# Exercise of Mawashi Geri Kick Using Ankle Weight Load

*By* Hartati Hartati

# Exercise of Mawashi Geri Kick Using Ankle Weight Load

*Hartati*, Physical Education Department, Universitas Sriwijaya, Palembang, South Sumatra, Indonesia.*

*E-mail: hartati@fkip.unsri.ac.id*

*Destriana, Physical Education Department, Universitas Sriwijaya, Palembang, South Sumatra, Indonesia.*

*E-mail: destriana@fkip.unsri.ac.id*

*Novi Pratiwi, Physical Education Department, Universitas Sriwijaya, Palembang, South Sumatra, Indonesia.*

*E-mail: novipratiwi.gmail.com*

*Muslimin, Sport Education Study Program, Faculty of Teacher Training and Education Department, Universitas Bina Darma, Palembang, Indonesia. E-mail: Muslimin@binadarma.ac.id*

**Abstract---** This study aims to determine the effect of kick training using ankle weight to increase the speed of Gaw Mawashi kicks in karate extracurricular activities at Senior High School 22 Palembang. The research method used was quasy experiment with pretest-posttest one group design. The population in this study were students who participated in karate extracurricular activities and the sample in this study amounted to 30 people. The research instrument used was the Mawashi Geri kick test. The treatment in this study in the form of kicking exercises using ankle weight was given for 6 week with a frequency of exercise 3 times a week. Test the effectiveness of using the experimental method with the results of the "t test" significant $\alpha = 0{,}05$ obtained tcount = (17,3) while ttable = (1,70), then tcount>ttable means tcount>ttable so Ha can be accepted, while H0 is rejected. Based on the findings of the study it can be concluded that kicking exercise using ankle weight weights have an effect on increasing the speed of Mawashi Geri's kick. The implication of this research is that kicking exercise using ankle weight can be used as one type of training for the speed of Geri Mawashi kick.

**Keywords---** Ankle Weight, Mawashi Geri Karate.

## I. Introduction

Karate is a martial art that uses its bare hands, and is one of the sports branches of achievement that is widely favored by people, including Indonesia. This is in agreement with Oktasari et al (2018: 53) who say that karate is a martial sport that is very well known in Indonesia. The development of karate sports in Indonesia can be seen from the increasing number of enthusiasts and responses from the community to participate in karate, ranging from children, adolescents, to adults. Among them there are those who really learn karate in order to take part in the competition and achieve achievements, and there are also those who make karate only as a hobby. According to Manullang (2015: 24) Karate is a martial art originating from Japan that uses attacks in the form of punches, kicks, locks, slamming, and others. Karate has benefits as a form of self-defense, a path to health, and as a sport. The basic techniques of karate are divided into three main parts, namely: Kihon (basic technique), Kata (stance), and Kumite (battle) (Fendrian and Nurzaman, 2016: 36).

Karate has movements that involve all components of the human body. The movement is arranged in a systematic movement in the form of: punch, kick, and block. This movement serves to attack and defend in a certain condition. As is the case at the time of the match, this sport matches two categories namely kumite (battle) and word (stance). In the kumite category in karate matches, many athletes use kick attack techniques, because with kicks they can reach opponents more easily and quickly than punch attacks. There are several types of kicks in karate sports, such as: mae geri kick, mawashi geri kick, ushiro mawashi geri kick, yoko geri kekome kick, and yange geri keange kick (Sari, 2017: 82). However, Mawashi kick techniques are very dominant used to carry out attacks on opponents.

Mawashi kick is a straight kick towards the back and towards the cheek, which is used to kick is a turtle leg or instep (Simbolon, 2014: 41). Mawashi Geri kick is a kick technique whose trajectory forms a half circle that is swung from the outside to the inside (Manullang, 2017: 42). According to Putra in Hutanty and Jatmiko (2013: 4) Mawashi kicks are side kicks where the kick kicks form a curved path like an arc from the outside in, with the target being in front or side, ura mawashi geri is a kind of kick which involves the core stability muscles of lumbar pelvic areas, quadriceps muscle (lower extremity) and knee and lumbar – pelvic joints while being performed (Khanzadeh, S.,

DOI: 10.5373/JARDCS/V12I5/20201969
ISSN 1943-0255
**Received: 30 Mar 2020/Accepted: 27 Apr 2020**

Sadeghi, H., Choghagalani, S. K., & Hoseiynpour, S. 2015). Mawashi kick technique is the most effective technique or weapon in karate competition, this technique is also considered to be fast in getting the highest points.

