



EXECUTION TIME OF SPORTIVE AND TRADITIONAL ROUNDHOUSE KICK (MAWASHI-GERI) IN SHOTOKAN KARATE

TEMPO DE EXECUÇÃO DO CHUTE SEMICIRCULAR ESPORTIVO E TRADICIONAL (MAWASHI-GERI) NO KARATÊ SHOTOKAN

TIEMPO DE EJECUCIÓN DE LA PATADA GIRATORIA TRADICIONAL Y DEPORTIVA (MAWASHI-GERI) EN SHOTOKAN KARATE

Breno Berny Vasconcelos


<https://orcid.org/0000-0003-0019-4493> 


<http://lattes.cnpq.br/0784325241716240> 

Universidade Federal de Pelotas (Pelotas, RS – Brasil)

brenobvasc@gmail.com

Robson Duarte Dias


<https://orcid.org/0009-0003-6573-8954> 


<http://lattes.cnpq.br/3345397898425550> 

Universidade Federal de Pelotas (Pelotas, RS – Brasil)

robson_1073@yahoo.com.br

Rossano Diniz


<https://orcid.org/0000-0001-8494-7530> 


<http://lattes.cnpq.br/2239470536158461> 

Universidade Federal de Pelotas (Pelotas, RS – Brasil)

rossanotkd@gmail.com

Paula Carolini Conceição Campelo


<https://orcid.org/0000-0002-6451-0128> 


<http://lattes.cnpq.br/2365222357831627> 

Universidade Federal de Pelotas (Pelotas, RS – Brasil)

paulacampelo14@gmail.com

Stephanie Santana Pinto


<http://lattes.cnpq.br/3084027728514230> 


<https://orcid.org/0000-0003-4555-2717> 

Universidade Federal de Pelotas (Pelotas, RS – Brasil)

tetisantana@yahoo.com.br

Cristine Lima Alberton

<https://orcid.org/0000-0002-5258-9406> 

<http://lattes.cnpq.br/2775060719288282> 

Universidade Federal de Pelotas (Pelotas, RS – Brasil)

cristine.alberton@ufpel.edu.br

Abstract

This study aimed to measure and compare the execution time of both traditional and sportive Mawashi-Geri roundhouse kick execution styles in Shotokan Karate athletes. Sixteen Shotokan Karate athletes (27.18±9.41 years old, 15.19±6.87 years of experience) participated in a study comparing the execution time of traditional and sportive Mawashi-Geri roundhouse kicks. Each athlete performed six kicks (three traditional, three sportive) in random order



on a fixed Body Opponent Bag (BOB) at waist level after a standardized warm-up. Kicks were filmed using a Casio™ EX-ZR100 (1920x1080, 30fps), and execution time was analyzed with Kinovea 0.8.15. The results showed that the sportive Mawashi-Geri had a significantly faster execution time (0.260 ± 0.040 s) compared to the traditional style (0.321 ± 0.110 s, $p=0.016$). The findings suggest that the sportive style is more effective for Kumite (sparring) competitions due to its speed, while the traditional style may be better suited for Kihon (technical) practices and Kata (form) competitions.

Keywords: Martial Arts; Combat Sport; Biomechanics; Kinematical Analysis.

Resumo

Este estudo objetivou medir e comparar o tempo de execução dos estilos tradicional e esportivo do chute Mawashi-Geri em atletas de Karatê Shotokan. Dezesesseis atletas ($27,18 \pm 9,41$ anos de idade, $15,19 \pm 6,87$ anos de experiência) participaram do estudo. Cada atleta realizou seis chutes (três tradicionais e três esportivos) em ordem aleatória contra um Body Opponent Bag (BOB) fixo na altura da cintura, após um aquecimento padronizado. Os chutes foram filmados com uma câmera Casio™ EX-ZR100 (1920x1080, 30fps) e o tempo de execução foi analisado com o software Kinovea 0.8.15. Os resultados mostraram que o Mawashi-Geri esportivo apresentou um tempo de execução significativamente mais rápido ($0,260 \pm 0,040$ s) em comparação ao estilo tradicional ($0,321 \pm 0,110$ s, $p=0,016$). Os achados sugerem que o estilo esportivo é mais eficaz para competições de Kumite (luta) devido à sua velocidade, enquanto o estilo tradicional pode ser mais adequado para práticas de Kihon (técnicas) e competições de Kata (formas).

