



The Effect of Agility Ladder Drill Training on The Footwork Agility of Karate Athletes in The Kumite Class at Bushido

Muhamad Almaas Atha Hilal^{1*}, Roas Irsyada²

¹²Program Study of Physical Education, Health, And Recreation, Faculty of Sport Science
Univeristas Negeri Semarang, Semarang, Indonesia

Keywords

Agility; Ladder drill;
Karate

Abstract

This study aims to determine the effect of the Agility Ladder Drill on the foot agility of karate athletes in the kumite class at the Bushido One Club in Tegal Regency. The study was conducted using a one-group pretest-posttest design and employed the Illinois Agility Test to measure the agility of the participants. This study involved a sample of 20 karate athletes competing in the kumite class. The results of the Paired Samples T-test showed that the mean difference between the pre-test and post-test was 0.77750 with a standard deviation of 0.48070 and a significance level of <0.001 (<0.05). Consequently, the null hypothesis (H_0) was rejected and the alternative hypothesis (H_1) accepted, indicating a significant difference following the intervention. It can therefore be concluded that the Agility Ladder Drill programme, comprising 14 sessions with a training schedule of three sessions per week, is effective in improving the foot agility of Bushido One Club karate athletes competing in the kumite category.

✉ Corresponding author :
E-mail: almaasatha@students.unnes.ac.id

INTRODUCTION

Karate is a martial art that originated in Japan and has become extremely popular in many countries. In Indonesia itself, karate is a sport that attracts a wide range of participants across all age groups, from children and teenagers to adults. People have different goals and focuses when taking up karate; some do it simply to maintain physical fitness, others aim to master the art of self-defence, whilst others focus on achieving competitive success. The history of karate in Indonesia was not brought by the Japanese military; rather, it was Japanese students returning from their studies who introduced karate to Indonesia. Several Indonesian students, including Baaud AD Adikusuma, Karianto Djojonegoro, Mochtar Ruskan, and Ottoman Nuh, established a dojo in Jakarta in 1963. They were the first people in Indonesia to introduce karate (the Shotokan style) and subsequently formed an organisation they named the Indonesian Karate Sports Association (PORKI), which was founded in Jakarta on 10 March 1964 and has since been renamed the Indonesian Karate Sports Federation (FORKI) (Wage et al., 2022).

In the martial art of karate, there are two competition categories: kata (form demonstration) and kumite (sparring). In the kumite category, agility is a crucial aspect that every athlete must possess to achieve a high level of performance. As practised by the Bushido One Club, there are several training methods frequently used by the club's coaches to develop their athletes' footwork agility. For foot agility training for Bushido One Club kumite athletes, the type of exercise frequently used is the agility ladder drill. Agility is a person's ability to change direction quickly and accurately without losing balance. Agility is not merely the ability to move quickly, but how the brain, muscles, and reflexes work together and combine effectively. Based on initial observations made by watching training sessions first-hand and through direct interviews with the Bushido One Club coach, the issue frequently faced by the athletes is the fluctuation in the quality of their footwork when they fail to attend training sessions as per the established schedule. The reason they do not attend training regularly is due to laziness or training schedules clashing with academic commitments. Therefore, the coach always strives to provide training methods that suit the athletes' needs. The results of this training are very evident when some athletes do not attend training regularly; sometimes laziness or training schedules clashing with academic activities prevent some athletes from attending training routinely. The effect of this issue is that an athlete experiences a decline in performance in terms of agility during kumite sparring simulations or during actual matches. This is a problem frequently encountered at the Bushido One Club. Furthermore, the difference between athletes from other dojos who do not use this agility ladder drill training programme is also very evident in the quality of their performance during kumite matches (Yuniasih & Amrulloh, 2024).

The study, entitled "The Effect of Agility Ladder Drills on the Footwork Agility of Kumite-Class Karate Athletes at Bushido One Club in Tegal Regency", aims to determine how agility ladder drills influence the improvement of footwork agility in karate athletes competing in the kumite class. As several karate dojos in Tegal Regency have not yet adopted the agility training method using ladder drills, the Bushido One Club a karate dojo with a wealth of achievements served as the researcher's rationale for implementing this method. It is hoped that this research will serve as a reference for variations in agility training for karate athletes, particularly in Tegal Regency. Agility is the ability of the body or a part of the body to change direction of movement rapidly. For example, the ability to change direction whilst running, to run back and forth over a specific distance and within a specific time frame, and to react quickly whilst maintaining a stable body position.

Previous research has shown that agility is a combination of various physical abilities. These include speed, strength, balance, reaction time, flexibility and muscle coordination. Agility is essential in many sports, one of which is the martial art of karate. Agility training is a crucial component of any overall physical fitness programme. However, agility training is often overlooked during exercise. In fact, agility is an important aspect that must be trained continuously. Someone with good agility usually possesses a high level of accuracy and speed (Nurhayati et al., 2023).

In karate, agility is essential for executing effective techniques and movement combinations. Agility in karate involves the simultaneous movement of the feet, hands and body, enabling a karateka to evade and respond to an opponent's attacks quickly. When improving agility, it is also important to consider other aspects such as speed, muscle strength, endurance and flexibility. Agility can help athletes overcome challenges and unexpected situations during training and competition. Furthermore, agility can also help improve the coordination between the brain and body movements, making an athlete's movements more effective and efficient (Haryono et al., 2021).

In karate competitions, athletes require a high level of agility due to the extremely fast pace of the sport, particularly in the kumite category. Agility enables athletes to perform movements that require them to change direction rapidly whilst maintaining balance, strength, speed and body control; therefore, agility is a crucial skill in the sport of karate. Agility helps the athlete's body to maintain proper alignment and posture throughout the movement. Furthermore, agility training encourages karate athletes to learn how to maintain correct body positioning. However, a factor that must be taken into account when designing an agility training programme is the athlete's Body Mass Index, as this factor is linked to agility (Nawawi et al., 2023).

In karate, particularly in the kumite category, athletes must have a good command of quick, short movements, as opponents will find it easier to score points if an athlete lacks agility. Conversely, good agility makes it easier for an athlete to move, attack and evade. Therefore, ladder drills are used in training to improve agility during kumite matches (Samudra & Suyoko, 2026).

In karate matches, high agility enables karatekas to evade attacks or launch counter-attacks more effectively. Consequently, without agility, karatekas will struggle to evade their opponents' attacks and launch precise counter-attacks. The ladder drill is a training method used to improve physical fitness, particularly agility. However, to achieve results from the ladder drill, good technique is essential; only then will the drill's objective of improving agility be realised. Training is a process of systematically preparing athletes to achieve maximum performance quality by subjecting them to physical and mental demands that are regular, targeted, progressive and repeated over time. Ladder drills are used to help athletes develop foot speed and body control, as well as improve movement skills (Waskita et al., 2025).

Athletes can master technique, physical fitness, tactics and strategy by focusing on agility to attack or evade opponents. The form of training and competition in karate is known as kumite, where athletes face each other in the arena. Athletes must train in accordance with sound technique, physical fitness, tactics and strategy, as well as maintaining a healthy mindset. Physical condition supports the performance of kumite athletes when competing in championship events; one of the most important components of physical condition is agility. When athletes possess good agility, their bodies are able to change direction quickly and accurately without losing balance. Furthermore, athletes with good agility also maintain better balance, ensuring they do not encounter difficulties when performing evasive manoeuvres or strikes (Kadir et al., 2022).

Based on the findings of the various previous studies outlined above, it can be concluded that agility ladder drills can improve the agility of karate athletes competing in the kumite category. As agility is essential for all athletes in kumite competitions, possessing good agility enables an athlete to perform effectively in a match. Athletes with agility will naturally find it easier to execute attacks, reactions, or counter-attacks. Conversely, athletes lacking agility will undoubtedly struggle when attempting attacks, reactions, or counter-attacks. Therefore, agility training using the agility ladder drill is essential for athletes to develop good agility. However, this does not mean that this training method is the best; there are various other types of exercises that can improve an athlete's agility. This study was conducted to motivate athletes and coaches to apply training methods effectively and correctly, in line with the needs of their athletes.

METHODS

This study employs a quantitative research design using a one-group pretest-posttest design, with the aim of testing the effect of agility ladder drills on the footwork agility of a kumite-category karate athlete at Bushido One Club in Tegal Regency. The choice of this research design is intended to facilitate the researcher's work in conducting the study on the karate athletes comprising the sample. It is also hoped that this design will help the researcher to obtain results from before and after the implementation of this type of training (Yunita et al., 2026).

This study also employed a pre-test–post-test experimental design using a single-group test. The aim of this approach was to demonstrate the differences in the athletes' condition before and after the intervention. The experimental research method was chosen in order to compare the results prior to the intervention with those following it. The basic principle of the experimental research method is straightforward: it involves observing what happens to a specific group following the intervention (Fauzi et al., 2025).

Quantitative research is a type of research that relies heavily on the use of numbers, from data collection and the interpretation of that data to the presentation of the results. Quantitative research involves numbers, frequencies and percentages, with the data being used to test hypotheses. Quantitative research also involves checking reliability and taking key variables into account (Syahroni, 2022).

The experimental research method is an approach used to test hypotheses by manipulating independent variables and observing their effects on dependent variables. This research aims to identify cause-and-effect relationships by controlling for other variables that may influence the results. In the context of scientific research, the experimental method is one of the most effective approaches for testing hypotheses. This method not only allows researchers to observe the results of manipulating variables, but also provides greater control over factors that may influence the research results (Aida et al., 2025).

The location of this study was the Bushido One Club karate training dojo, situated in the Yaumi Centre building in Trayeman Village, Slawi Sub-district, Tegal Regency, Central Java. The population of this study was the Bushido One Club Dojo in Tegal Regency. Using purposive sampling, the researcher selected a sample of 20 participants comprising 9 female athletes and 11 male athletes competing in the kumite category from the age of 12.

A population refers to the total number of people or inhabitants in a given area; the number of people or individuals sharing common characteristics; the number of inhabitants, whether human or other living organisms, within a specific spatial unit; a group of people, objects, or phenomena serving as the source for sampling; or a collection meeting specific criteria relevant to the research problem. Another view states that a population is a group or cluster of objects that are the subject of research, and a sample is a subset of objects selected in a specific manner to represent the population. A population comprises all attributes, which may be people, objects, or events that form the focus of the research. For example, if a researcher wishes to study juvenile delinquency related to alcohol consumption throughout Indonesia, the characteristics of adolescents across the country—whether in urban or rural areas, in densely or sparsely populated regions, among the wealthy or the poor, and in the Western, Central, and Eastern regions—must be included in the research population. These areas must be fully represented (Musthofa et al., 2024).

A sample in research is a part of the whole population that has been carefully selected to serve as a source of data. The sample acts as a representation, so that the research findings can be generalised to describe a broader situation. Sampling, on the other hand, is the methodological process or procedure of selecting a subset of the population to form the research sample. It can therefore be concluded that a sample is a part of the research population that has been selected to represent the whole (Ahmad & Supriadi, 2026).

The data used in this study comprised both quantitative and qualitative data. The quantitative data were obtained from measurements of the technical ability and agility of karate athletes in the kumite category at Bushido One Club, taken before and after the intervention. Data collection was carried out by administering agility tests designed in accordance with the research objectives.

Qualitative data can be obtained by conducting interviews with Bushido One Club coaches and through observations made during training sessions at Bushido One Club. This qualitative data can be used to provide an overview of the initial condition of karate athletes in the kumite category prior to the intervention; this data serves as supporting evidence.

In this study, the researchers employed a single-group design for the pre-test and post-test. The study comprised 16 sessions: one pre-test session, 14 treatment sessions and one post-test session. During the treatment sessions, in each session, the exercise was performed in 4 sets of 3 repetitions, and the time for each set was measured using a stopwatch operated by a timekeeper; a rest period of 15 seconds was provided between sets. The principle of this exercise was to achieve the best time in each repetition.

Research instruments are the lifeblood of research. This is because research instruments are tools selected and used by researchers to carry out data collection activities, ensuring that these activities are systematic and streamlined. Research instruments are also used to measure the values of the variables to be studied. Therefore, research instruments can be described as tools used to collect research data so that the data is easier to process and produces high-quality research (Ardiansyah et al., 2023).

In the initial stage of the research, the data collection techniques employed involved direct observation during training sessions and conducting interviews with the Bushido One Club coaches to ascertain the athletes' initial training conditions prior to the intervention. This technique was also used to identify the challenges faced by the coach in implementing the existing training programme, as well as to assess the agility of the Bushido One Club athletes. The instrument used in this initial stage involved completing a respondent identification form containing the athlete's name, gender, age, height, weight, and the duration of their karate training.

Following the initial data collection phase through observation and interviews, the researcher then employed a data collection technique by conducting a preliminary agility test (pre-test) to objectively assess the athletes' initial agility levels. The test to be used is the Illinois Agility Test, which is frequently employed in the field of sport; this test is used to measure speed regardless of the participant's gender (Pavlović, 2023). Below is an example of the Illinois Agility Test and the sequence of the test procedure:

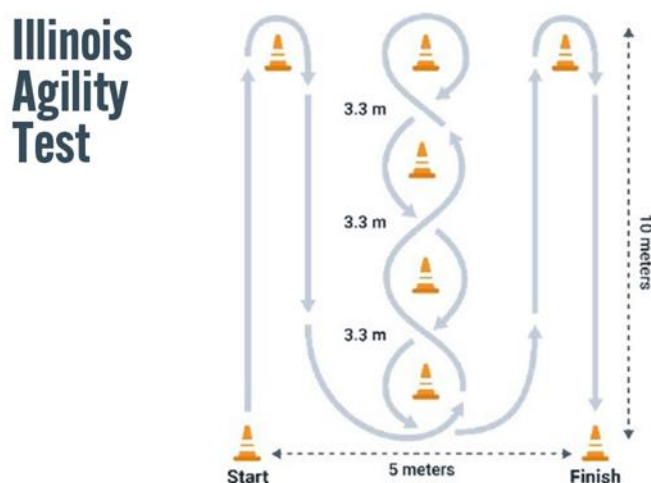


Figure 1. Illinois Agility Test

The equipment and facilities used in the Illinois Agility Test include: a stopwatch, 8 cones, a measuring tape, a field or training hall, and a results recording form. The layout or pattern of the agility test to be conducted uses a 10-metre-long track with a width of 5 metres; four cones are placed at each corner of the track and the remaining four cones are placed in the centre of the track to form a zig-zag obstacle course. The procedure for conducting the test

is as follows: the athlete stands at the starting line in a standing position; upon the command “GO”, the athlete runs along the designated route; the time is recorded from the “GO” command until the athlete crosses the finish line. Each athlete performs the test once and the agility score is recorded in a seconds.

Table 1. Illinois Agility Test Standards Table

Category	Males	Females
Excellent	<15,2	<17,0
Good	16,1 – 15,2	17,9 – 17,0
Average	18,1 – 16,2	21,7 – 18,0
Fair	18,3 – 18,2	23,0 – 21,8
Poor	>18,3	>23,0

In this study, the researcher employed training methods comprising the two-step run, lateral run, in-and-out drill and icky shuffle. This training programme was conducted three times a week over a total of 14 sessions. The data analysis technique used in this study was quantitative descriptive analysis; this technique was employed to analyse the results of individual technical tests and the agility of athletes before and after the intervention. This quantitative data will be presented in the form of mean values, percentages, and comparisons between pre- and post-intervention measurements to assess improvements in the athletes' abilities. The data analysis carried out in this study utilised SPSS software, employing normality tests and paired-sample t-tests.



Figure 2. Training Using The Agility Ladder Drill

RESULTS AND DISCUSSION

This study aimed to determine the effect of agility ladder drills on the footwork agility of kumite karate athletes at Bushido One Club in Tegal Regency. The study was conducted over 16 sessions, comprising one pre-test, 14 treatment sessions and one post-test. The study sample consisted of 20 kumite karate athletes aged 12 years and above, and the study design was a one-group test. Agility was measured using the Illinois Agility Test. The data obtained were then analysed using quantitative descriptive analysis and statistical tests using the SPSS software. SPSS stands for Statistical Products and Services, Inc. SPSS is an essential component of the analytical process that provides access to data. SPSS can read various types of data or import data directly into the SPSS Data Editor (Anggraini et al., 2021).

Normality Test

In statistical analysis, the normality test is one of the key procedures that must be carried out before applying parametric tests. The normality test aims to determine whether the research data follows a distribution that approximates a normal distribution. Through this test, researchers can ensure that the data distribution does not deviate significantly from a

normal distribution. If the data meets the assumption of normality, the analysis can proceed using parametric statistical tests, such as the t-test. Conversely, if the data does not meet the assumption of normality, the analysis should use non-parametric statistical tests to ensure that the research results remain valid and in accordance with scientific principles (Fatih et al., 2026).

This study employed the Shapiro-Wilk test with a significance level of more than 0.05. After the data were analysed using SPSS software, the results were presented in the following table:

Table 2. Normality Test

		Tests of Normality					
		Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Pre		.106	20	.200*	.956	20	.464
Post		.121	20	.200*	.958	20	.512

Based on the results in the **table 2**, using the Shapiro-Wilk test, it can be concluded that the significance level for the pre-test data is 0.464. Similarly, the table above shows that the significance level for the post-test data is 0.512. Consequently, the pre-test and post-test data are normally distributed, as the significance levels are both greater than 0.05.

Paired Samples T-test

The paired t-test is a type of parametric statistical test used to compare two sets of paired data. These paired data are obtained from the same research subjects but measured under different conditions, namely before and after the treatment was administered. This test aims to determine whether there is a difference in the mean between the initial measurement (pre-test) and the final measurement (post-test). Thus, the paired sample t-test can be used to assess the effectiveness of a treatment based on the changes that occur after the treatment is administered (Kaporina et al., 2023).

Table 3. Paired Samples Test

		Paired Samples Test							
		Paired Differences							
				Std. Error		95% Confidence Interval of the Difference		t	df
		Mean	Std. Deviation	Mean		Lower	Upper		
Pair 1	Pre - Post	.77750	.48070	.10749		.55253	1.00247	7.233	19
									Sig. (2-tailed)
									<.001

Based on output pair 1, the significance value of the pretest-posttest is <0.001. This indicates that there is a significant difference, as the value is <0.05. After the data was obtained, the mean score on the pre-test was 19.2880 with a standard deviation of 1.20093, whilst the mean score on the post-test was 18.5105 with a standard deviation of 0.96591. This indicates that there is a significant difference in the mean post-test results following the intervention consisting of 14 sessions of agility ladder drills.

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This study was conducted to investigate the impact of implementing agility training using the Agility Ladder Drill on the footwork agility of kumite-class karate athletes at Bushido One Club in Tegal Regency. Based on the results of the data analysis, there was a significant difference between the pretest and posttest scores. The Paired Samples t-test showed that the mean score obtained from the pretest-posttest results was 0.77750 with a standard deviation of 0.48070. With a significance level of <0.001, it can be concluded that agility training using

the Agility Ladder Drill, conducted consistently over 14 sessions, can improve the foot agility of the athletes at Bushido One Club.

This is consistent with previous research which explains that, in the world of competitive sport, consistency is a key factor that cannot be compromised. Training carried out regularly and systematically not only builds physical endurance and technical proficiency, but also hones an athlete's winning mentality. However, this consistency does not stand alone; it is heavily dependent on the harmony of training management—from the regulation of volume and intensity, the application of appropriate periodisation, to physical recovery strategies. When any one of these elements is neglected, the stability of an athlete's performance is disrupted, which ultimately often leads to failure on the field of play (Cahyono & Yulfadinata, 2025).

The results of the Shapiro-Wilk normality test conducted in this study indicate an increase in the significance value. In the pre-test stage, the significance value obtained was 0.464, whilst the significance value in the post-test after routine treatment was administered over 14 sessions was 0.512. This indicates that there was a significant increase in the research sample following the treatment involving agility training using the Agility Ladder Drill. This study used the Shapiro-Wilk test because it involved 20 samples, meaning the sample size was less than 50.

These findings are supported by previous research indicating that normality tests are an essential prerequisite for determining the suitability of parametric statistical methods. The choice of testing techniques—such as the Shapiro-Wilk, Kolmogorov-Smirnov, Anderson-Darling, Liliefors, D'Agostino's K2, or Shapiro-Francia tests—must be based on the characteristics of the data and the sample size. Among these various methods, the Shapiro-Wilk and Shapiro-Francia tests are highly effective for small sample sizes. In particular, the Shapiro-Wilk test is considered the most robust tool for analysing small to medium-sized samples ($n < 50$), with the advantage of maintaining consistency even in larger sample sizes (Lentrisna et al., 2023).

This study suggests that the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted. It can therefore be concluded that the agility training method using the Agility Ladder Drill has a significant effect on improving the footwork agility of a karate athlete competing in the kumite category.

These findings are supported by previous research indicating that ladder drills are an effective method for improving agility whilst teaching motor skills in an interactive manner. Although the linear and lateral movements in this exercise are based on simple biomechanics, their combination is capable of creating complex movement patterns. In addition to agility, the implementation of ladder drills contributes positively to optimising various aspects of basic movement, including body balance, reflex responses, muscular endurance, reaction speed, and coordination between body parts (Oktanansa et al., 2022).

Other studies also suggest that ladder drills contribute significantly to improved coordination, speed and footwork, and can optimise nerve conduction, thereby enhancing neuromuscular coordination. This mechanism directly influences reaction speed and the effectiveness of leg movements. Furthermore, this exercise improves the elasticity of the leg muscles and joint flexibility, thereby allowing for a wider range of leg swing whilst running. Specifically, ladder drills focus on strengthening the lower extremity muscles, which play a crucial role in determining an individual's level of agility (Annabila & Jamil, 2025).

Based on the above findings, this study provides empirical evidence that agility training using the Agility Ladder Drill method is effective in improving the footwork agility of karate athletes from the Bushido One Club who compete in the kumite category. This study contributes to providing varied training guidelines for coaches in accordance with an athlete's needs. However, this study has limitations, as only one type of training method was used and it was applied to only one club. Furthermore, this study did not include a control group for the participants regarding other activities undertaken outside the training programme.

CONCLUSION

This study aims to determine the impact of the Agility Ladder Drill on improving the foot agility of kumite karate athletes at the Bushido One Club in Tegal Regency. Based on the research findings, significant results were shown in the paired t-test, which yielded a p-value of <0.001 ; this indicates that the training programme using the Agility Ladder Drill demonstrated a significant difference in mean scores between the pre-test and post-test for the Bushido One Club kumite athletes. With these results, it is hoped that this study can serve as a reference for training variations for coaches in providing varied agility training in accordance with the needs of kumite category karate athletes. Although training using the ladder drill can be used as one variation of footwork training, future research requires a control group with a larger sample size and a comparison of the ladder drill with other agility training methods such as the shuttle run, zig-zag run, or plyometric drills.

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