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The effectiveness of hurdle jump training on the ability of mawashi geri kicks in karate martial arts

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Abstract

Improving the ability to kick mawashi geri in karate martial arts requires measured and planned training, namely through hurdle jump training, which is specific to karate martial arts. This research aims to determine the effectiveness of hurdle jump training on the ability to kick mawashi geri in karate martial arts. The research uses quantitative methods with a pre-experimental design through a one-group pre-test post-test design. The sample in this study consisted of 25 students who actively carried out extracurricular activities at Senior High Schools in Southeast Sulawesi Province. The instrument used to measure mawashi geri kick ability in karate martial arts is using mawashi geri kicks for 30 seconds. The training used to improve mawashi geri kicking ability in karate martial arts is using plyometric hurdle jump exercises with low and high jump sequences. The data analysis technique uses quantitative data analysis with probability statistics, using prerequisite data analysis tests with normality and homogeneity tests followed by the t-test at a significance level of 0.05 using SPSS version 26. From the results of the pre-test and post-test data analysis, Mawashi Geri's kicking ability through hurdle jump training has a significance of 0.000 < 0.05, meaning that there is a significant influence between the pre-test and post-test variables on the ability to kick Mawashi Geri in karate martial arts sports. Hurdle jump training can help athletes integrate the strength and control they gain from hurdle jump training in the context of the mawashi geri technique.

Keywords: training, hurdle jump, mawashi geri, karate.

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

INTRODUCTION

Sports are carried out with physical activity by individuals or groups with the aim of improving physical fitness, developing physical abilities, and participating in competitions (Karasievych et al., 2021). Exercise has many benefits, including maintaining health, improving physical skills, reducing stress, improving quality of life, and promoting social interaction (Gao et al., 2020). The sport also has an important psychological aspect.

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Exercising can help relieve stress, improve mood, increase self-confidence, and help improve cognitive abilities (He et al., 2022). One of them is through karate martial arts, which combines attack and defence movements using bare hands which focuses on techniques of punches, kicks, blocks, and other body movements (Luft et al., 2023). Karate has physical, mental and spiritual aspects, which make it much more than just a physical skill (Lystad et al., 2020).

Karate teaches a variety of techniques, including punches (tsuki), kicks (geri), blocks (uke), and body movements (kata) (Mamadaliyeva & Nurmamatova, 2023). Regular practice in this technique helps improve strength, agility and coordination (Stamenković et al., 2022). Karate also has a combat aspect known as kumite, in which two participants compete in hand-to-hand combat. Points are awarded based on effective technique and control in contact (Susanti et al., 2023). In addition to the sports and competition aspects, karate also teaches self-defence techniques that can be used in real situations (Anatoliy, 2023; Burt et al., 2023). Karate involves a variety of effective kicking techniques, and each technique has a different use and situation in training or competition, one of which is the mawashi geri kick.

The mawashi geri kick is a circular kick that is often aimed at the opponent's body or head (Ihsan, 2020; Navickaitė & Thomas, 2023). The mawashi geri kick starts from the appropriate position, which is standing straight with feet shoulder-width apart. Make sure the body weight is evenly distributed on both legs, and the body tends to be in a stable position (Nursamedy et al., 2019). The mawashi geri kick involves a circular motion of the attacking leg. Usually, the foot used is the leg closest to the target. Want to kick with the right foot, move the left foot in a circle from the outside to the inside, and launch the kick with the outside of the foot (the instep) (Sadeghi et al., 2022; López et al., 2022). Mawashi geri kicks can be aimed at various targets, such as the opponent's stomach, waist, thighs, or even the head. The most common target is the belly, as it is a larger and easier area to score points in a match (Irawan et al., 2021).

When throwing kicks, it is important to rotate at the waist and hips to generate more force in the kick. Body rotation provides additional power, which increases the power and effectiveness of the kick (Jemili et al., 2017). One important aspect of this technique is control. Make sure to have complete control over the kick, do not lose balance, and return to the starting position quickly (Rony Syaifullah, 2023).

