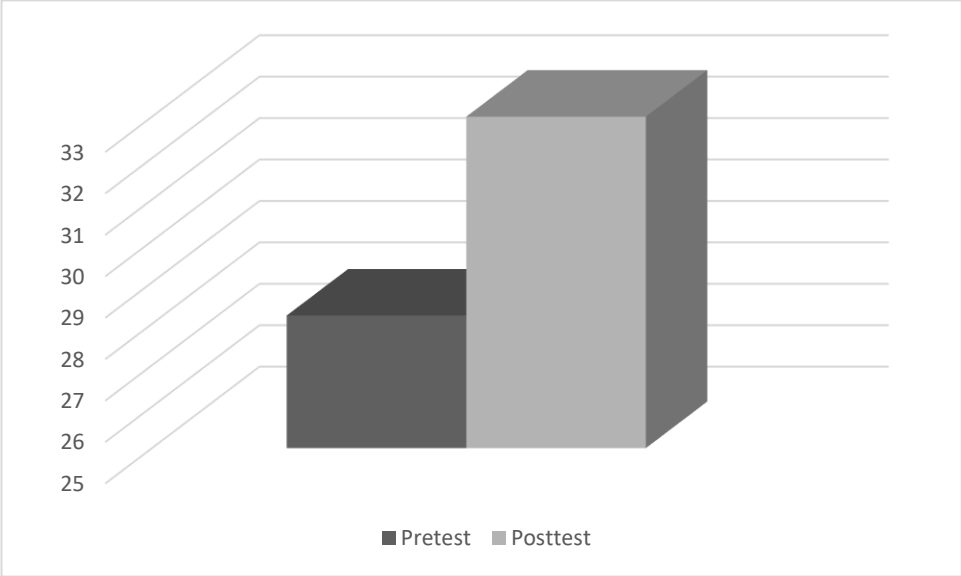

Figure 1. Average Results of the Initial and Final Tests of Group 1 (Squat Jump Exercise)

The results of the data described in the leg squat training group before and after treatment on the variable mawashi geri kick ability are shown in Table 3 below.

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Table 3. Description of the average data of the initial test and the final test of group 2

Variable	Average Pretest	Average posttest	Gain Score
Test Mawashi Geri's kicking ability	27,1	36	8,9

The results concluded that leg squat training (X_2) was able to improve the ability of mawashi geri kicks. The average results of the initial and final tests of group 2 on the variables can be illustrated in Figure 2.

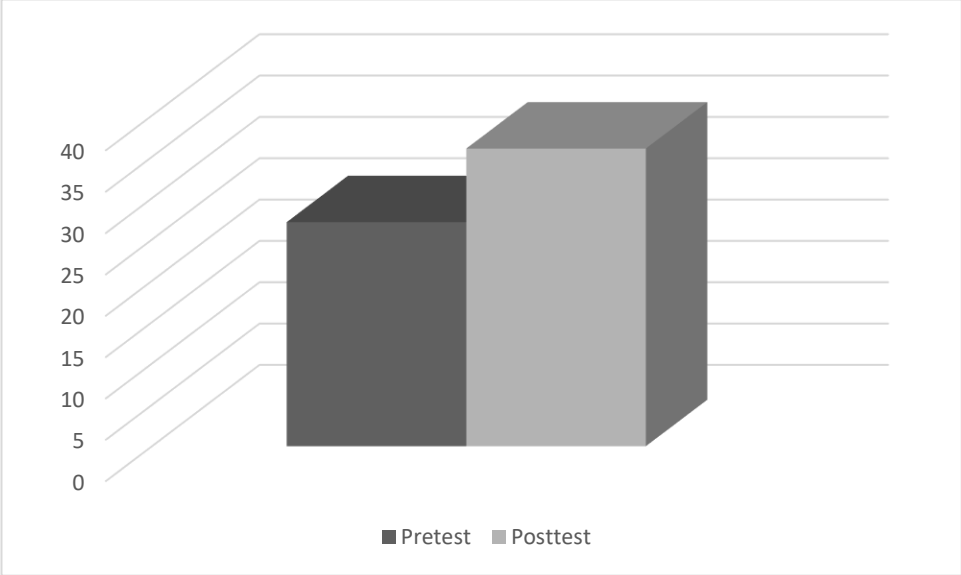

Figure 2. Mean Results of Initial and Final Tests of Group 2 (Leg squat exercises)

The results of the description data in the walking lunges training group before and after treatment on the variable mawashi geri kick ability are shown in Table 4 below.

Table 4. Description of the average data of the initial test and final test of group 3

Variable	Average Pretest	Average Posttest	Gain Score
Test Mawashi Geri's kicking ability	28,3	38,4	10,1

The results concluded that walking lunges (X3) training improved mawashi geri's kicking ability. The average results of the initial and final tests of group 3 on the variables can be illustrated in the following Figure 3.