Palavras-chave: Artes Marciais; Esporte de Combate; Biomecânica; Análise Cinemática;

Resumen

Este estudio midió y comparó el tiempo de ejecución de los estilos tradicional y deportivo de la patada Mawashi-Geri en atletas de Karate Shotokan. Participaron dieciséis atletas ($27,18 \pm 9,41$ años de edad, $15,19 \pm 6,87$ años de experiencia). Cada atleta realizó seis patadas (tres tradicionales y tres deportivas) en orden aleatorio contra un Body Opponent Bag (BOB) fijo a la altura de la cintura, después de un calentamiento estandarizado. Las patadas fueron filmadas con una cámara Casio™ EX-ZR100 (1920x1080, 30fps) y el tiempo de ejecución se analizó con el software Kinovea 0.8.15. Los resultados mostraron que el Mawashi-Geri deportivo tuvo un tiempo de ejecución significativamente más rápido ($0,260 \pm 0,040$ s) en comparación con el estilo tradicional ($0,321 \pm 0,110$ s, $p=0,016$). Los hallazgos sugieren que el estilo deportivo es más efectivo para competiciones de Kumite (combate) debido a su velocidad, mientras que el estilo tradicional puede ser más adecuado para prácticas de Kihon (técnicas) y competiciones de Kata (formas).

Palabras clave: Artes Marciales; Deporte de Combate; Biomecánica; Análisis Cinemático.

INTRODUCTION

Karate is a Japanese striking martial art and combat sport widespread globally, recently featured in Tokyo's 2020 Summer Olympic Games (Manzenreiter, 2020). As a traditional martial art, it has different styles, such as Shotokan, one of the most famous Karate styles, and has been used for self-defense, health, ethical, and moral development purposes (Chang *et al.*, 2018). As a sport, it features powerful striking motor actions in two different disciplines: Kata, a non-fighting discipline in which athletes perform a standardized sequence of fighting motor actions simulating a real fight, and Kumite, a sparring striking discipline (Manzenreiter, 2020).

As Karate developed itself throughout the last century, substantial differences emerged, differencing standard school techniques and competition techniques. The standard school techniques, also called traditional techniques, are commonly seen in Kihon (technical) practices and Kata (Form) competitions. On the other hand, competition techniques, also called





sportive techniques, are frequently used in Kumite (sparring) competitions (Kahrović *et al.*, 2014). These differences emerged from each activity's specific demands. While in Kihon and Kata activities, athletes need to perform motor actions following pre-determined standards concerning the shape and aesthetic of the movements, in Kumite, athletes need to adapt their techniques to the match situations and need to perform powerful strikes using the least time possible (Emmermacher *et al.*, 2007).

The kicking techniques have a substantial importance in Karate activities, especially in Kumite competition, because the point system values more kicking strikes to the detriment of punches (World Karate Federation, 2020). Therefore, a higher kicking ability, which means delivering high speed and powerful kicks, may increase Kumite athletes' chances of victory; meanwhile, Kata athletes may focus more on the aesthetical side of kicking (Kahrović *et al.*, 2014).

Round-house kicks are an essential leg technique in many combat sports and figure among the most utilized kicking techniques in many of them, such as Kickboxing (Ouergui *et al.*, 2013), Taekwondo (Chang *et al.*, 2021; Diniz *et al.*, 2021), Muaythai (Diniz *et al.*, 2021) and Wushu/Kung-Fu (Vasconcelos; Del Vecchio, 2017). Likewise, the Mawashi-Geri, Karate's round-house kick, is the most utilized leg technique, especially in Kumite competition (Ibáñez *et al.*, 2018). Round-house kicks' advantages are their technical simplicity, short execution time, high power output, efficacy, and scoring potential (Liang, 2007).

The Mawashi-Geri has also suffered substantial changes along the Karate-sport development process, especially for Kumite competition. Although the biomechanical differences in the traditional and sportive executions of Mawashi-Geri are described (Emmermacher *et al.*, 2007; Marques Junior, 2011), data on kicking performance, such as velocity/power outputs and executions time, are lacking. Therefore, this study aimed to measure and compare the sportive and traditional execution times of the Mawashi-Geri round-house kick in Shotokan Karate. The authors hypothesized that the biomechanical differences during the execution of both styles would lead to different execution times, directly impacting athletes' performance, depending on which event (Kata or Kumite) they are competing in.



MATERIAL AND METHODS

Experimental Design

This quantitative observational study aimed to measure and compare the sportive and traditional kick execution times of the roundhouse kick (Mawashi-Geri) performed with the back leg in Shotokan Karate.