The mawashi geri kick in karate requires leg muscle strength, which is very important to produce a strong and effective kick. Strength in the core of the body helps in transferring energy from the lower body to the kick more efficiently (Barlian & Prawibowo, 2023). The mawashi geri kick requires a wide circular motion. Flexibility of the pelvic, thigh and hip muscles is very important to perform this movement freely. The flexibility of the back also supports the circular motion required for the mawashi geri kick. Coordinate the movements of the upper and lower limbs simultaneously to produce precise and powerful kicks. Having good balance is very important to avoid losing control when executing a kick. Speed in executing the mawashi geri kick movement can increase its strength and effectiveness (Siregar & Nurkadri, 2023).

Exercises to improve mawashi geri kicking skills can improve overall strength, speed, flexibility and balance, which can contribute to better physical health. To execute the mawashi geri kick well, high focus and strong concentration are required. Constant practice can help improve these qualities. The mawashi geri kick is an important part of the broader karate technique. Improving skills in kicks can also improve karate technical skills. Executing an effective mawashi geri kick requires good coordination between the upper and lower body. Improving skills in kicking can also improve overall body coordination, providing flexibility and adaptability in various situations, both in training and in actual matches (Jeknić et al., 2022).

Improving the ability of the mawashi geri kick in karate martial arts requires measurable and planned training, namely through hurdle jump exercises (Krkeljas & Kovac, 2021). Specific hurdle jump exercises for

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martial arts karate will focus on increasing agility, leg strength, and stability to assist in the mawashi geri kick technique (Yudhistira, 2023). The hurdle jump exercise that can be applied in the context of karate is a basic hurdle jump with a height that can be jumped comfortably with a focus on the correct jumping technique (Styriak et al., 2020). Consecutive hurdle jumps, keeping balance, landing softly and immediately ready for the next jump. Arrange the hurdles in a linear pattern or form appropriately spaced triangles. Alternately, jump over the hurdle from one side to the other. This drill will help improve agility and reaction speed, which is essential for an effective mawashi geri kick (Chaabene et al., 2019). Hurdle jump as part of a combination kick exercise. For example, after jumping over the hurdle, continue with mawashi geri when landing. This exercise will help integrate the mawashi geri kick with other movements, such as jumps or shifts. If comfortable with jumping at a certain height, consider gradually increasing the hurdle height (Abi Permana et al., 2022). The increase in height will increase leg strength and help get a more powerful kick. Use the hurdle jump as a speed and leg accuracy exercise.

According to Limbong et al. (2022), research states that it creates consistency in students' ability to execute the Mawashi Geri kick, both in practice and in matches. Athletes can better adapt their Mawashi Geri kicks to actual match conditions after undergoing varied and thorough training. Besides simply improving Mawashi Geri kicks, effective training can also contribute to an athlete's overall abilities in the martial arts of karate, such as agility, balance, and core strength. Some students have problems with a lack of flexibility, which can hinder their kicking movements. Lack of stretching before and after exercise. There needs to be more balance in executing the mawashi geri kick, the problem is that the kick is too low, and the stability of the kick is lacking, so body movement, foot position and rotation when executing the kick are not optimal. The student may lose balance while performing the mawashi geri kick (Türkeri & Gonca, 2023). Balance exercises separately and in the context of kicks. The trainer can provide specific drills to improve stability

when executing kicks (Mudric et al., 2020). One common problem is poor technique, such as the feet being too low or there not being enough rotation (Carvalho Rodrigues et al., 2022). Focus on practising the correct technique. The trainer should provide detailed guidance on proper body movement, foot position and rotation. Exercises done slowly with an emphasis on technique will help students understand and correct these problems.