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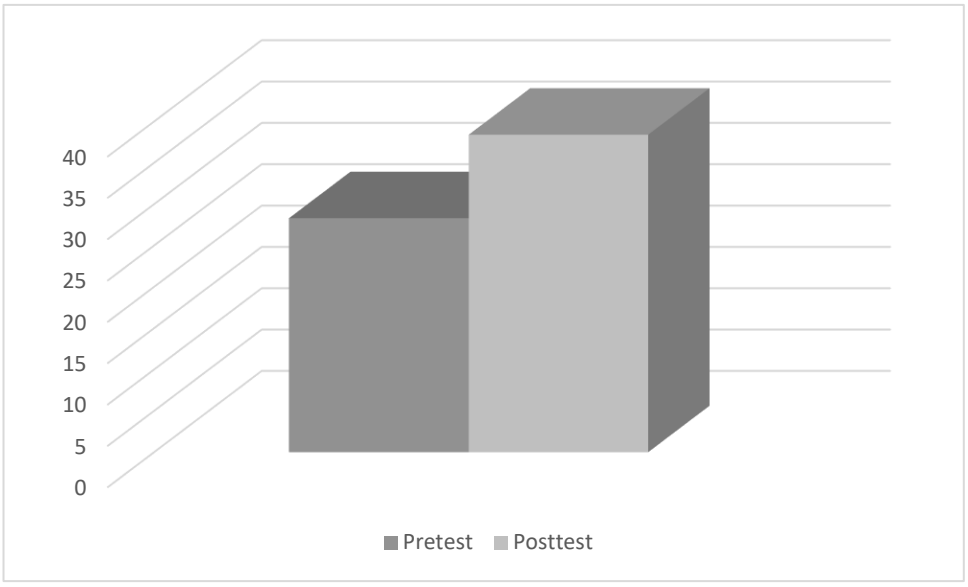

Figure 3. Average Results of Group 3 Early and Final Tests (Walking lunges exercise)

The average results of data from each group given squat jump exercises, leg squat exercises, and walking lunges exercises are described in Table 4.

Table 4. Data on improved training results on mawashi geri's kicking ability

Variable	Average Pretest	Average Posttest	Gain Score
Improved results	4,8	8,9	10,1

Based on the results of the measurement of the Exercise Results Improvement table on mawashi geri's kick ability, it can be seen that there is an increase in each bound variable seen from the average delta value showing a positive number.

The data normality test is intended to determine whether or not the data is normal. The normality test results are shown in the following table 5:

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Table 5. Data normality test

Variable	Mean And Standard Deviation	L_o	L_{table}	α	Ket
Groups Squat Jump Posttest Data	$\overline{X_i}$ = 49.95 S= 10.06	0.16 _	0.258 _	0.05	Normal
Groups Leg Squat Posttest Data	$\overline{X_i}$ = 49.99 S = 9.99	0.179 _	0.258 _	0.05	Normal
Groups Walking Lunges Data Post-	$\overline{X_i}$ = 50.01 S = 9.99	0.183	0.258 _	0.05	Normal
Mawashi Geri Kick Post-Test Data	$\overline{X_i}$ = 50.02 S = 9.99	0.217 _	0.258 _	0.05	Normal

Based on Table 5, it can be seen that the data obtained from the ability of mawashi geri kicks states that the data is normally distributed. This is because data normality testing using the Liliefors test obtained posttest Squat Jump data L 0 = 0.16 and L table 0.258 with n = 10 and a significant level of α = 0.05. Since the table L count <L, it can be concluded that the samples are normally distributed.

Table 6 hypotheses Pretest and Posttest Results Squat jump exercise group Based on Table 5, it can be seen that the data obtained from the ability of mawashi geri kicks states that the data is normally distributed. This is because data normality testing using the Liliefors test obtained posttest Squat Jump data L 0 = 0.16 and L table 0.258 with n = 10 and a significant level of α = 0.05. Since the table L count <L, it can be concluded that the samples are normally distributed.

The hypothesis test was used to see the effect of Squat Jump training on the ability of mawashi geri kicks in Shokaido Dojo karate athletes. Based on the results of the analysis, the following data were obtained:

Table 6. hypotheses Pretest and Posttest Results Squat jump exercise group

Variable	Df	T_{table}	T_{Count}	*P*
Squat jump training	9	2,282	4,432	0,000

From the results of the hypothesis test, it can be seen the significance value of the test is 0.002 < 0.05, then these results show the results of the t-paired test analysis of the t sample t-test in the squat jump exercise group obtained a t-count value (4.432) > t table (2.282), and a p-value (0.000) < of 0.05, these results show that the t-count value is greater than the t-table. Thus, there is an influence of Squat Jump training on the ability of mawashi geri kicks in Shokaido Dojo karate athletes. This means that Squat Jump

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training significantly influences the ability of mawashi geri kicks in Shokaido Dojo karate athletes.