Participants

Sixteen male national and international level Shotokan style Karate athletes participated in the study. To be included in the study, athletes needed to be Shotokan Karate athletes, be older than 18 years old, and be free of any musculoskeletal lower limbs or spine injuries. Athletes who met the inclusion criteria and accepted participating in the study were recommended not to perform any physical activity 48 hours before the data collection. All subjects were informed about this study procedure, including risks and benefits, and signed the Free and Informed Consent Form. The local Ethical Committee of the Federal University of Pelotas approved this research project (CAAE: 69931817.5.0000.5313).

Procedures

Before the data collection procedures, the athletes signed the consent form and filled out a questionnaire about their competitive level. Then, anthropometric data were collected (body weight, height, trunk height, and 7-skin folds by (Jackson; Pollock, 1978), and were instructed about the warming-up procedures. The standardized warm-up consisted of two sets of 20 jumping jacks, 10 burpees, and 2 min and 30 s performing the Mawashi-Geri roundhouse kick at a fixed target at low intensity. After the warm-up, subjects chose their preferred target distance, standardized for all kicking attempts. Also, the target height was settled as the same height as the athlete. The target used was a Body Opponent Bag (BOB) (Boomboxe® training simulators) heavy enough to sustain all-out kicks without falling, and athletes were instructed to kick at the target's waist level. Each athlete performed six kicks using their back dominant lower limb during the data collection, three sportive and three traditional executions, performed in a randomized order. A 1-min interval was settled between kicks of the same style, and a 2 min interval was settled between each kick style.



Figure 1 illustrates the differences between the sportive and the traditional execution styles. For that, we measured and compared the execution time of both styles.

Figure 1 – Sportive (A) and traditional (B) execution of the roundhouse kick (Mawashi-Geri) in Shotokan Karate

A - Sportive execution



B - Traditional execution



Source: original formulation.

Data was collected through a high-resolution and velocity digital camera (Casio™, Model EX - ZR100 - 1920x1080 pixels, 30fps) settled in the sagittal plane according to the athlete's dominant lower limb centralized 2 m far from the athlete and target. After data collection, the videos were evaluated by a technical consultor (5th Dan Black Belt in Shotokan Style Karate), who has chosen the best sportive and traditional executions for each athlete. The best attempt of each style was analyzed using the software Kinovea 0.8.15. The software timer was started when the athlete's dominant foot left the ground and ended when it hit the target for the first time. Two experienced evaluators performed the data treatment and analysis in a



blinded design with an intraclass correlation coefficient of 0.84 and 0.94 between evaluators for sportive and traditional styles, respectively.

Statistical Analyses

Data was presented in mean \pm standard deviations (SD). For inferential analysis, the execution time was considered a dependent variable, and the kick style (sportive or traditional) was considered independent. Data normality was tested through the Shapiro Wilk's test, and a paired T-test was performed to compare the means of the execution time of each kicking style. The analyses were performed on the SPSS 20.0 statistical package, and the significance level was settled as 5%.

RESULTS

Table 1 describes the sample characteristics regarding mean age, height, trunk height, body fat, and practice and competition time.