The problem when carrying out hurdle jump training to improve the ability to kick mawashi geri in karate is that hurdle jump training carries the risk of injury to the leg muscles, knees or other body parts if it is not done with the correct technique or the intensity is too inappropriate for the participant's physical condition. Some need help adapting to hurdle-jumping techniques that require special coordination and muscle strength. Another obstacle arises if participants need help to integrate the results of hurdle jump training effectively into their mawashi geri techniques in the context of daily karate practice. Overcoming these problems through a more structured approach, careful supervision, adaptation of training according to individual needs, and maintained motivation will help increase the effectiveness of hurdle jump training in improving mawashi geri kick ability in karate.

This research can help identify and understand the contribution of hurdle jump training in improving students' performance abilities in the specific context of the mawashi geri kick. This research may provide insight into how plyometric training can increase the lower extremity strength and agility required in the mawashi geri kick (Nasrulloh et al., 2023). Research seeking a deeper understanding of the mawashi geri kick technique, including its biomechanics and factors influencing its success, may provide a basis for assessing the effectiveness of hurdle jump training. This can help determine whether this exercise has a positive impact on kicking technique. Involving experienced karate athletes in a case study to see the impact of hurdle jump training on their kicking skills. This will provide practical data on whether these exercises are useful in the context

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of karate martial arts. Studies that include biomechanical analysis of the Mawashi Geri kick, such as the movement of the joints and muscles involved, may be helpful in evaluating changes that may occur after hurdle jump training. Research carried out by Siregar & Nurkadri (2023) states that the mawashi geri kick, a branch of karate martial arts, contributes to the physical component of explosive power, especially in the leg muscles. This research can strengthen the research carried out in discussing the mawashi geri kick.

Evaluating mawashi geri kicking ability before and after hurdle jump training, using accurate measurements such as kick speed, kick height, and target precision, will provide empirical data on the effectiveness of this exercise. Studies evaluating the impact of hurdle jump training on the risk of injury or physical discomfort in karate athletes help understand whether this exercise is safe and can be integrated into a training program without undesirable risks. Research involving observations over a longer period of time can provide insight into the long-term impact of hurdle jump training on mawashi geri kicking skills and overall performance. These studies, when applied and analyzed together, will form a strong basis for measuring the effectiveness of hurdle jump training in improving mawashi geri kicking ability in the sport of karate. With a good scientific approach, it can compile informative research and contribute to the understanding of how plyometric training can benefit karate athletes.

METHOD

The research uses quantitative methods with a pre-experimental design through one group pre-test and post-test design, namely using the initial test, then proceeding with treatment and ending with the final test. The sampling technique used total sampling, that is, the entire population was sampled, so the sample in this study was 25 people consisting of 16 men and 9 people aged 15-18 years. The instrument used to measure the ability of the mawashi geri kick in karate martial arts is using the mawashi geri kick for 30 seconds, namely, the karateka standing in front of the body protector holder, in a ready position, the legs in a stance position with one

of them in front (Cakrawijaya, 2021). The direction of the body is straightforward, and the hands are bent and clenched at the sides of the body to do the mawashi geri kick. Data analysis techniques used data analysis prerequisite tests with normality and homogeneity tests followed by a t-test at a significant level of 0.05 using SPSS version 26.

The exercise used to improve the ability of the mawashi geri kick in karate martial arts uses plyometric hurdle jump exercises with low and high jump sequences (Kennely, 2017). The programs provided are as follows:

Table 1. Plyometric exercises (Hard jump)

	a low and high jump sequence
Warm-up	15-20 minutes
Number of exercises	6-10 sets
Volume	60-100 foot contact
Intensity	Medium-high
Number of reps/sets	6-10 times foot contact
Duration	5-10 seconds
Rest between sets	90 seconds- 3 minutes
Cooldown	15-20 minutes
Total training time	60-90 minutes
Frequency	3 frequencies
cycle length	6 weeks