The hypothesis test was used to see the effect of giving leg squat exercises on the ability of mawashi geri kicks in Shokaido Dojo karate athletes. Based on the results of the analysis, the following data were obtained:

Table 7. hypotheses Pretest and Posttest Results Group leg squat exercise

Variable	Df	T_{table}	T_{Count}	*P*
Squat leg training	9	2,282	4,458	0,000

From the results of the hypothesis test, it can be seen that the results of the t-test analysis paired sample t-test in the leg squat exercise group obtained a t-count value (4.458) > t table (2.282) and a p-value (0.001) < of 0.05, these results show that the t-count value is greater than the t-table. So, these results show that there is a significant difference. Thus, there is an influence of leg squat training on the ability of mawashi geri kicks in Shokaido Dojo karate athletes. This means that leg squat training significantly influences the ability of mawashi geri kicks in Shokaido Dojo karate athletes.

The hypothesis test was used to see the effect of walking lunges on the ability of mawashi geri kicks in Shokaido Dojo karate athletes. Based on the results of the analysis, the following data were obtained:

Table 8. hypotheses Pretest and Posttest Results Walking lunges exercise group

Variable	Df	T_{table}	T_{Count}	*P*
Walking Lunges Training	9	2,282	4,501	0,000

From the results of the hypothesis test, it can be seen that the results of the t-paired test analysis of the t-test sample in the walking lunges exercise group obtained a t-count value (4.501) > t table (2.282) and a p-value (0.003) < of 0.05, these results show that the t-count value is greater than the t-table. So, these results show that there is a significant difference. Thus, there is an influence of walking lunges training on the ability of mawashi geri kicks in Shokaido Dojo karate athletes. This means that

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walking lunges practice significantly influences the ability of mawashi geri kicks in Shokaido Dojo karate athletes.

DISCUSSION

The research results in improving the ability of mawashi geri kicks in Shokaido Dojo karate athletes using the training model of squat jump exercises, leg squat exercises, and walking lunges exercises significantly contribute positively. The analysis results of squat jump exercises, leg squat exercises, and walking lunges exercises significantly improve the ability of mawashi geri kicks. The walking lunges exercise model has a significant increase in ability, this can be seen from the ratio of gain score between pretest and posttest scores of 10.1.

A squat jump is jumping in a place that begins with a squat (squat). The form of leg muscle strength training is squat jump exercise, which is the jumping up so that both legs are straight, and when descending, both knees are slightly bent with the hip position only slightly lowered (Colomar et al., 2020). Squat jump is a form of exercise to train, improve, and increase the endurance component and leg muscle power because muscular endurance is the ability of muscles to perform consecutive contractions for a long time.

Squat jump exercises are designed in such a way as to meet the scientific principles of exercise so that they can be used as an exercise to gain and increase muscle strength. Squat jump exercise is a form of exercise to increase leg muscle strength (Mekic et al., 2020). In squat jump training, it did not contribute to the results of mawashi geri kicks karate athletes. Mawashi geri kick is one of the supporting physical biomotor strengths, the characteristic of the mawashi geri kick is the emphasis on lower limb strength so that when athletes do it can produce the strongest force (Purba, 2017).

The magnitude of the increase in mawashi geri kick ability after being given lunges training significantly improves mawashi geri kick results. Upper leg building exercises are physically considered very necessary because they involve a very large muscle area. The exercises chosen are lunges (with free weights). According to Suwarganda, (2015), Lunge exercises are

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a form of exercise to build leg muscle strength or upper leg building exercises (Navickaitė & Thomas, 2023). Physically, this exercise is needed because it involves large muscle areas.

This lunge exercise is done with free weights, and it is relatively difficult to do lunges, because balance is required. The results of this study confirm that, leg press training is a weighted exercise which in its implementation, involves the work of many muscles so that it can further increase the strength and, of course, leg power possessed by an athlete and contribute to the results of mawashi geri kicks. As stated by Sepriadi (2019), the main thing in power training is to have to fight weights or resistance.

Thus, the most effective training program to increase muscle is weighted training. This opinion is in line with what is expressed (Bompa & Buzzichelli, 2015), excellence in weight training programs using leg presses can increase the explosive power of the legs to facilitate the limbs in lifting body weights. This convenience can make it easier for karate athletes to do mawashi geri kick movements. After going through leg squat exercises, the explosive power of the leg muscles increased, thus contributing to the results of mawashi geri kicks.

CONCLUSION

Based on the conclusions above, the results of this study can have implications in the form of useful notes for karate athletes regarding data on mawashi geri kick ability in their athletes. Moving from the recommendations of the research results, it is known that there is an effect of squat jump exercises, leg squat exercises, and walking lunges exercises on the ability of Mawashi Geri kicks in Shokaido Dojo karate athletes, thus it can be a reference for future research to pay attention to good forms of exercise in improving technical abilities in each sport. The results of this study with a limited number of subjects make characteristics less varied, so in the future, it can improve characteristics and pay attention to other physical exercise models to improve basic technical abilities.

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