

Karate athletes' Mawashi Geri kicking ability: Flexibility, balance and explosive power

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Abstract

Problem Formulation and Objectives. Karate is a popular martial sport today, the Mawashi Geri kick is a form of technique that is a mainstay for karate athletes to get points, but this kick is still very difficult for karate athletes to master because it involves physical fitness which is related to skills such as flexibility, balance and Explosion power. Therefore, this study aims to look at the relationship between flexibility, balance and explosive power on the Mawashi Geri kicking ability of karate athletes. **Method.** This research is quantitative associative, with 25 junior athletes in the youth to adult categories taken using purposive sampling. The procedures and instruments in this research take all data on each variable. Mawashi Geri kick (Y) data was obtained using the Mawashi Geri kick test ability which was carried out three times, then the best execution was taken in seconds. Next, for flexibility (X1), data was obtained using the Front-to-Rear-Split Test using the Flexomeasure tool and a ruler or meter. Scoring is determined by recording the best score from three trials as the performance score. Next, for balance (X2), data was obtained using the Balance Beam Test, the score calculated is the average of three experimental scores. Next, the explosive power (X3) was measured using the Stunding Board Jump Test. The data was then analyzed using descriptive statistics and regression analysis. **Results.** The results showed that flexibility, balance and explosive power influenced the Mawashi Geri kicking ability of karate athletes ($p < 0.05$) with a simultaneous influence of 81.10%. The effect of flexibility is 4.75%, with a mean and standard deviation of 6.2 ± 6.74 . Balance was 12.12%, with a mean and standard deviation of 4.68 ± 0.75 . The explosive power was 5.28%, with an average and standard deviation of 178.28 ± 26.83 . Of these three factors, balance is the dominant factor that influences the mawashi geri kick without ignoring other factors (flexibility and explosive power). **Conclusion.** Good balance, good flexibility and optimal explosive power impact the mawashi geri kick. This research is expected to be useful for coaches, sports instructors and athletes to evaluate the importance of these factors to obtain optimal mawashi geri kick results.

Keywords: Mawashi Geri Kick, Flexibility, Balance, Explosive Power, Karate

Introduction

Talent is a superior ability that a person has, is genetic and is largely determined by the environment in the process of development until it reaches the optimal stage (Bakhtiar et al., 2023). Martial artists are a unique group of athletes who practice the arts of combat and self-defense collectively known as martial arts (Welis, Effendi, Mario, Ilham, & Ihsan, 2024). A trained martial artist must be proficient in blocking, attacking, and dodging techniques (Moenig, Kim, Choi, & others, 2023);(Welis, Effendi, Ilham, et al., 2024). Karate is one of the most popular martial arts in the world, karate has also become a sport that is competed at national and international levels (bagińska et al., 2022). This sport requires you to be physically fit (Padli et al., 2024) characterized by various forms of punches and kicks in static and dynamic conditions (Stanley, 2020). In this context, several studies show that "guiaku-zuki" as a punch and "kiza-mawashi-guiri" as a kick are the main skills used in the evaluation or training process (Jemili, Mejri, Sioud, Bouhlel, & Amri, 2017).

The mawashi geri kick technique begins by taking a kidadachi stance, where the leg that will perform the kick is placed behind the supporting leg (Mudric & Rankovic, 2016). Then, lift the leg at an angle to the side and immediately straighten the leg quickly towards the target (Boyce & Schoenfeld, 2022). After reaching the target, the leg is immediately pulled back to the starting position (Joshi & Srinivasan, 2019). To perform a

mawashi geri kick well and hit the target precisely, supporting physical conditions are needed. Some important elements of physical condition include flexibility, balance and explosive power (Marchenko, Jagiello, Iermakov, Ivashchenko, & Khudolii, 2021).

Flexibility is an important element of physical condition that supports the ability to kick (Aminudin, Sugiyanto, & Liskustyawati, 2020). Flexibility helps strengthen the joints that support leg movement, making them more flexible and easy to move (Nuzzo, 2020). This makes kick execution easier, allows for better aiming, and increases overall kick speed (Paramitha, Rosadi, Ramadhan, & Suwanta, 2020).

The importance of balance in the mawashi geri kick technique is vital (Octavian et al., 2022). Balance involves the ability to maintain body position at rest and in motion (Diaz et al., 2019) (Yaswinda, Bakhtiar, Maulana, & Irsakinah, 2021);(Handayani, Myori, Komaini, Mario, & others, 2023). Therefore, the position of the foot in the kick has an important role as a support for body weight (Tamura, Shimura, & Inoue, 2022). Lack of balance can reduce the effectiveness of kicks due to the inability to support body weight properly (Komaini, 2022).

In executing the mawashi geri kick, the explosive power of the leg muscles plays a very important role (N Ihsan, 2020). This explosive power is needed to give the kick enough force to knock the opponent out (Branquinho et al., 2020). By designing kick movements that use the explosive power of the leg muscles efficiently, a karate athlete can increase the efficiency and effectiveness of the kick technique (Fachrezzy et al., 2021). Seeing that previous research only discussed the physical condition components of karate athletes, such as research (Kasih, Siregar, Priyambada, & others, 2021);(Septri et al., 2023) looked at the physical condition of karate athletes in the form of application software on Android and digital. Not only that, research (Kabadayi et al., 2022) analyzed the impact of an 8-week core strength training (CST) program in young karate practitioners on core endurance, agility, flexibility, sprinting, jumping and kicking performance. There is still minimal research involving physical condition components with a focus on basic karate techniques. By looking at the relationship between physical condition factors in the success of kicking techniques in the sport of karate.

Therefore, researchers were interested in conducting this research with the aim of analyzing how much flexibility, balance and explosive power have a relationship with the Mawashi Geri kicking ability of karate athletes. These findings are important for instructors, coaches, practitioners and athletes in improving agility.

Method

Study Design

This research is quantitative associative and aims to prove the relationship between two or more variables. The relationship used is causal, consisting of flexibility (X1), balance (X2), and explosive power (X3) as independent variables and the Mawashi Geri Karate kick (Y) as the dependent variable.

Participant

A total of 25 junior athletes as samples in this study were taken using purposive sampling. The sample for this study was categorized as youth to adult or senior athletes, the sample was male (n=10) and female (n=15). They have stated that they are able to comply with the rules during the research and participate voluntarily through a written agreement.

Procedures and Instruments

Mawashi Geri Karate

Mawashi Geri Karate measured using the Mawashi Geri Karate kick test towards the target as quickly as possible, using a Handbox/patching pad. The implementation was carried out 3 times and the best time was taken. Time measurements are expressed in the form of two numbers after the comma. The assessment is carried out through three attempts to complete the Mawashi Geri Karate kick with the fastest time. The following is the classification of the Mawashi Geri Karate kick test. (Table 1)

Table 1. Classification of the Mawashi Geri Karate test

Time(Seconds) Man	Category	Time (Seconds) Woman
< 2.12	Very well	< 2.60
2.56 - 2.13	Good	3.14 - 2.61
3.01 - 2.57	Enough	3.67 - 3.15
3.46 - 3.02	Not enough	4.20 - 3.68
> 3.47	Very less	> 4.21

Note: the unit of score is "seconds".

Flexibility

Flexibility is measured using the Front-to-Rear-Split Test using a Flexomeasure tool and a ruler or meter. Scoring is determined by recording the best score from three trials as the performance score. The flexibility classification can be seen in (table 2).

Table 2. Classification of Front-to-Rear-Split Tests

Man	Tiers	Woman
0 -3	Advanced/sophisticated	0 - 2.75
3.25 -8	adv. Intermediate/between	3 - 7.50
8.25 - 17	intermediate/between	7.50 - 16.75
17.75 -22.5	adv. Beginner	17 - 21.50
> 22.75	Beginner	> 21.75

Note: the score unit is "cm"

Balance

The balance score is obtained from the results of the Balance beam test. The Balance beam test uses a beam measuring 2.5m long, 4cm wide and 12cm high and a stopwatch. The score is determined through three trials in completing the balance beam walking test, and then the score is given based on the results of subjective observations of the person crossing the beam. To ensure accuracy, the calculated score is the average of the three experimental scores. The classification of the balance beam test is seen in (Table 3) below.