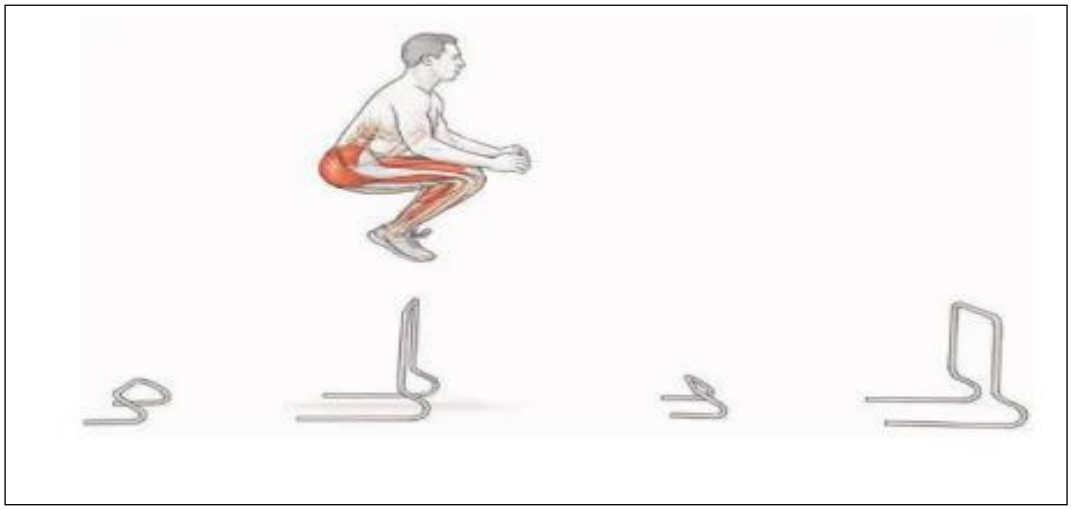

Figure 1. The Hurdle Jump Exercise (Kennely, 2017)

Implementation of the training load during the program is given for 6 weeks, held over 18 meetings, namely on monday, Wednesday and Friday. The exercise lasts one day to restore physical condition after treatment. The implementation varies and begins with a warm-up jogging, walking hamstring, knee hug to lunge and backword lunge, while the core of the implementation is with a low and high hurdle jump sequence, in weeks 1-2

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using 6 sets with 60 contact, hurdle jump height 15 cm, 30 cm, 15 cm, 30 cm, 15, cm, and 30 cm. Implementation in weeks 2 – 4 uses 8 sets with 80 contacts, hurdle jump heights of 15 cm, 30 cm, 15 cm, 30 cm, 15 cm, 30 cm, 15 cm and 30 cm. For week 5 – 6 use 10 sets with 100 contacts, hurdle heights 15 cm, 30 cm, 15 cm, 30 cm, 15 cm, 30 cm, 15 cm, 30, 15 cm, 30 cm and 30 cm. The last exercise is relaxing with abductor stretches, hamstring stretches, glute stretches, and hip flexor stretches.

The initial test was carrying out the mawashi geri kick test for 30 minutes with a sample size of 25 people. Before carrying out the training, first carry out initial training to see the maximum ability in hurdle jump training so that determine the maximum training program for 18 training sessions, which are carried out three times a week. In this study, there was no comparison group, only the pre-test and post-test groups. To see improvements before and after exercise. The final stage after doing the training is the final test, which involves carrying out the mawashi geri kick test again for 30 minutes.

RESULT

Descriptive data on the results of pre-test and post-test mawashi geri kick skills in karate martial arts using hurdle jump exercises

Table 1. Pretest and posttest mawashi geri kick ability in karate martial arts

Test	N	Means	SD	Max	Min
Pre-test	25	21,16	2,192	25	17
Post Test	25	24,40	1,708	28	21

From the results of the ability of the mawashi geri kick in karate martial arts before carrying out the hurdle jump exercise, the ability of students participating in karate extracurricular activities reached a mean of 21.16, with a standard deviation of 2.192, a maximum ability of 25 strokes and a minimum of 17 strokes. As for the ability to kick mawashi geri after the implementation of the hurdle jump exercise with a mean of 24.40, with a standard deviation of 1.708, the highest score was 28 strokes, and the lowest score was 21 strokes. Based on the results of the study, there was

an increase before and after carrying out hurdle jump exercises to improve the ability of the mawashi geri kick in karate martial arts.