To carry out attack techniques must be supported by physical conditions, because physical conditions are a prerequisite needed in the achievement of achievement and good technical mastery. The components of physical conditions, namely: strength (strength), speed (speed), endurance (endurance), flexibility (flexibility), coordination, balance and power agility (Wahyuddin, et al., 2019: 96). Of the physical condition components that affect kicking skills in karate one of which is speed. According to Syamsuramel et al (2019: 63) speed is the ability to move certain limbs or move motion in the shortest possible time. Therefore, when doing a kick attack Mawashi really needs speed, so the opponent can not fend off the kick.

The results of observations of students who took part in karate extracurricular activities at SMA Negeri 22 Palembang showed that at the time of doing a Mawashi Geri kick, most students had poor speed. One of them kick speed when attacking. This causes the kick is easily deflected by the opponent. To have a fast and hard kick, it requires maximum leg muscle power, one form of exercise to train leg muscle power is weight training using ankle weight. Ankle weight is a foot weights made of cloth that is given a ballast with iron powder (Nasution and Heri, 2017: 93).

This study was conducted with the aim to determine the effect of kicking exercises using ankle weight weights to increase the speed of Gaw Mawashi kicks in karate extracurricular activities at SMA Negeri 22 Palembang.

## II. Methodology

This type of research used in this study is quasy experiment (quasy experiment) using a design / design pretest-posttest one group design. This research uses measurement test methods and documentation methods. In this case the researcher did not conduct the research activities themselves, the research subjects were still collecting data, processing data and drawing conclusions by adjusting the assessment norms that were already available to the standards of reliability and validity.

The procedure for implementing the Mawashi kick test is: the athlete gets ready to stand behind the sandsack / target with one foot resting behind the line as far as 50 cm (princess) 60 cm (son). At the "Yes" signal, the athlete kicks with the right foot and returns to the starting position by touching the floor behind the line, then continuing the right kick as fast as possible for 10 seconds. Likewise with the left foot for 10 seconds. The implementation was carried out 3 times and the best time was taken with a sandsack / target height of 75 cm (princess) and 100 cm (son) (Simbolon, 2016: 144).

## III. Result/Findings

The following are the results of the Mawashi Geri Kick Test (pretest) and Mawashi Geri Kick (Posttest) data are presented in the following table:

Table 1: Distribution of Test Instrument Data Mawashi geri's kick (pretest)

| Research variable | N | Highest Amount | Lowest Amount | Span | Mean | SD |
|---|---|---|---|---|---|---|
| Mawashi Geri's kick | 30 | 20 | 10 | 10 | 15,5 | 2,55 |

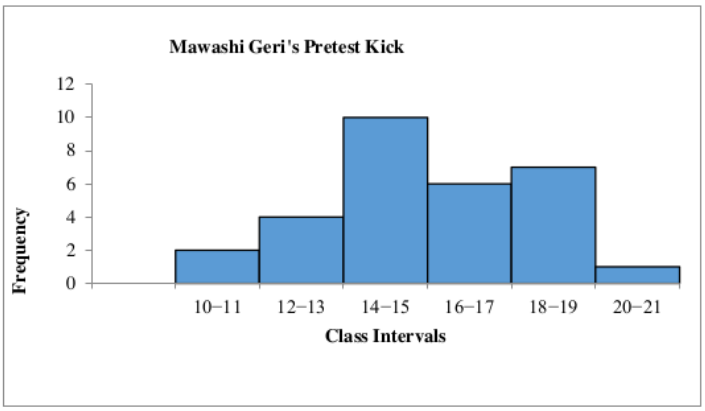
Table 1 can be seen the number of the highest value 20, the lowest number of 10, the range of 10, the average obtained from the pretest is 15.5 and the standard deviation obtained from the results of the pretest is, 2.55.

Table 2: Distribution List of Mawashi Geri Kick Results (Pretest)

| Class interval | f | X | $x^2$ | f.x | $f.x^2$ |
|---|---|---|---|---|---|
| 10-11 | 2 | 10,5 | 110,25 | 21 | 220,5 |
| 12-13 | 4 | 12,5 | 156,25 | 50 | 625 |
| 14-15 | 10 | 14,5 | 210,25 | 145 | 2102,5 |
| 16-17 | 6 | 16,5 | 272,25 | 99 | 1633,5 |
| 18-19 | 7 | 18,5 | 342,25 | 129,5 | 2395,5 |
| 20-21 | 1 | 20,5 | 420,25 | 20,5 | 420,25 |
| Avarage | 30 | 93 | 1511,5 | 465 | 7397,5 |

DOI: 10.5373/JARDCS/V12I5/20201969
ISSN 1943-0235
**Received: 30 Mar 2020/Accepted: 27 Apr 2020**

