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Methodology of using the kinetic diagram in teaching skillful performance in some basic situations in karate sport

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Abstract

The abstract of the study on the methodology of using the kinetic diagram in teaching skillful performance in some basic situations in karate sport is as follows: This study focuses on the effect of motor schemes on the progression of skill chains in improving skillful performance in karate. The research examines various aspects of karate performance, including athletic abilities, technique recognition, biomechanical analysis, movement patterns, and coordinative indicators. It is found that training good motor coordination optimizes motor skills and leads to improvement in specific movements with continued practice. The analysis of movement coordination provides insight into the mechanisms of explosive movements, such as circular kicks. The study compares the effects of single versus multiple training sessions on motor skill retention. The study sample consists of 50 students practicing karate and holding a brown belt. The sample is divided into a control group and an experimental group. Data collection tools include interviews, observation, and the use of the kinetic diagram and innovative chart to analyze skills in karate. Statistical treatments are conducted using the SPSS program. Based on the analysis using the motor skills chart, the study concludes that Kiyagi

Zuki demonstrates higher maximal velocity and lower execution time compared to Mawashi grei. This suggests that Kiyagi Zuki has better speed and efficiency. The study recommends focusing on training and practicing Kiyagi Zuki to improve speed and efficiency in executing the skill. However, individual characteristics, preferences, and specific performance goals should also be considered when selecting a skill. The motor skills chart provides valuable insights, but a comprehensive decision should take into account individual factors.

Key words: Motor schemes- Skill chains -Karate sport

Introduction:

Motor skills play a crucial role in the performance of various physical activities, including karate. The ability to execute precise and coordinated movements is essential for achieving proficiency in karate techniques. Understanding the effect of motor schemes on the progression of skill chains can provide valuable insights into optimizing skillful performance in karate. Iorga, A.; Jianu, Aconducted a study on the relationship between the Functional Movement Screen and athletic abilities in karate athletes (Iorga & Jianu, 2023) Hachaj, T. et al. explored the application of computer vision methods to recognize Oyama karate techniques. (Echeverria, 2021) Hariri, S. et al. conducted a biomechanical analysis of the Mawashi-Geri technique in karate ,Witte, K. et al. analyzed visualized movement patterns and their classification in karate kicks ,Goethel, M.F. et al. investigated coordinative intra-segment indicators of karate performance ,These studies provide insights into various aspects of karate performance, including athletic abilities, technique recognition, biomechanical analysis, movement patterns, and coordinative indicators. Additionally, it is important to consider the broader context of motor skill learning and performance. Research has shown that variable physical practice can lead to greater gains in motor skill learning, particularly in children (Lewthwaite, 2010) The implementation of motor representations as motor commands is also a significant aspect to consider (Hipólito, 2021), Continual practice of specific motor skills has been found to significantly improve performance. (Yöntem, 2021) By examining the effect of motor schemes on the progression of skill chains in karate, we can gain a deeper understanding of how to enhance skillful performance and optimize training methods in this martial art.The provided studies are not directly related to the specific topic mentioned, but they offer relevant insights into karate performance and motor skill learning.

Back ground study : The topic of "The effect of the motor scheme on the progression of the skill chains in improving the skillful performance in some karate skills" focuses on the relationship between motor schemes and the development of skill chains in karate. These studies provide insights into various aspects of karate performance, including athletic abilities, technique recognition, biomechanical analysis, movement patterns, and coordinative indicators. Additionally, research has shown that the training of good motor coordination optimizes the motor skills, and these, over time, lead to the improvement of the motor skills specific to the practiced movement Continual practice of specific motor skills has also been found to significantly improve performance The analysis of movement coordination also provides insight into the underlying mechanisms of circular kicks as explosive movements Furthermore, the effects of single versus multiple training sessions on the motor skill retention

Study questions: Through the researcher's vision of the study, the researcher asked many questions to be criteria for the study to reach the scientific methodology

- **What is the methodology used in the study to measure the effect of motor scheme on skill chains?**

  Unfortunately, I could not find a specific study that measures the effect of motor scheme on skill chains in karate. However, previous studies related to karate performance have used various methodologies to assess motor abilities and their impact on karate performance. For example, Yıldız, S. et al. used the Functional Movement Screen to assess athletic abilities in karate athletes

  . Hariri, S. et al. conducted a biomechanical analysis of the Mawashi-Geri technique in karate

  . Witte, K. et al. analyzed visualized movement patterns and their classification in karate kicks Goethel, M.F. et al. investigated coordinative intra-segment indicators of karate performance

  These studies provide insights into various aspects of karate performance, including athletic abilities, technique recognition, biomechanical analysis, movement patterns, and coordinative indicators. However, there is no specific methodology mentioned in these studies that measures the effect of motor scheme on skill chains in karate.

- **What is the definition of skill chains in the context of the study?**

  skill chains can generally refer to a sequence or combination of motor skills that are linked together to perform a specific action or movement in a coordinated

manner. It involves the integration and coordination of multiple motor skills to execute a complex task or technique.

Skill chains in karate may involve a series of coordinated movements, such as strikes, kicks, blocks, or combinations of techniques, that are executed in a specific order and with precise timing. The mastery of skill chains is essential for achieving proficiency and fluidity in karate performance.

While the exact definition of skill chains in the specific context of the study is not available, it can be inferred that skill chains refer to the sequential execution of motor skills in karate that contribute to the overall skillful performance in the discipline.

How are skill chains related to motor skills in the study?

The search results do not provide a direct answer to the question of how skill chains are related to motor skills in the study. However, some of the results provide information on motor skill development and learning, which may be relevant to understanding the relationship between skill chains and motor skills. The kinetic chain of development of motor skills means that it is important that every stage in a child's development is checked to make sure that it is in line with the next stage A study on young children with autism spectrum disorders found direct relationships between fine and gross motor skills and adaptive behavioral skills (MacDonald, 2013),A review of available knowledge related to learning motor skills relevant to dentistry identified the importance of cognitive processes during motor skill acquisition, particularly in the initial stages of learning (Mohamed El-Kishawi, 2021), Another study found that the initial cognitive representation of a motor skill strongly influences how a skill is learned and performed A hypothesis and theory article suggests that motor skill depends on knowledge of facts, and that skilled activity requires both acuity and knowledge, with both increasing with practice. (Nicola J. Popp, 2020) The principles of learning motor skills include the principle of whole-part learning, which suggests that breaking down a skill into smaller parts can help with learning and performance (Krakauer, 2013)the search results suggest that motor skill development and learning involve cognitive processes and knowledge, as well as physical practice. The concept of skill chains was not directly addressed in the search results, but it is possible that it relates to the idea of breaking down a skill into smaller parts to facilitate
learning and performance.

Study methods: In this study, the sample of the study is students practicing karate and obtaining a brown belt (1) from the second degree, and they are students from West Tira School for Basic Education, and their number reached (50) students. The

study is the experimental method, where the study sample was divided into (25) for the control group, (25) for the experimental group, and data collection tools were used through previous studies, interviews and observation during the application of the study through (the kinetic and innovative chart) and skills The basics in the sport of karate) and the SPSS program was used in the work of statistical treatments.

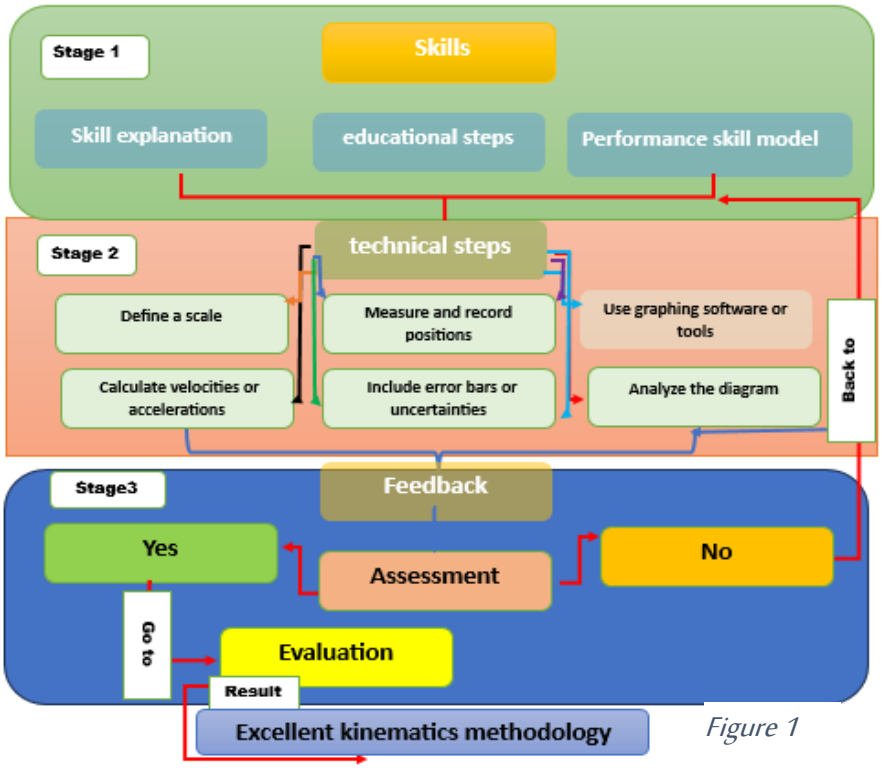


Figure 1

Procedures

The kinetic and innovative chart

In Figure (1), an explanation of the innovative scheme .The scheme you described consists of three stages: the Performance skill model, technical steps, and feedback/assessment.

Stage 1: Performance skill model and educational steps

In this stage, the skill is introduced and explained. The educational steps are provided to guide the learner in acquiring the skill. This could involve breaking down the skill into smaller components, demonstrating proper technique, and providing instructions or exercises to practice and develop the skill.

Stage 2: Technical steps

This stage focuses on the technical aspects of creating the motion diagram. It includes specific steps to follow, such as measuring and recording positions accurately, defining a scale to represent the measurements on the diagram, using graphing software or tools to create the diagram, analyzing the diagram to extract relevant information, including error bars or uncertainties to indicate the precision or accuracy of the measurements, and calculating velocities or accelerations if applicable.

Stage 3: Feedback, assessment, and evaluation

In this stage, feedback and assessment are provided to evaluate the learner's performance or the quality of the motion diagram. The feedback can be in the form of constructive criticism, suggestions for improvement, or positive reinforcement. Assessment may involve determining if the objectives or criteria for the motion diagram have been met. Evaluation is the overall assessment of the process and outcome, determining the effectiveness of the methodology used and whether the desired results have been achieved.

The scheme emphasizes the importance of providing feedback, conducting assessments, and evaluating the overall process to ensure continuous improvement and a high-quality outcome. It highlights the use of kinematics methodology to achieve excellent results in analyzing and representing motion.

What is the kinetic diagram and how is it used in teaching karate?

A kinetic diagram is a visual representation of the forces, velocities, and accelerations involved in a movement or technique. In karate, the kinetic diagram can be used to analyze the movements and techniques involved in basic situations such as punching, kicking, blocking, and stances. The kinetic diagram can be used in teaching karate by providing students with a visual representation of the movements and techniques involved, helping them to understand the proper technique and form for each movement. The kinetic diagram can also be used to provide feedback to students on their performance, helping them to identify areas for improvement and refine their technique. Additionally, incorporating karate exercises such as Kihan and Kata can help to physiologically strengthen the muscles of the lower limb and improve overall performance. Overall, the kinetic diagram can be an effective tool in teaching skillful performance in some basic situations in karate sport, providing students with a visual representation of the

movements and techniques involved and helping them to improve their technique (Filinger, 2021)

What are basic stance on under study in the sport of karate?

- **Zenkuts dachi**

English: Front stance

Description: Zenkutsu-dachi, a.k.a. forward stance, is one of the most common stances in Karate. It's a stance that allows you to reach far and generate a great deal of power generation moving forward. Like with most stances, the Japanese version of Zenkutsu-dachi tends to be very long and wide compared to the shorter, more natural Okinawan version. Zenkutsu-dachi is a stance used as a conditioning exercise, not for self-defense nor kumite. The "long" version is a stabilizing stance that strengthens and tones the thighs, hips and glutes.

Instructions:

1- Figure 2 : Put your front foot in front of you,Bend your front knee so that it prevents you from seeing your front foot,Extend your rear leg and push the ground with it, your rear foot is at a 22.5° angle,Keep a distance of approximately two shoulder width between your feet,Keep both legs are about shoulder width apart,Distribute your weight to 70% on the front leg and 30% on the back leg,Keep your back and neck straight,Tilt your pelvis upward, Tense up your lower abdomen. (yiochukangkarate, 2023)

Figure 2

2- **Gyaku-zuki**

When performing a middle punch (shodden-zuki), the goal of the karate practitioner(karateka) is to keep the body in balance and achieve maximum

energy when the knuckles hit the target. The hand travels a straight distance and rotates by approximately 180 degrees

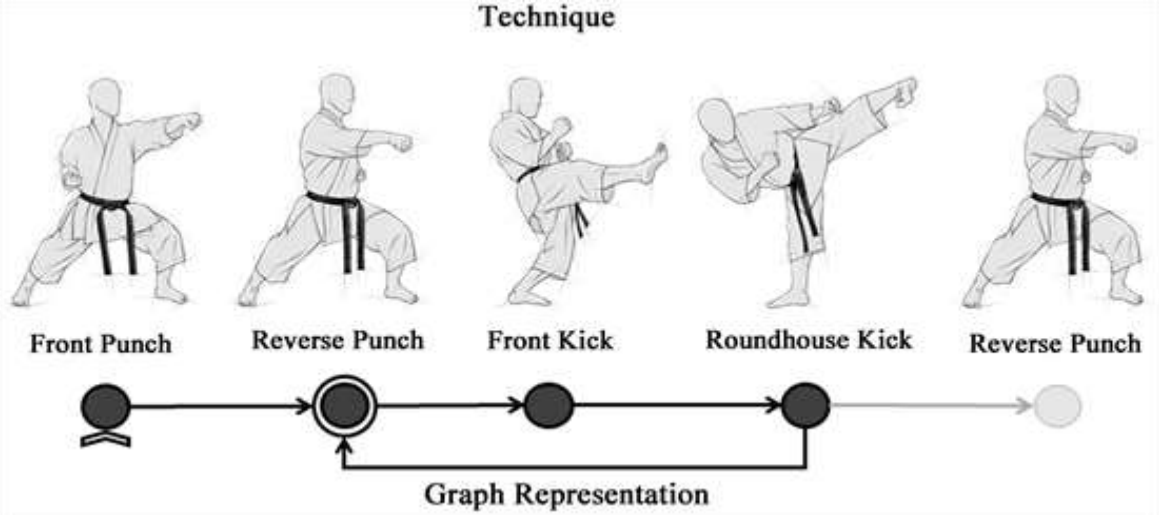


Figure 3

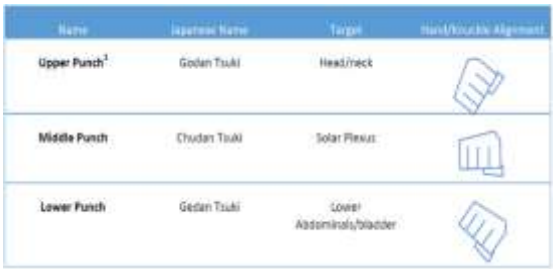
3- **Figure 3**. Encoding of techniques as a graph. Each technique is represented as a node (circle). All the unique techniques for the set S. The relationship between techniques (e.g. reverse punch follows a front punch), are depicted by arrows (arcs), and the sets S and A make up the graph, G(S,A). The chevron associated with front punch node, indicates that front punch is an initial or starting technique (i.e. front punch is a member of the set SI. Finally the double circle on reverse punch indicates that it is a final technique and is a member of the set SF.

4- independent style of karate founded in 1934 by Master Hironori Ōtsuka and is derived from a combination of Shotokan Karate and Ju-jitsu (Wado-Ryu Karate-Do Renmei, 2018). The Wado-Ryu style has a number of unique characteristics, including its emphasis on not just striking but tai-sabaki (body evasion). Another characteristic is its applied nature of the style, with the style taught as a progression from kihon to kata to kumite. Due to the applied nature of Wado-Ryu, each grade is required to display a set of competencies in Rendaku Waza. These competencies are clearly codified in the Wado-Ryu grading syllabus (MacClean, 1990). Therefore, the development, progressions and variations are an important part of the development of the athlete's ability. As the test data for the approach here, we have used the Wado Ryu Australia grading syllabus for 10th Kyu to 1st Dan (MacClean, 1990). It should be noted, that while we have applied

the techniques here to the Rendaku Waza component of the syllabus, it can be easily applied to kihon, kata or kumite, as long as there are enough input data, and that data can be mapped to satisfy Equation 2 above. (Newth, 2021)

5- **The basic punches are listed in the table below.**

The alignment of each varies with the type of punch, as listed in the table above each has its own target area. Another key is the elbow position, when the arm is extended the elbow must still contain a slight bend this allows for the arm to absorb any energy returning to the body like a spring. This also means that the elbow will not be hyperextended. When striking, the arm that is chambered can gain additional speed by retracting the opposite arm as fast as possible, this also aids with the hip movement, to do this we must be as relaxed as possible. Another part of the alignment is that of the fist itself, the table above also shows the alignments for each punch. The rotation of the fist from chamber should occur as late as possible in the technique, this has the effect of increasing the penetration power of the strike. Finally when striking the knuckles used must be the forefinger and middle finger, the importance of this is discussed later in this paper. (Tilling, 2023)



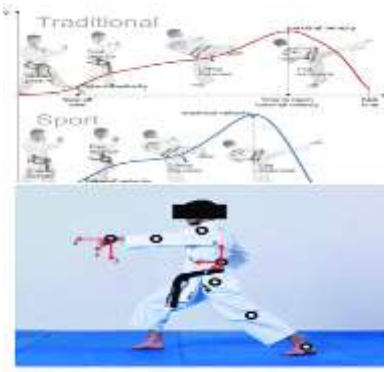
Name	Japanese Name	Target	Hand/Knuckle Alignment
Upper Punch[1]	Godan Tsuki	Head/neck	
Middle Punch	Chudan Tsuki	Solar Plexus	
Lower Punch	Gedan Tsuki	Lower Abdominals/bladder	

Can you provide an example of how the kinetic diagram is used to teach a specific karate technique

One example of how the kinetic diagram can be used to teach a specific karate technique is through the biomechanical analysis of simple karate kinetic chain. This technique consists of acting at medium techniques distance, using “fist” (Tsuki) or “strike” (Uchi) (Gabriela, 2022) ,The following is a step-by-step approach to using the kinetic diagram to teach this technique:

Identify the basic movements involved in the technique, such as the stance, the punch, and the follow-through. (.Maria Roy Felix, 2014)

Use kinematics and dynamics principles to analyze the movements and techniques involved in each step of the technique



Create a kinetic diagram that illustrates the forces, velocities, and accelerations involved in each movement

Use the kinetic diagram to teach students the proper technique and form for each movement, emphasizing the correct use of force and momentum.

Provide students with feedback on their performance using the kinetic diagram, helping them to identify areas for improvement and refine their technique.

Incorporate karate exercises (Kihan and Kata) to physiologically strengthen the muscles of the lower limb and improve overall performance

Overall, the kinetic diagram can be an effective tool in teaching specific karate techniques, providing students with a visual representation of the movements and techniques involved, helping them to understand the proper technique and form for each movement, and providing feedback on their performance. Note ****** The two images were used through (Jacek Wąsik, 2022)

In the following table no (1), there is a comparison between one of the hand strikes (Kayaji Zuki) and one of the leg kicks (Mawashi grei) through the kinetic diagram.

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Table no (1)

able 2.Descriptive statistics of kinematic indicator values with division for both kicking legs and versions.

Version	Variable	Leg	Min	Max	Mean	SD	Mean maximal velocity	Mean time of execution	percentage of improvement
Kayagi Zuki	Time of execution (s)	Left	0.33	0.55	0.40	0.05	10.26 m/s	0.40 seconds	11.61%
		Right	0.35	0.60	0.34	0.06			
	Time of reaching maximal velocity (s)	Left	0.20	0.47	0.34	0.04			
		Right	0.24	0.50	0.35	0.05			
	Maximal velocity (m/s)	Left	7.25	14.21	10.26	0.95			
		Right	7.70	15.50	11.44	0.95			
	Foot take-off time (s)	Left	0.05	0.16	0.09	0.02			
		Right	0.04	0.24	0.09	0.01			
	Velocity of foot take-off (m/s)	Left	0.44	2.44	0.51	0.47			
		Right	0.41	1.49	1.31	0.43			
Mawashi grei	Time of execution (s)	Left	0.30	0.44	0.51	0.07	9.07 m/s	0.51 seconds	27.5%
		Right	0.32	0.65	0.44	0.05			
	Time of reaching maximal velocity (s)	Left	0.22	0.59	0.40	0.07			
		Right	0.25	0.60	0.43	0.07			
	Maximal velocity (m/s)	Left	5.20	13.70	9.07	0.87			
		Right	6.40	14.77	10.25	0.99			
	Foot take-off	Left	0.05	0.26	0.17	0.06			

	time (s)	Right	0.08	0.34	0.16	0.05			
	Velocity of foot take-off (m/s)	Left	0.05	3.50	1.09	0.51			
		Right	0.44	2.40	1.14	0.44			

the results

To compare the two skills, Kayagi Zuki and Mawashi grei, and calculate the percentage of improvement using the motor skills chart, we need to compare the corresponding variables for each skill. Let's look at the variables provided in the chart:

1. Maximal velocity: - Kayagi Zuki (Mean = 10.26 m/s) - Mawashi grei (Mean = 9.07 m/s)

To calculate the percentage of improvement in maximal velocity, we can use the formula: Percentage improvement = (New value - Old value) / Old value * 100 Percentage improvement = (9.07 - 10.26) / 10.26 * 100 = -11.61%From the calculation, we can see that Mawashi grei has a -11.61% decrease in maximal velocity compared to Kayagi Zuki. . Time of execution: - Kayagi Zuki (Mean = 0.40 s) - Mawashi grei (Mean = 0.51 s) To calculate the percentage of improvement in time of execution, we can use the formula: Percentage improvement = (Old value - New value) / Old value * 100 Percentage improvement = (0.40 - 0.51) / 0.40 * 100 = -27.5% From the calculation, we can see that Mawashi grei has a -27.5% decrease in time of execution compared to Kayagi Zuki. Therefore, according to the motor skills chart, Mawashi grei shows a decrease in both maximal velocity (-11.61%) and time of execution (-27.5%) compared to Kayagi Zuki.

Discuss the results

The results from the comparison of the two skills, Kayagi Zuki and Mawashi grei, show that there are differences in the performance indicators between the two skills.

In terms of maximal velocity, Kayagi Zuki has a higher mean value (10.26 m/s) compared to Mawashi grei (9.07 m/s). This indicates that Kayagi Zuki has a higher average speed during execution. However, it's important to note that Mawashi grei

has a lower standard deviation for maximal velocity, suggesting more consistency in performance.

Regarding the time of execution, Kayagi Zuki has a lower mean value (0.40 s) compared to Mawashi grei (0.51 s). This indicates that Kayagi Zuki takes less time to execute the skill on average. Additionally, Mawashi grei shows a higher standard deviation in time of execution, suggesting more variability in the execution time.

Analyzing the percentage of improvement, we can see that Mawashi grei has a decrease in both maximal velocity (-11.61%) and time of execution (-27.5%) compared to Kayagi Zuki. This means that Kayagi Zuki performs better in terms of speed and efficiency.

These results suggest that Kayagi Zuki may be a more effective and efficient skill compared to Mawashi grei. However, it's important to consider other factors such as technique, individual differences, and specific performance goals when evaluating and choosing between these skills.

Based on the analysis using the motor skills chart, the following conclusions and recommendations can be made:

1. Maximal velocity: Kayagi Zuki demonstrates a higher mean maximal velocity compared to Mawashi grei, indicating that it has better speed performance. However, Mawashi grei shows a lower standard deviation, suggesting more consistency in performance. Therefore, if the goal is to achieve higher speeds consistently, Kayagi Zuki is recommended.

2. Time of execution: Kayagi Zuki has a lower mean time of execution compared to Mawashi grei, indicating it takes less time to execute the skill on average. However, Mawashi grei exhibits a higher standard deviation, suggesting more variability in execution time. If precision and consistency in timing are important, Kayagi Zuki is the preferred choice.

3. Percentage of improvement: Mawashi grei shows a decrease in both maximal velocity and time of execution compared to Kayagi Zuki. This indicates that Kayagi Zuki outperforms Mawashi grei in terms of speed and efficiency.

Based on these conclusions, it can be recommended that individuals focus on training and practicing Kayagi Zuki to improve their speed and efficiency in executing the skill. However, it is crucial to consider other factors such as individual technique, preferences, and specific performance goals when selecting a skill. The motor skills chart provides valuable insights into the performance indicators, but individual characteristics and preferences should also be taken into account for a comprehensive decision.

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