Table 2. Pretest and posttest mawashi geri kick skills in karate martial arts

Implementation of Pre-test		Implementation of Posttest	
Intervals	Frequency	Intervals	Frequency
17 - 18,42	3	21 - 22,24	3
18,43 - 19,85	3	22,25 - 23,49	5
19,86 - 21,28	8	23,50 - 24,74	5
21,29 - 22,71	2	24,75 - 26,00	9
22,72 - 24,14	8	26,01 - 27,25	2
24,15 - 25	1	27,26 - 28	1
Total	25	Total	25

The implementation of the mawashi geri kick ability is carried out with initial measurements of karate participants to assess their abilities. This can include the level of altitude, strength, speed, and technique applied. Do regular exercises with a focus on the correct hurdle-jumping technique. Make sure the researcher provides clear directions to the participants. Incorporate hurdle jump training into the existing karate training program. This helps integrate enhanced skills into the context of everyday karate practice. Carry out regular monitoring of participants' progress in performing mawashi geri kicks after hurdle jump practice. They are comparing measurement data before and after training to evaluate whether there is a significant increase in mawashi geri kicking ability through frequency distribution.

Based on the results of the study, for the pre-test data of the ability to kick mawashi geri before the hurdle jump exercise, 3 people had kicks with a percentage of 12% and class intervals from 17 to 18.42. A total of 3 people have kicks with a percentage of 12% and interval class 18.43 - 19.85. 8 people had kicks with a percentage of 32% and interval class 19.86 - 21.28. A total of 2 people have kicks with a percentage of 8% and interval class 21.29 - 22.71. A total of 8 people have kicks with a percentage of 32% and interval class 22.72 - 24.14. As many as 1 person who has a kick with a percentage of 4% and an interval class of 24.15 – 25.

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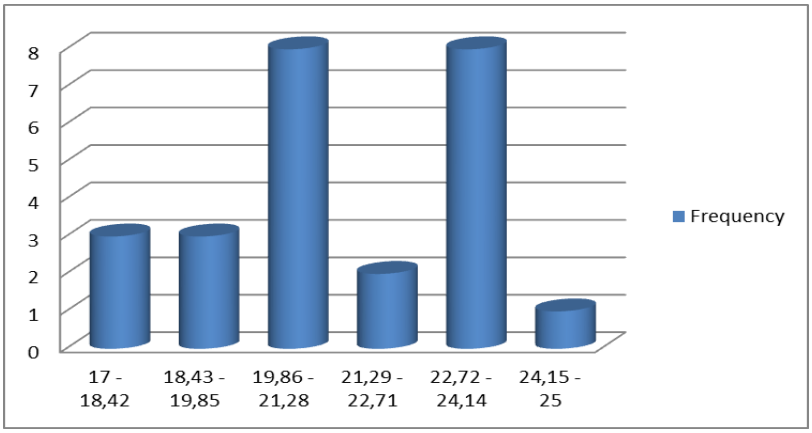

Figure 2. Pre-test histogram of Mawashi Geri's Kicking Ability in Karate Martial Arts

Meanwhile, for post-test data on the ability to kick mawashi geri after the implementation of the hurdle jump exercise, there were as many as 3 people who had kicks with a percentage of 12% and class intervals of 21 - 22.24. A total of 5 people have kicks with a percentage of 20% and interval class 22.25 - 23.49. A total of 5 people have kicks with a percentage of 20% and interval class 23.50 - 24.74. 9 people had kicks with a percentage of 36% and an interval class of 24.75 - 26.00. 2 people had kicks with a percentage of 8% and an interval class of 26.01 - 27.25. As many as 1 person has a kick with a percentage of 4% and an interval class of 27.26 – 28.

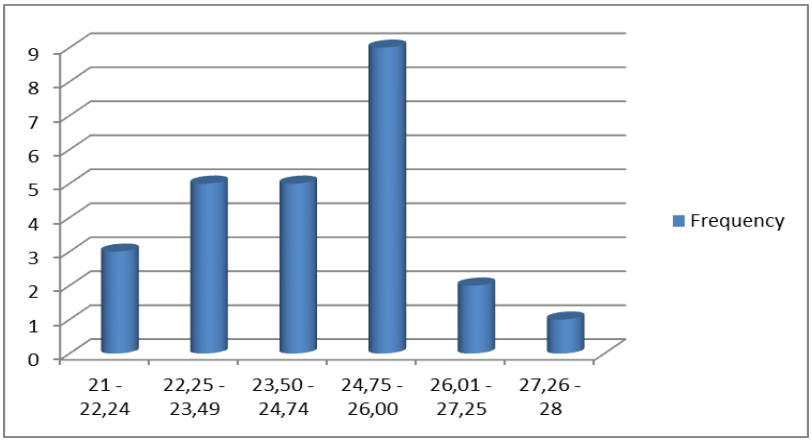

Figure 3. Post-test histogram of Mawashi Geri's kicking ability in karate martial arts

The interpretation of the results of the mawashi geri kick ability after going through hurdle jump training is that it can increase the height of the mawashi geri kick. This can be interpreted as the effectiveness of hurdle jump training in increasing the leg muscle strength needed to reach higher

heights. There was an increase in kick speed, which shows that hurdle jump training has helped in increasing the athlete's reaction and movement speed. Being able to produce kicks with greater power indicates that hurdle jump training effectively increases the muscle strength needed for stronger kicks. In addition to physical metrics, improvements in kicking technique, such as stability, accuracy, and better body position, can also be results that indicate the effectiveness of hurdle jump training.

A normality test was used to determine the distribution of the variables in the study using the Kolmogorov-Smirnov formula.

Table 3. Data normality test results

	N	Statistic	Asymp. Sig (2-tailed)
Pre-test	25	0,123	0,200
Post-test	25	0,159	0,101

The results of data analysis using the normality test of the execution of the mawashi geri kick ability in karate martial arts have a significance value greater than 0.05. Based on the results of the normality test, it can be concluded that the data obtained is normally distributed.

Table 4. Results of the research homogeneity test

	Statistic	Df1	Df2	Sig.
Pre-test and Post-test	2.752	1	48	0.104

The results of the research were that a homogeneity test was conducted to find out that the data group in the sample comes from a homogeneous population based on decision-making. In this study, the significance of > 0.05 means that the data on the pre-test and post-test variables are homogeneous. Based on the results of the homogeneity test, it can be concluded that it is homogeneous.

Table 5. Results of the research t-test

	t	df	Significance
Pre-test and Post-test	71.436	24	0,000

From the results of the pre-test and post-test data analysis of the ability to kick mawashi geri through hurdle jump training, the significance is 0.000 < 0.05, meaning that there is a significant influence between the pre-test and post-test variables on the ability to kick mawashi geri in karate

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martial arts. From the results of the data analysis, there is a significant effect of hurdle jump training on the ability of mawashi geri kicks in karate martial arts.

DISCUSSION

From the results of the data analysis, there is a significant effect of hurdle jump training on the ability of mawashi geri kicks in karate martial arts. Based on the principle of practice. The hurdle jump is an exercise that can help increase agility and leg strength. This exercise involves jumping over a hurdle or bar with feet, which requires strong coordination of the leg muscles, core muscles, and hip extension. This can be useful in increasing the power of the mawashi geri kick. According to Abi Permana et al. (2022), hurdle jumps can improve precise kicking abilities, especially in training and competition situations. Obstacle jumping involves good balance and control. This opinion is confirmed by Irianto & Situmeang (2022), who state that the hurdle jump can support the ability to maintain the correct position when performing the mawashi geri kick. Exercises performed correctly can also increase flexibility, which is important for avoiding injury and increasing the range of motion when executing a kick.

According to Irianto & Situmeang (2022), success in executing the mawashi geri kick correctly from a technical angle and the ability to direct the kick correctly at the desired target. It was emphasized by Marlina et al. (2023) that hurdle jump training that is done correctly can also increase body flexibility, which is important in avoiding injury and increasing the range of motion when executing kicks. Hurdle jumps can help increase muscle explosive power, which is also necessary in executing powerful kicks. The effectiveness of hurdle jump training will largely depend on the training design, frequency, intensity, duration, and how the exercise is integrated into the overall training program.

Increase variation in hurdle jump training by using different hurdle heights, in this exercise, the direction of the jump varies. This variation will make the exercise more interesting and useful (Krkeljas & Kovac, 2021). Optimal results will be achieved if hurdle jump training is carried out

regularly and integrated into the overall training program. Hurdle jumping practice can also help improve general technique in karate. Mastering this exercise can also improve the elements of the mawashi geri kick movement. Regular evaluation and appropriate training arrangements will help in achieving the desired results (Styriak et al., 2020).

Increasing the effectiveness of the mawashi geri kick through hurdle jump training is an interesting approach to developing techniques and skills in karate self-defence. The hurdle jump exercise can provide some benefits that have the potential to improve the performance of the mawashi geri kick (Zaida et al., 2023). Hurdle jump training requires leg muscle strength, especially in jumping over obstacles. This can help develop the muscle strength relevant to the mawashi geri kick so that the kick can be executed with more power and is devastating. Jumping over obstacles requires good body control. This exercise can help students learn to control their body movements, which is also necessary for executing mawashi geri kicks with precision. The hurdle jump exercise involves jumping movements that can increase flexibility. Greater flexibility in the hips and legs can help in maximizing the range of motion when executing the mawashi geri kick (Navickaitė & Thomas, 2023).

The hurdle jump exercise requires good muscle coordination and movement. This coordination ability is important in integrating efficient body movements when executing the mawashi geri kick. The combination of strength, balance, and flexibility improved through hurdle jump training can result in increased "power" in the mawashi geri kick, making it more effective in competition. Hurdle jump training requires high mental focus to jump over obstacles successfully (Hammami et al., 2022). The ability to maintain focus is also very important in executing mawashi geri kicks accurately and powerfully. These exercises need to be integrated into training programs effectively and safely. It is also important to ensure that the exercises are at the student's skill level and physical ability. Hurdle jump training should be done under the supervision and guidance of an experienced trainer and in a safe environment to avoid injury. With the

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right approach, hurdle jump training can be an effective tool to improve the ability of mawashi geri kicks in karate martial arts.

Research on the effectiveness of hurdle jump training on mawashi geri kicking ability in karate may have several limitations that need to be noted. The research has a limited number of participants. This may limit the generalizability of the study findings to the broader population of karate practitioners. Other factors, such as participants' initial fitness level, other exercise methods they participated in, or individual differences in response to exercise, may have influenced the results. Some studies needed to be longer in duration, which may limit understanding of the long-term effects of hurdle jump training on mawashi geri kicking ability. Sometimes, the training that occurs in a research environment only partially reflects the real situation of a karate competition. This could affect the direct relevance of the findings to application in real competition. Measurement of mawashi geri kicking skills may vary across studies, and there may be differences in the measurement methods used. Each participant may have different strength, flexibility, or other physical characteristics, which may influence their response to hurdle jump training.

CONCLUSION

This research confirms the significant effectiveness of hurdle jump training and improving the ability of mawashi geri karate kicking techniques, especially in athletes or practitioners who undergo consistent training. It was found that hurdle jumping training can improve the strength, speed, coordination and muscle flexibility needed to perform mawashi geri kicks better. Athletes who perform this exercise show improvements in kicking technique, with greater control, precision, and speed in performing the mawashi geri movement. These findings have direct relevance in the context of the martial art of karate, providing evidence that hurdle jump training can specifically improve the technical skills required in karate competitions or training. This study provides a strong basis for the development of more holistic and targeted training programs in martial arts by including hurdle jumping exercises as an integral part of the training

program. While providing positive evidence, further research is needed to deepen our understanding of the factors that influence the effectiveness of these exercises at different levels of fitness and skill.

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