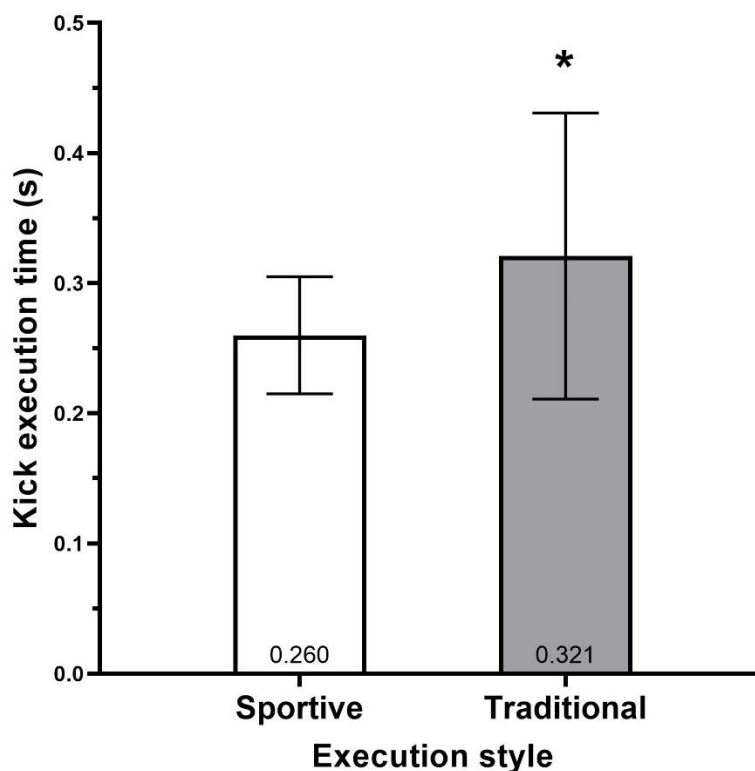
Table 1 – Sample characteristics

Variables	Mean \pm SD
Ages (years)	27.18 \pm 9.41
Height (m)	1.75 \pm 0.07
Trunk height (m)	0.90 \pm 0.04
Body fat (%)	19.39 \pm 5.11
Practice time (years)	15.19 \pm 6.87
Competition time (years)	13.38 \pm 7.13

Source: original formulation.

Figure 2 illustrates the execution time of the Mawashi-Geri roundhouse kick's sportive and traditional styles. The sportive style execution time was lower when compared to the traditional execution time (0.260 \pm 0.045s vs. 0.321 \pm 0.110s respectively; $p=0.016$).

Figure 2 – Execution time of sportive and traditional executions of the roundhouse kick (Mawashi-Geri) in Shotokan Karate (N=16)



Source: original formulation.

Note: * Significantly higher execution time ($p=0.016$). Data expressed in means \pm SD.

DISCUSSION

This study aimed to measure and compare the execution time of traditional and sportive styles of the Mawashi-Geri round-house kick in Shotokan Karate. As the main finding, we point out that the sportive execution time is significantly shorter than traditional (19%).

A previous study has also evaluated the execution time of Mawashi-Geri roundhouse kick among 20 black belt Karate male athletes and found higher execution times (0.482 s) when compared to this study's results (0.250 and 0.321 s for sportive and traditional styles, respectively) (Piemontez *et al.*, 2013). Several methodological differences may explain these execution time differences. Firstly, the author did not mention athletes' characteristics, such as age, height, and body weight, and these variables may influence kicks execution time. Also, the fixed target was slightly higher since athletes performed kicks on their xiphoid process height, and in this study, athletes performed kicks at their waist height, increasing the distance between the kicking foot start position and its final position at the target, which directly



influences the execution time. Furthermore, the study lacks details on which kicking style (traditional or sportive) was implemented, and the measuring methods were slightly different. In the study by Piemontez *et al.* (2013), a kinematic Vikon MX-13 system was used, and the reference for analysis was the ankle's lateral malleolus movement. In contrast, a digital camera was used in our study, and the reference for starting measuring was when the foot lost contact with the ground.

The Mae-Geri, a front kick, is also a prevalent kick technique in Karate. A previous study evaluated the execution time of the Mae-Geri among 10 purple to black belt Karate male athletes, comparing dominant and non-dominant kicking legs (Oliveira *et al.*, 2008). As the main findings, the authors found execution times of 0.384 s for the non-dominant and 0.392 s for the dominant back leg, with no differences between legs. These execution times are slightly different from those found in the present study (0.250 and 0.321s), mainly due to the specificity of each leg technique. While Mae-Geri is a front kick, which involves a hip flexion and a knee extension movement, the Mawashi-Geri is a roundhouse kick involving a hip abduction and a knee extension movement (Oliveira *et al.*, 2008; Piemontez *et al.*, 2013).

Furthermore, this study addresses the differences between the traditional standard school techniques, commonly seen in Kihon (technical) practices and Kata (Form) competitions, and the sportive competition techniques commonly seen in Kumite (sparring) competitions. Although these differences seem clear for coaches, athletes, and practitioners, data on those differences are scarce and may highlight several relevant aspects of the training processes and the athletes' specificities for the different Karate competitive disciplines (Kata and Kumite).

This study has some limitations that should be considered. The recruiting process was made by convenience, and athletes were not asked if they were Kata or Kumite specialists. Future studies should better address the differences between Kata and Kumite specialists, possible gender influences, differences between dominant and front and back, and dominant and non-dominant leg, and evaluate other kinematic and neuromuscular variables to provide more insights on these kicking style differences.

CONCLUSION

In conclusion, the sportive execution style of the Mawashi-Geri roundhouse kick presents a lower execution time when compared to the traditional execution-style among Shotokan Karate male athletes. This finding not only supports the initial hypothesis that





biomechanical differences between the styles influence performance but also highlights the importance of adapting techniques according to the specific demands of Kumite and Kata competitions.

Furthermore, the reduction in execution time in the sportive style suggests that training focused on sportive execution may be beneficial for athletes seeking to maximize their performance in Kumite competitions. Therefore, coaches and athletes should consider incorporating training methods that prioritize the most relevant executions for the type of competition, whether Kata or Kumite.

REFERENCES

CHANG, Wei-Gang *et al.* Differences in Pivot leg kinematics and electromyography activation in various round house kicking heights. **Journal of sports science and medicine**, v. 20, n. 3, p. 457-465, 2021.

CHANG, Ying-Chih *et al.* Sport activity for health!! The effects of karate participants' involvement, perceived value, and leisure benefits on recommendation intention. **International journal of environmental research and public health**, v. 15, n. 5, p. 953, 2018.

DINIZ, Rossano *et al.* Kinematic comparison of the roundhouse kick between taekwondo, karate, and muaythai. **Journal of strength and conditioning research**, v. 35, n. 1, p. 198-204, 2021.

EMMERMACHER, Peter *et al.* Different variations of the Karate technique Mawashi-Geri. In: INTERNATIONAL SYMPOSIUM ON BIOMECHANICS IN SPORTS, 25, 2007. **Proceedings...** Federal University of Ouro Preto, Ouro Preto, SP.

IBÁÑEZ, Rafael *et al.* Observational analysis of the technical-tactical performance of elite karate contestants. **Cultura, ciencia y deporte**, v. 13, n. 37, p. 61-70, 2018.

JACKSON, Arthur S.; POLLOCK, Michael L. Generalized equations for predicting body density of men. **British journal of nutrition**, v. 40, n. 3, p. 497-504, 1978.

KAHROVIĆ, Izet Hamdo *et al.* Differences between Karate practitioners of varied competition orientations in specific motor tests results. **Facta universitatis**, v. 12, n. 3, p. 227-239, 2014.

LIANG, Ya-Dong. Technical statistics of female athletes at 3rd Wushu Sanda World Cup. **Journal of wuhan institute of physical education**, v. 41, n. 3, p. 89-96, 2007.

MANZENREITER, Wolfram. Karate - Bowing to the Olympics in style. In: HOLTHUS, Barbara *et al.* (Orgs.). **Japan through the lens of the Tokyo Olympics**. London, United Kingdom: Routledge, 2020.





MARQUES JUNIOR, Nelson Kautzner. Sugestão do Mawashi Geri do Karatê Shotokan com embasamento da biomecânica. **Revista movimenta**, v. 4, n. 1, p. 66–72, 2011.

OLIVEIRA, Leandro Marques de *et al.* Simetria intermembros no desempenho do chute Mae-Geri do karatê. **Revista brasileira de ciência & movimento**, v. 16, n. 4, p. 1–13, 2008.

OUERGUI, Ibrahim *et al.* Technical and tactical analysis of high level kickboxing matches. **International journal of performance analysis in sport**, v. 13, n. 2, p. 294–309, 2013.

PIEMONTEZ, George Roberts *et al.* Cinemática do chute semicircular no karatê: comparação entre as fases de ataque e retorno. **Revista da educação física**, v. 21, n. 1, p. 51–59, 2013.

VASCONCELOS, Breno Berny; DEL VECCHIO, Fabrício Boscolo. Wushu Sanda: color bias, home advantage and motor actions analysis in female matches' from the 13th World Championships. **Revista de artes marciais asiáticas**, v. 12, n. 1, p. 1, 2017.

WORLD KARATE FEDERATION. **Karate competition rules**. 2020. Disponível em: <https://www.wkf.net/pdf/WKF_Competition_Rules_2020_EN.pdf>. Acesso em: 2 nov. 2021.

Dados do primeiro autor:

Email: brenobvasc@gmail.com

Endereço: Rua Luís de Camões, 625, Bairro Três Vendas, Pelotas, RS, CEP: 96055-630, Brasil.

Recebido em: 16/01/2025

Aprovado em: 31/03/2025

Como citar este artigo:

VASCONCELOS, Breno Berny *et al.* Execution time of sportive and traditional roundhouse kick (Mawashi-Geri) in shotokan karate. **Corpoconsciência**, v. 29, e.18995, p. 1–10, 2025.

Acknowledgements:

The authors want to acknowledge the support of individual research grants from the following funding agencies:

CNPq (Conselho Nacional de Desenvolvimento Científico e Tecnológico), Brazil, Grant number 315430/2021-4 (CLA).

CAPES (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior), Brazil, Finance Code 001 (BBV).