The results of table 2 list the distribution of the results of the Mawashi Geri kick test (pretest) it can be seen that the frequency is 30, the number of middle values (x) 93, the number of X2 is 1511.5, the number of f.x is 465 and the number of f.x2 is 7397.5. Based on the table listing the distribution of the results of the kick test (pretest), it can be described in a histogram as follows:




Histogram 1: Distribution of the Results of the Kick Test (Pretest)

Table 3: Distribution of Test Instrument Data Mawashi Geri Kick (Posttest)

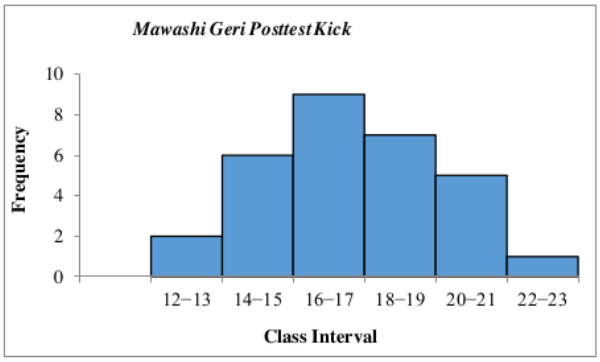
| Research variable | N | Highest Amount | Lowest Amount | Span | Mean | SD |
|---|---|---|---|---|---|---|
| Mawashi Geri's kick | 30 | 22 | 12 | 10 | 17,16 | 2,53 |

Table 3 can be seen the number of high scores 22, the lowest number of 12, the range of 10, the average obtained from the posttest is 17.16, and the standard deviation obtained from the posttest results is 2.53.

Table 4: Distribution List of the Results of the Gaw Mawashi Kick Test (Posttest)

| Class interval | f | X | $x^2$ | f.x | $f.x^2$ |
|---|---|---|---|---|---|
| 12-13 | 2 | 12,5 | 156,25 | 25 | 312,5 |
| 14-15 | 6 | 14,5 | 210,25 | 72,5 | 1051,25 |
| 16-17 | 9 | 16,5 | 272,25 | 148,5 | 2450,25 |
| 18-19 | 7 | 18,5 | 342,25 | 129,5 | 2395,75 |
| 20-21 | 5 | 20,5 | 420,25 | 102,5 | 2101,25 |
| 22-23 | 1 | 22,5 | 506,25 | 22,5 | 506,25 |
| Avarage | 30 | 82,5 | 1401,25 | 515 | 9027,5 |

The results of table 4 lists the results of the mawashi geri kick test (posttest) it can be seen that the frequency is 30, the number of middle values (x) 82.5, the number of x2 1401.25, the number of f.x is 515 and the number of f.x2 is 9027.5. Based on the distribution table listing the results of the Gaw Mawashi Kick Test (Posttest), it can be described in a histogram as follows:




Histogram 2: Gaw Mawashi Kick Test (Posttest)

DOI: 10.5373/JARDCS/V12I5/20201969
ISSN 1943-0235
**Received: 30 Mar 2020/Accepted: 27 Apr 2020**

## IV. Discussion

The results of the pretest data of the experimental group with the highest number of Mawashi Geri kicks were 20 and the lowest number was 10, with a mean of 15.5, a data mode of 14.7 and a standard deviation of 2.55 and a slope of 0.31. Posttest data results with the highest number of kicks 22 and the lowest number 12, with a mean of 17.16 data mode 16.7, and a standard deviation of 2.53 with a slope of 0.18. Based on research that kicking exercises using ankle weight weights can be used to increase the kick speed of Mawashi Geri Karate High School 22 Palembang. This can be seen from the practice of kicking using ankle weight to increase the speed of the mawashi geri karate kick, from the posttest there has been an increase after being treated, an increase in the speed of the mawashi geri kick from the pretest and posttest. Besides being given treatment, of course in the process of extracurricular activities taught and applied basic and advanced techniques in karate sports. According to Rhadian (2009: 17) the basic techniques of karate consist of several types, namely: (1) Kihon is interpreted as a foundation or foundation. Kihon or this basic technique is very important in karate, especially for beginners. The techniques of movement are in the form of punches, kicks, and defiance, (2) The word is the beauty of the stance, both male and female. In the word competition there is a compulsory stance and a choice stance, word competition is divided into two types namely individual words and team words, (3) Kumite (fighting) can be done by sons and daughters, kumite is divided into two namely individual kumite and team kumite, this technique is very difficult to heavy weight players; especially players under the match or maximum load training in Karate and in same time very common (Farouq, T., & Alsamad, A. 2012).

This sport only matches two categories namely kumite (battle) and word (style). In the kumite category in the karate match, Mawashi kicks are very dominantly used as attacks on opponents. According to Bagia (2016: 120) mawashi geri or spinning kick is a kick technique in karate that can be used to attack almost all parts of the body. Starting from attacking the knee / lower part (gedan), back / middle part (chudan) to attack the head / upper part (jodan). Mawashi kick technique is the most effective technique or weapon in karate competition, this technique is also considered to be fast in getting the highest points. For this reason, varied training is needed to improve the quality of athlete's kicks at school, especially in extracurricular activities.

The training objectives and main objectives of the exercise are to help athletes improve their skills and achievements to the maximum extent possible. To achieve this, there are four aspects of training that need to be considered and trained carefully by athletes, namely physical training, technical training, tactics training, and mental training, (Syafruddin, 2013: 55).

The process of practicing physical conditions carried out carefully, repeatedly with increasing training load, allows one's physical fitness to be more skilled, strong and efficient in his movements. This research was conducted for 6 weeks with a frequency of exercise 3 times a week in accordance with the opinion of Bompa in Apta Mylsidayu and Febi kurniawan (2015: 50) which said that: "the increase in training results occurs within 2-6 weeks, if the exercise is done at least 3 times a week , and a maximum of 12-14x a week (2 sessions a day) ". A week often and the more exercise the faster the improvement, but must pay attention to the principles of exercise so as not to overtraining. For this reason, the development of the best physical condition components also helps an athlete to be able to follow the next training in an effort to achieve the highest achievements.

The exercise used to increase the speed of the mawashi geri karate kick is a kick exercise using ankle weight, this study was conducted on 30 karate extracurricular students at 22 Palembang High School. This study includes a population study, a research population of 30 people, the sample of this study researchers took the entire existing population. The population in this study amounted to 30 people. This group was given treatment in the form of kicking exercises using ankle weight for 6 weeks with a frequency of exercise 3 times a week, after 6 weeks of training the study group conducted a final test or posttest. The slope value for the experimental group pretest data is 0.31 and the slope for the experimental group posttest data is 0.18.

Based on these values, then both the pretest and posttest data are normally distributed, which is located between (-1) and (+1). The results of the statistical calculation of the "t test" obtained 17.3 results while the Ttable is 1.70 obtained from the T distribution table with dk (30-2) = 28 and 95% confidence level ($\alpha = 0.05$) listed in the table. Hypothesis testing criteria accept Ha if $^{T}$count> $^{T}$table (1- $\alpha$), and reject H0 if $^{T}$count <$^{T}$table (1- $\alpha$), because $^{T}$count(17.3)> $^{T}$table (1.70) then there is a significant difference between post- test and pre-test, thus the hypothesis H0 is rejected and the hypothesis Ha is accepted. Ha's statement is that there is an effect of kicking exercise using ankle weight to increase the speed of the mawashi geri kick in the karate extracurricular activities at 22 Palembang High School. To achieve an achievement in sports requires practice, training must be done correctly, programmed, and continuously (Purba, 2016: 5). Training is a systematic process of practicing that is carried out repeatedly by

DOI: 10.5373/JARDCS/V12I5/20201969
ISSN 1943-0231
**Received: 30 Mar 2020/Accepted: 27 Apr 2020**

increasing the ability of the skills, energy capacity, and physical in which to use and pay attention to educational aspects (Kurnia Sari, et al, 2017: 150). According to Hartati et al (2019: 54) exercise is a form of effort in improving the functional quality of the bodily organs and the psychic culprit. The training plan must be prepared with an exercise program that will guide the implementation, beside that (Sari, Y. K., 2017) limb power is an important factor to produce kick mawashi geri and ushiro mawashi-gery, in other words the greater the leg power the better the kick effort from the strength and speed, in other research (Purba, P. H, 201 9)*the* explosive power of limb muscles plays a role in the results of mawashi geri kicking of 27.04% and the remaining 72.96% mawashi geri kicking ability influenced by other factors such as agility, speed, flexibility, strength, and in the other research said (Andayani, T. N, 2018). by using mawashi-geri technical training with drill training model can improve the basic technical skills of mawashi-geri karate-ka Dojo.

The principle of training is something that must be obeyed so that the training objectives can be achieved in accordance with what is expected. The principles of training play an important role in several aspects, namely physiological aspects and psychological aspects of athletes. Individuals with wider shoulders appear to perform the roundhouse kick more quickly and more forcefully (D, Doder, J, Malacko, V Stancovic, R, Doder, 2009). Understanding the principles of training will support efforts to improve the quality of training. In addition, it can prevent athletes from injury while doing training (Wiarto, 2013: 153). Kicking exercises using ankle weight are given for 6 weeks with a frequency of exercise 3 times a week. Weight training is an exercise in which an athlete or athlete must be able to push, lift, pull an object either himself or a load from the outside. This term also includes all forms of training against prisoners such as one's own body weight, barbells, dumble, weighted jacket, and weight shoes, or objects that are tied to other parts of the body (Bompa in Nurcahyo, 2010: 76). Can also use ankle weight as a training load. Ankle weight is a ballast device made of cloth containing iron powder. One form of ankle weight training is ankle weight tied to the leg area or above the ankle foot (Nasution and Heri, 2017: 93). According to Simbolon (2016: 32) kicking exercises using ankle weights are exercises to strengthen leg muscles, but they are also effective for training kick speeds in martial arts. Ankle weight training is a kicking exercise using weights on the legs aimed at increasing the speed of the Gawyer Mawashi kick, because the aim of this exercise is to produce a quick kick movement after the load is released. This statement is reinforced by the results of research Safitri et al (2018: 3) which states that ankle weight training is an exercise to improve the strength of the leg muscles' performance, which is done by putting a strain on the lower limbs to react quickly, especially when doing kicks. According to Harsono in Hanafi (2010:4) weight training if done correctly, can develop speed, power, strength and endurance, which are important factors for every athlete, beside that Ali, H. (2019) rubber training has a significant effect on improving Mawashi Geri's kick ability in martial arts, and Sepriadi, S. (2018) said the contribution of leg muscle explosive power to the ability of Gaw Mawashi kicks is 41.16%; The contribution between balance to the ability of Gaw Mawashi kick is equal to 20.85%; the contribution between leg muscle explosive power and balance together to the ability of Gaw Mawashi kick, 48.93%. One of them is speed which is an important component in kicking skills

## V. Conclusion

Based on the results of exercises conducted for 6 weeks with a frequency of exercise 3 times a week and has been tested data normality and hypotheses with t test statistics, based on the results of research and data analysis, then it can be concluded that there is an effect of kicking exercise using ankle weight load on increasing the speed of the mawashi geri kick in the karate extracurricular activities at 22 Palembang High School. The implication of this research is that kicking using ankle weight can be used as a type of exercise to increase the speed of students' mawashi kicks.

## References


[1] ALI, H. (2019). Effect of Rubber Training on Mawashi Geri's Kick Ability on the Shorinji Kempo Kenshi Dojo UNG Self-Defense. *Thesis* , *1* (831415137).

[2] Andayani, TN (2018). *The effectiveness of the drill training model for improving the Mawashi-Geri Karateka technique in the Horizon Dojo of Malang City* (Doctoral dissertation, State University of Malang).

[3] Bagia, I.M. (2016). Correlation of Body Weight and Leg Length to the Speed of the Karate Mawashi Geri Jodan Kick Students at SMP Negeri 11 Denpasar. *Journal of Recreational Health Education*. 2 (2): 119-127.

[4] D, Doder, J, Malacko, V Stancovic, R, Doder. (2009). Impact and prediction validity og morfhological and motor skills on mawashi geri. *Acta Kinesiologika*.

[5] Farouq, T., & Alsamad, A. (2012). The Kinematics Analysis of Doubles Kazami Mawashi-Geri for Heavy Weight Players under the Maximum Load in Karate.


DOI: 10.5373/JARDCS/V12I5/20201969
ISSN 1943-0235
**Received: 30 Mar 2020/Accepted: 27 Apr 2020**

[6] Fendrian, F., & Nurzaman, M. (2013). The Effectiveness of Blow Attack Techniques and Kick Attack Techniques on Achieving Points in the Kumite Match in Karate Sports. *Journal of Sports Coaching*. 8 (2): 35-47.

[7] Hanafi, S. (2010). The Effectiveness of Weight Training and Plyometric Exercise in Increasing Leg Muscle Strength and Reaction Speed. *ILARA Journal*. 1 (2): 1-9.

[8] Hartati., Destriana., & Junior, M. (2019). One Foot Dot Drill Exercise Against Sickness Kickiness in Pencak Silat Extracurricular. *Altius Journal*. 8 (1): 52-60.

[9] Hutanty, P.E., Jatmiko, T. (2013). The Effect of Walking Lunges Training on Mawashi Geri Kick on Karate Sports in Children 11-14 Years Old at the Dojo Aspol KPPP Benowo Surabaya. *Journal of Sports Achievement*. 1 (1).

[10] Khanzadeh, S., Sadeghi, H., Choghagalani, S. K., & