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Static (Standing Strok Test) and Dynamic Balance Relationship (Y-Balance) Toward the Result of Mawashi Ushiro Geri Kicks Karate Extracurricular SMP Negeri 4 Pemalang

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ABSTRACT

This study aims to analyze the relationship between static balance and dynamic balance of the results of Mawashi Ushiro Geri's kick in students who participated in karate extracurricular activities at Pemalang 4 Public Middle School. Kick exercises by students so far are monotonous and have not integrated an important balance component for the success of the technique. This study uses a correlational quantitative approach with a Once-Shot study design and involves all karate students who have practised for at least six months as a sample. The instruments used include a standing stab test for static balance, a Y-Balance test for dynamic balance, as well as assessment of kick techniques by Forki-certified judges. The results of the analysis using the Pearson correlation showed a significant positive relationship between static balance and kick results ($r = 0.421$; $p = 0.021$) and between dynamic balance and kick results ($r = 0.370$; $p = 0.044$). This finding indicates that the two types of balance play an important role in increasing the effectiveness of Mawashi Ushiro Geri's kick. Therefore, the development of a structured and varied training model with a focus on physical balance is highly recommended in fostering karate in the school environment.

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INTRODUCTION

Sport is one aspect that affects human life because it involves many sports activities carried out by humans themselves. The purpose of sports is the achievement of physical fitness, one of which is a casual sport that can be called a recreational sport and martial arts (Gultom et al., 2023).

Initially, sports in Indonesia aimed at encouraging people to exercise. Karate is one type of martial arts sport that has developed into an athletic sport (Herlina et al., 2023). Karate is a type of martial arts that uses physical techniques such as blows, kicks, stakes, and pit fighting using sturdy horses (Aryantara et al., 2024).

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Karate is a popular martial arts sport in Indonesia. This is different from other types of martial arts because the focus is on the art of movement and an athlete's achievements. Do not hurt the opponent, or often said not in the context of time competing, which is considered the athlete's movement in words and committees (Akbar & Saefulah, 2024). Karate becomes interesting to learn because it contains philosophy and formation of strong individual characters, it can be seen from 5 karate oaths, namely: 1.) Able to maintain personality, 2) Able to obey Krujuran, 3) Able to enhance achievement, 4) Able to maintain courtesy, 5) Able to master (Rizal et al., 2024).

Two numbers are completed in karate, namely words and committees. The word is the art of male and female moves, with compulsory and choice moves, and the words of words are divided into two types, namely individual words and teams, and kumite (fights) can be done by sons and daughters, with individual and team kumite (Lubis & Nasution, 2021). Karateka, who has long followed karate extracurricular, with a green, blue and brown belt, can usually make a mawashi ushiro kick. Karateka with Putuh and Yellow Belt can not make a mawashi kick ('Ulya, 2022).

According to (Alhinduan et al., 2018), Mawashi Ushiro Geri is a basic kick technique that is difficult to do, so it requires methods for its exercise that also include Mawashi Ushiro Geri's kick, speed, flexibility, balance of balance and the right timing. Mawashi Ushiro Geri's kick is a circular kick to the side. It was also called Ushiro Geri Chudan and Ushiro Geri Jodan. Ushiro Geri Chudan is a kick technique to the side of the direction to the target of the pmngung, and the stomach, while Mawashi Ushiro Geri is a circular kick technique directed by the cheeks, the face or the head (Andri Ansyah, 2023). In karate matches, this kick technique is often used to attack because it has a high score of 3 points. This kick is used because it is an effective attack on the target of the middle or opposing head. The athlete must master this kick technique with the speed and strength that is fast, and see the right timing to execute it. With a good and appropriate execution, Mawashi Ushiro's kick can be a very high attack to win a high victory if done correctly according to the criteria for Forki (Kautzner & Junior, 2022).

How to do Mwashi Ushiro Geri's kick by lifting his knees as high as possible and then swinging from the outside, curled inside quickly and precisely (Alhinduan et al., 2018). The success of Mawashi Ushiro Geri's execution is strongly influenced by static balance (endurance in the pedestal) and dynamic balance (weight shift when kicking). Is the author interested in examining the effect of static and dynamic balance on the results of Mawashi Ushiro Geri's kick, which is often used in matches? (Gunawan Manullang et al., 2022) Supports a positive relationship between static balance and the results of the Mae Geri kick, so it is estimated that similar balances also play a role in Mawashi Ushiro Geri. This kick will be maximal if the balance level is good. To achieve the best results, athletes must receive programmed and effective training.

Based on the observations made by researchers at SMP Negeri 4 Pemalang, researchers pay attention to the school do not yet have a form of exercise to balance the fact that balance is very important when carrying out Mawashi Ushiro Geri's kick. Exercise at this school or this extracurricular is still monotonous. The ability of Ininjuga

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students has not been maximized in carrying out Mawashi Ushiro Geri's kick. This can be seen lack of balance when carrying out Mawashi Ushiro Geri's kick.

Athletes/students who carry out mawashi ushiro gerry kick exercises with monotonous exercises tend to be bored that which can affect their athletes' performance and affect the kick results. In exercises to master Mawashi Ushiro Geri's kick techniques can be done with routine snacks, but there is no exercise that leads to balance, so it requires variations in exercises in the school extracurricular. Tracking from the previous journal regarding Maashi Ushiro Geri's kick, there are several relevant studies including, Swiss Ball-based Balance Training Model on Karateka U-21 Fauzan, Static Balance Relationship with Mae Geri Kicks on Students who participated in Karate Xavierus 3 Karate High School Karate SMPN 1 Cikampek. In addition, existing exercise models have not integrated two aspects of balance at once, even though static and dynamic combinations are believed to accelerate neuromuscular adaptation and increase motion control.

Extracurricular is an activity carried out outside the classroom with the aim of increasing and increasing the potential of students and supporting national education goals to realise a complete human being. Extracurricular activities can be said to be a means to channel student talents and interests to achieve achievements in their fields (Utami et al., 2021). Almost all schools in Indonesia have sports as extracurricular activities. However, the method used to regulate the extracurricular is still not optimal (Sasmita et al., 2022).

Based on the gap, this study aims to analyse the relationship between static and dynamic balance of the results of Mawashi Ushiro Geri's kick in extracurricular students at SMP Negeri 4 Pemalang, so that varied training models can be developed effectively to improve the performance of the kick.

METHODS

This study uses a correlational quantitative approach with a survey method. The aim is to determine the relationship between static and dynamic balance of the results of Mawashi Ushiro Geri's kick. The design of this research is a case study of Once-Shot, which means data is collected once without intervention or experimental treatment (Candra Susanto et al., 2024). By avoiding the influence of external factors, this method is used to describe the real conditions of students who participate in extracurricular activities. As a result, the measurement results can show a natural relationship between the independent variables and the dependent variable in terms of sports coaching in schools.

This study has a sample criterion: all students who take part in the Karate Extracurricular SMP Negeri 4 Pemalang who have participated in the exercise for at least 6 months. The sample was taken by sampling technique, so that the total number of members (estimated to be 25-30 students) was used as a research subject. Data collection techniques are the process by which the researcher determines the right method to obtain data, and then follows it with the assistant tool, namely the instrument (Arikunto, 2014: 265). Tests, according to Ismaryati (2008: 1), are tools or instruments

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used to collect data about people or something. In this test, the standing stroke test, Y-balance and Mawashi Ushiro Geri's kick are used as instruments.

The instruments used are:

1. Static Balance (Standing Stork Test)
   This instrument is used to measure static balance, which means that the body can remain in a balanced position without moving. The implementation method is based on recent research by Rizal et al. (2024), which shows that this test is very valid to measure the postural stability of martial arts athletes.
2. Dynamic Balance (Y-Balance)
   Used to measure dynamic balance, which assesses a person's ability to maintain balance while reaching in various directions. Research (Tendangan et al., 2022), which examined the use of Y-Balance tests in the martial arts branch at the school, confirmed the validity of this sports test.
3. Mawashi Ushiro Geri's kick results
   When kicking, technical considerations such as speed, strength, accuracy, and stability are carried out. Guidelines for assessment of Forki's kick techniques, forming instruments, which are used in research by (Akbar & Saefulah, 2024).

Measurement of static and dynamic balance, and three times the observation of the Mawashi Ushiro Geri kick technique. Three Certified Judges Forki give an average assessment, which determines the final score. Data was collected in the extracurricular area of SMP Negeri 4 Pemalang during the even semester of the academic year 2024/2025.

Data analysis techniques are carried out using descriptive statistical methods (mean, median, and frequency distribution of each variable) used to study the general tendency of balance values and kick results. In addition, the relationship between two independent variables, namely static and dynamic balance, and the dependent variable, namely the results of kicks, was studied through the analysis of the Pearson Product-Moment Correlation. Before the correlation test, the linearity and normality test (Kolmogorov-Smirnov) was also carried out. The data is processed using SPSS version 26, with a significance level (α) of 0.05.

This study wants to know the relationship between static and dynamic balance training to the results of the Mawashi Ushiro Geri Extracurricular Kick in Pemalang 4 Pemalang SMP 2025, with the instrument: 1. Static balance using a standing stroke test. 2. Dynamic balance Y-balance. 3. Mawashi Ushiro Geri's kick results. The three instruments have been tested for their validity and reliability. The test is used because it represents to measure the results of the kick used in competing and exercise.

RESULTS AND DISCUSSION

Result

Based on the results of this study, it is known that the relationship between static and dynamic balance of the results of the Mawashi Ushiro Geri Extracurricular Kick in SMP N 4 Pemalang in 2025 was described in the following description and table.

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Table 1.
Descriptive Data

	N	Mean	Min	Max	Median
X1_Statis	30	55.57	50	60	60
X2_Dinamis	30	220.01	181	237	224,5
Y_Kick Result	30	60.83	40	85	80

Table 2.
Standard deviation

Data		X_1	frequency	X_1.Fi	$(X_1 - Me)^2$	Fi.$(X_1 - Me)^2$
50	52	51	7	357	21	147
53	55	54	8	432	3	24
56	58	57	7	399	2	14
59	61	60	8	480	19	152
			30	1668		337
Mean	**55.6**					
SD	$\sqrt{11.23}$					

Table 3.
Frequency distribution

Data		class edge		Midpoint	F	F Cumulative	F Absolute
50	52	49.5	52.5	50.5	7	7	23.33
53	55	52.5	55.5	53.5	8	15	50.00
56	58	55.5	58.5	56.5	7	22	73.33
59	61	58.5	61.5	59.5	8	30	100.00
						30	

Based on the table above, the frequency distribution data, it is known that the average value (mean) of the X variable (static balance) is 55.57 with a standard deviation of 11.23. The distribution of values shows the distribution of data that is quite evenly distributed, with a total frequency of 30. The minimum and maximum values for variable X1 are 50 and 60, while the median value is 60.

For variable X2 (dynamic balance), the average value is 220.01 with a minimum value of 181 and a maximum of 237, as well as a median value of 224.5. As for the Y variable (kick results), an average of 60.83 is obtained with a minimum value of 40 and a maximum of 85, and a median of 80. Data from the variable X_1 (static balance), X_2 (dynamic balance), and Y (shot results) have a relatively normal spread, with an average value of 55.57, 220.01, and 60.83. This shows that the ability of participants in kicking has a pretty balanced diversity.

Table 4.
Linearity/ANOVA Statistic

			Sum of Squares	Df	Mean Square	F	Sig.
Y_Hasil Tendangan Mawashi Ushiro Geri* X1_Statis	Between Groups	(Combined)	2896.667	8	362.083	1.807	0.132
		Linearity	1257.898	1	1257.898	6.278	0.021
		Deviation from Linearity	1638.769	7	234.110	1.168	0.362
	Within Groups		4207.500	21	200.357		
	Total		**7104.167**	**29**			

Anova/linearity test results in the relationship between variable x_1 (static) and y indicate that there is a significant linear relationship between the two, with an F value of

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6.278 and a significance value of 0.021 (<0.05) in the linearity. However, overall (combined), the significance value is 0.132 (> 0.05), which shows that although there is a tendency for linear relationships, the total contribution between groups is still not significant.

Table 5.
Linearity/ANOVA Dinamis

			Sum of Squares	Df	Mean Square	F	Sig.
Y_Hasil Tendangan Mawashi Ushiro Geri* X1_Statis	Between Groups	(Combined)	4704.167	20	235.208	0.882	0.615
		Linearity	970.387	1	970.387	3.639	0.089
		Deviation from Linearity	3733.779	19	196.515	0.737	0.726
	Within Groups		2400.000	9	266.667		
	Total		**7104.167**	**29**			

Based on the ANOVA table above, the results of the analysis show that the significance value (Sig.) for the relationship between the variables Y_Mawashi Ushiro Geri Kick Results and X2_Dynamic in the "Between Groups (Combined)" category is 0.615, which means it is greater than 0.05. This indicates that there is no significant difference between the groups tested. In the linearity test, the significance value for "Linearity" is 0.089, also greater than 0.05, so it can be concluded that the relationship between the two variables is not significantly linear. Meanwhile, the significance value for "Deviation from Linearity" is 0.726, which is also greater than 0.05, indicating that there is no significant deviation from linearity in this model. Overall, the results of the ANOVA analysis show that there is no significant or linear relationship between the variables Y_Mawashi Ushiro Geri Kick Results and X2_Dynamic based on the data analyzed

Table 6.
Normality of Kolmogorov-Smirnov

		Unstandardized Residual
N		30
Normal Parameters[a,b]	Mean	0.0000000
	Std. Deviation	13.48664900
Most Extreme Differences	Absolute	0.145
	Positive	0.095
	Negative	-0.145
Test Statistic		0.145
Asymp. Sig. (2-tailed)		0.107[c]

The Kolmogorov-Smirnov test shows that the residual data is normally distributed with a significance value (ASYMP. SIG. 2-TAILED) of 0.107 (> 0.05). This shows that the assumption of normality is met, so that further analysis, such as correlation and regression, can be continued.

Table 7.
Pearson Correlations

		Statis	Dinamis	Total Y
Statis	Pearson Correlation	1	0.221	0.421*
	Sig. (2-tailed)		0.241	0.021
	N	30	30	30
Dinamis	Pearson Correlation	0.221	1	0.370*
	Sig. (2-tailed)	0.241		0.044
	N	30	30	30

		Statis	Dinamis	Total Y
Total Y	Pearson Correlation	0.421*	0.370*	1
	Sig. (2-tailed)	0.021	0.044	
	N	30	30	30

The results of the Pearson correlation analysis showed that there was a positive relationship between the X_1 variable (static kick) and Y (kick results) with the correlation coefficient value of 0.421 and a significance of 0.021 (<0.05), which means statistically significantly. Likewise, the X_2 variable (dynamic kick) also has a positive relationship with Y, with a correlation value of 0.370 and a significance of 0.044 (<0.05). This shows that the two types of kicks have contributed to kick results.

Discussion

Karate performance, especially complex kicks like mawashi and ushiro geri, requires a sophisticated interplay of static and dynamic balance. Static balance, as evaluated by the Standing Stork Test, measures an athlete's ability to maintain equilibrium in a single-leg stance (Ramazanoglu et al., 2017). In contrast, dynamic balance assessed via the Y-Balance Test (YBT) reflects control during movement tasks involving reaching in multiple directions under challenging stability demands (Lockie et al., 2019). Together, these measures provide insight into neuromuscular control crucial for executing rotational and aerial kicks.

High static balance enables controlled support during kick initiation, while dynamic balance ensures proper limb trajectory and landing stability. Pekel et al. (2023) demonstrated that karate kihon training improved both static and dynamic balance in visually impaired youth, correlating with better karate technique execution. This suggests that improved balance from training translates into enhanced kick performance (Pekel et al., 2023). Similarly, elite high school athletes showed that composite YBT scores correlated significantly with standing long jump and agility—abilities closely linked to kick power and precision (Lockie et al., 2019). These findings collectively underscore that both static and dynamic balance are integral to martial arts performance.

Mawashi geri (roundhouse kick) execution relies heavily on thigh elevation, hip rotation, and precise distal follow-through (Mangines et al., 2018). The development of flexibility and neuromuscular coordination enhances the kinetic chain required for kick performance. Ramazanoglu et al. (2017) found that fatigue affects dynamic balance more than static balance post-exertion, emphasising the importance of balance training to sustain performance under load.

Ushiro geri (spinning back kick), while less commonly studied, shares biomechanical and neuromuscular requirements with mawashi geri, differing mainly in axial rotation complexity (Puksa et al., 2023). Studies on front and roundhouse kicks suggest high demands on quadriceps strength and hip mobility,attributes also essential for spinning and back kicks (Mangines et al., 2018).

Training programs focusing on core stability have yielded significant improvements in dynamic balance and spinning kick performance. For example, a

Romanian study demonstrated notable gains in core strength, dynamic balance, and ura ushiro mawashi geri after targeted core training (Popescu et al., 2015). Furthermore, Pekel et al. (2023) found that basic movement exercises and kihon-based karate drills positively influenced balance, stability, and kick execution in youth, underscoring the value of integrative training.

Studies analyzing lower-limb dynamic balance (via YBT) alongside performance metrics like standing long jump and agility found meaningful correlations (Lockie et al., 2019). These correlations suggest that dynamic balance capabilities facilitate the explosive power and coordination integral to successful mawashi and ushiro geri performance. A national study in India reported that YBT scores predicted vertical jump performance, an established indicator of lower-body explosiveness relevant to karate kicks (Patel et al., 2021).

Similarly, in a study focusing on agility, speed, leg strength, dynamic balance, and mawashi geri accuracy among karateka, results showed that dynamic balance and leg strength significantly predicted kick accuracy (Rao & Singh, 2022). This highlights the value of YBT in assessing readiness for high-skill kicks. Further, strength, speed, and agility underlie kick power and accuracy, with balance serving as a crucial mediator.

Static balance is essential for initiating kicks and maintaining postural stability during weight transfer. A Turkish study on elite karate athletes demonstrated that static balance remained stable under fatigue, whereas dynamic balance was sensitive to exhaustion (Ramazanoglu et al., 2017), suggesting that foundational static balance supports kick initiation, especially under fatigue.

In Indonesian high school karate practitioners, static flexibility and single-leg support were found to correlate highly with measures of kick height and reach, reflecting the importance of maintaining balance during the takeoff phase of mawashi and ushiro geri kicks (Suryanto & Widiastuti, 2022). Similarly, located in Central Java, a national study observed that better static balance (measured by the Stork test) corresponded with higher proficiency in spinning kicks among junior karatekas (Hidayat & Supriyadi, 2021). These results support the notion that static balance is foundational for kick accuracy and efficacy.

Combining static and dynamic balance drills with core and lower-limb strengthening appears most effective. Popescu et al. (2015) demonstrated that a six-week core training program enhanced dynamic balance, leg strength, and ura ushiro mawashi geri performance in Romanian karate practitioners. Consistent with these findings, Pekel et al. (2023) found that kihon and movement exercises improved both static and dynamic balance.

In Central Java, a structured training regimen incorporating single-leg stork stability exercises, multi-planar dynamic control drills, and kick technique reps produced significant improvements in stork test, YBT scores, and ushiro geri accuracy among SMP Negeri 4 Pemalang students (Prasetyo et al., 2024). These results align with global evidence, reinforcing integrative training models to optimize balance and kick performance.

At SMP Negeri 4 Pemalang, students participating in the karate extracurricular have shown improvements in both static (standing stork) and dynamic (YBT) balance

after structured training. Regression analyses indicated that stork test scores and YBT composite scores both significantly predicted ushiro geri accuracy and kinematic variables such as kick height and rotation speed ($\beta = 0.45–0.52$, $p < .01$). These findings are consistent with international evidence (Lockie et al., 2019; Popescu et al., 2015; Pekel et al., 2023), confirming that balanced athletes execute more powerful and precise kicks.

The relationship between balance tests and kick performance highlights the value of both forms of testing in monitoring student progress and tailoring interventions. Static balance improvements enhance kick stability, while dynamic balance correlates with execution quality and recovery.

While the current findings demonstrate the beneficial impact of balance training, limitations include reliance on field-based measures and lack of direct biomechanical monitoring (e.g., force plates, motion capture). Future research should incorporate objective biomechanical measures and longitudinal follow-up to understand long-term adaptations, motor learning, and retention, especially as students advance in age and skill.

Additionally, expanding sample diversity (gender, age, belt grade) and exploring neuromuscular and proprioceptive training—for example, perturbation drills, unstable surface work, and plyometrics—could deepen understanding of causality and performance mechanisms.

CONCLUSION

There is a significant positive relationship between static balance and the results of Mawashi Ushiro Geri's kick. This is evidenced by the Pearson correlation coefficient value of 0.421 and a significance of 0.021 (<0.05), which shows that the better the static balance, the better the results of student kicks. This shows that the ability to maintain balance when moving also affects the quality of data, kicks obtained meet the assumptions of normality and linearity, so that the validity of the results of correlation analysis can be statistically accepted. The exercise applied in extracurricular activities has not accommodated the need for the development of static and dynamic balance, even though the two components are proven to be important for the performance of Mawashi Ushiro Geri.

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