Table 3. Classification of Balance beam Tests

Score	Classification
5	Can cross the balance beam with perfect balance in 6 seconds.
4	Can cross the balance beam with a slight wavering or instability within 6 seconds.
3	Able to cross the balance beam by stopping one or more times and taking more than 6 seconds.
2	Fell off the beam before completing the balance beam
1	Falls off a block when starting to walk.

Note: the score unit is "number"

Explosion power

Explosive power can be measured with the Standing Board Jump Test, using a plastic and iron meter, Duct tape or something that can be used as a barrier, Test form, Flat and level floor. The Standing Board Jump Test classification can be seen in (Table 4).

Table 4. Classification of Stunting Board Jump Test

Man	Woman	Score	Category
≥ 224	≥ 178	5	Very well
195 -223	153 - 177	4	Good
165- 194	129 -152	3	Currently
136 - 164	104 - 128	2	Not enough
≤ 135	≤ 103	1	Very less

Note: the score unit is "cm"

Statistic analysis

Data were analyzed using descriptive statistics to determine the classification level of each research variable. Correlation and regression analysis are then used to prove the relationship between variables. All stages were analyzed using IBM SPSS version 24.

Results

The data description aims to describe the testing and measurement characteristics of each variable. So that the level/classification of the sample is known. Table 5 shows that the average Mawashi Geri Karate score is 2.84 for male athletes in the "fair" classification and for female athletes it is 3.12 in the "fair" classification. Flexibility in male athletes of 9.1 is in the "intermediate/between" and for female athletes it was 4.27 in the "adv. Intermediate/between". The balance for male athletes is 4.8 in the "5" classification, while for female athletes it is 4.6 which is also in the "5" classification. Furthermore, the explosive power for male athletes was 191.5 in the "medium" classification and for female athletes it was 169.47 in the "good" classification.

Figure 1 shows that the average score of men is higher than women, in terms of Mawashi Geri Karate kicks, flexibility, balance and explosive power. The results of the Kolmogorof-Smirnov normality test and Linearity Test also show that each variable has a normal and linear distribution ($p > 0.05$) (Table 6). Correlation and regression analysis are used to determine the relationship between these variables.

Table 7 shows that flexibility, balance and explosive power have a significant relationship with Mawashi Geri Karate kicking ability, both partially and simultaneously ($p < 0.05$). The correlation between flexibility and Mawashi Geri Karate is 0.295 and the contribution is 4.75%. The correlation between balance and Mawashi Geri Karate is 0.160 and the contribution is 12.12%. The correlation between explosive power and Mawashi Geri Karate is 0.102 and the contribution is 5.28%. Furthermore, the correlation of flexibility, balance and explosive power to Mawashi Geri Karate is 0.480 and the contribution is 81.2%.

Figure 2 shows a graphic plot forming a line pattern from bottom left to top right. Therefore, each variable has a linear and significant relationship with mawashi geri ($Y = 0.0155 + 2.9134X1$; $Y = 0.2222 + 4.0491X2$; and $Y = 0.0041 + 3.7388X3$). Meanwhile, simultaneously obtained the Regression model $Y = 4.231 + 0.620X1 + 0.353X2 + 0.793X3$

Table 5. Descriptive Statistics

Gender	Variable	N	Minimal	Maximum	m	elementary school
Man	Mawashi Geri Karate (second)		2.46	3.36	2.84	0.28
	flexibility (cm)	10	0	25	9.1	8.23
	Balance (score)		3	5	4.8	0.63
	Explosive Power (cm)		155	224	191.5	25.07
Woman	Mawashi Geri Karate (second)		2.02	4.17	3.12	0.56
	flexibility (cm)	15	0	11	4.27	4.93
	Balance (score)		3	5	4.6	0.83
	Explosive Power (cm)		118	211	169.47	24.93

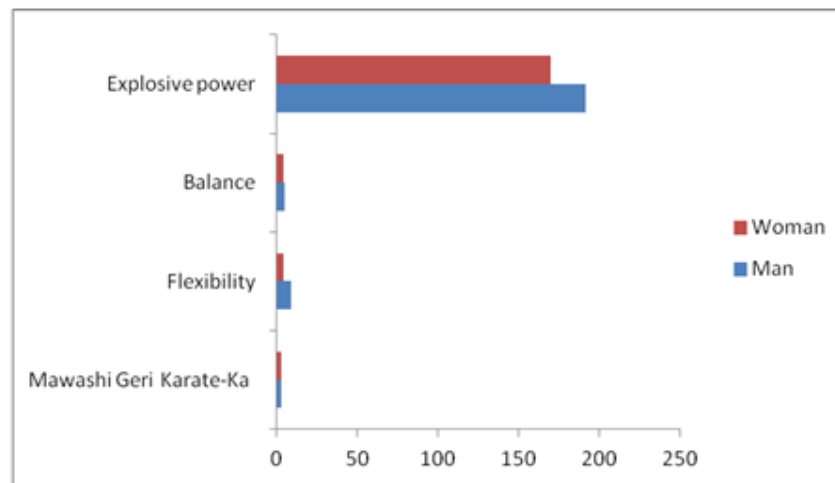


Figure 1. Differences in Average Scores Between Men and Women

Table 6. Normality and Linearity Test

Variable	Normality Test (p^*)	Linearity Test (p^*)
YX1	0.200	0.441
YX2	0.200	0.174
YX3	0.200	0.751

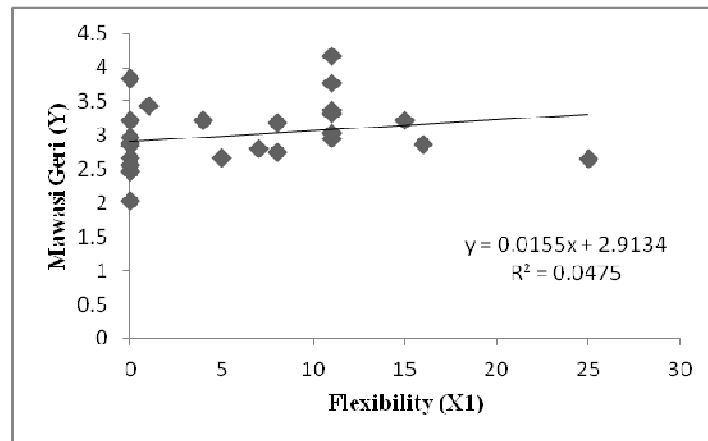
Note: *Data is normally and linearly distributed ($p > 0.05$)

Table 7. Multiple Analysis and Correlation

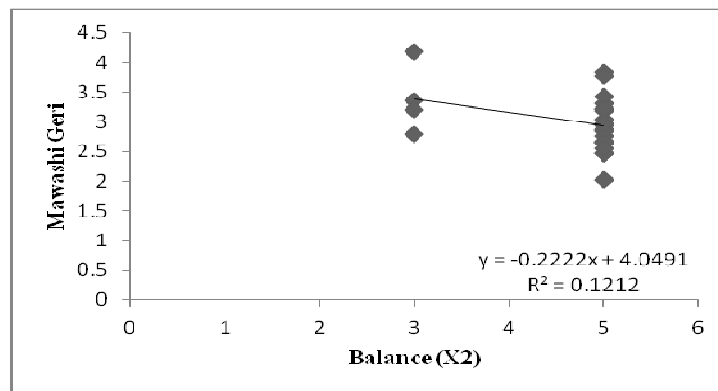
Variable	B	R	Rsquare	Q	P
Flexibility	0.0155	0.295	0.0475	2,442	0.043
	2.9134				
Balance	0.2222	0.160	0.1212	2,837	0.048
	4.0491				
Explosion power	0.0041	0.102	0.0528	4,722	0,000
	3.7388				

	4,231			
Simultaneous	0.620	0.480	0.811	0,000
	0.353			
	0.793			

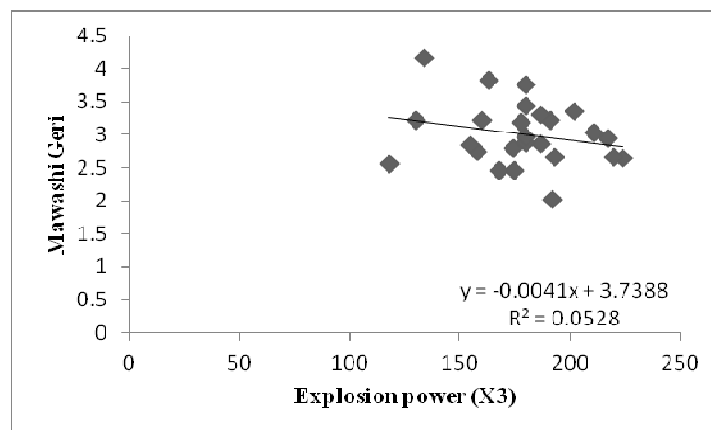
Note: The dependent variable *Mawashi Geri Karate*, significance ($p < 0.05$). “B” is the regression model; “R” is the magnitude of the relationship; “RSquare” is the contribution amount; “T” is the importance of the relationship; “P” is the significance of the regression.



(A)



(B)



(C)

Figure 2. Flexibility linearity curve with mawashi geri kick, (b) balance with mawashi geri, (c) explosive power with mawashi geri.

Discussion

These findings show that flexibility, balance and explosive power influence the mawashi geri kick ability of karate athletes (simultaneous influence of 81.10%). Flexibility provides an influence of 4.75%, balance of 12.12% and explosive power of 5.28%. Of these three factors, balance is the dominant factor that influences mawashi geri, without ignoring other factors (flexibility and explosive power). This finding is in line with and agrees with the aim of this research, namely to see how big the relationship or correlation is in each variable or together.

The results of this study are consistent with previous research, reporting that balance is very important for martial arts sports that involve kicking, especially when athletes feel tired (Güler, Gülmez, Yılmaz, & Ramazanoglu, 2017). Apart from that, balance is also very important and is trained by karate athletes (Rzepko, 2019). In all martial arts sports, you must have good flexibility, balance and explosive power (Plush, Guppy, Nosaka, & Barley, 2022), because it has an important role in achieving maximum performance (Alzoubi & Nashwan, 2022). Judging from previous research reports, good flexibility, balance and explosive power are the basis for achieving maximum performance (Yuliandra, Nugroho, & Gumantan, 2020) because it affects the muscles that have an important role in movement in martial arts sports (Kabadayi et al., 2022).

Not only does balance have an influence, flexibility also has an influence, although not as big as balance, this is in line with previous research which states that fights carried out in a sport do not interfere with an athlete's performance, including flexibility (Do Nascimento et al., 2023). Apart from that, flexibility can provide flexibility to athletes who are competing (Nuzzo, 2020).

Explosive power also influences mawashi geri kicking ability, this finding is in line with research (Nurul Ihsan et al., 2022) that explosive power has an effective influence on the success of kicking technique. Apart from that, explosive power provides additional strength or power when athletes carry out kicking techniques (Negra et al., 2020). This research reminds us that flexibility, balance and explosive power have an effective influence on the mawashi geri kick ability of karate athletes, which supports factors that influence the mawashi geri kick such as speed, flexibility, experience, and concentration (Camenidis, 2019)

Based on data obtained in the field, the optimal mawashi geri kick for karate athletes is influenced by several factors, including flexibility, balance and explosive power. However, there are several limitations that need to be validated in future research. The sample used is still random, aged teenagers to adults so a more focused, wider and more diverse sample is needed. The factors used are still limited, namely flexibility, balance and explosive power. Therefore, it is necessary to add other factors that influence the mawashi geri kick ability of karate athletes. Of these three factors, balance is the dominant factor that influences mawashi geri, without ignoring other factors (flexibility and explosive power). This means that athletes who have good balance can good flexibility and optimal explosive power impact the mawashi geri kick.

Conclusion

Based on the results of this study, it can be concluded that flexibility, balance and explosive power have an effect simultaneously or individually on the success of karate athletes' mawashi geri kicking techniques (simultaneous effect 81.10%). Flexibility has an effect of 4.75%, balance of 12.12% and explosive power of 5.28%. Good balance, good flexibility and optimal explosive power affect the ability of mawashi geri kicks. This study is expected to be useful for coaches, sports instructors and athletes to evaluate the importance of these factors in order to obtain optimal mawashi geri kicking results.

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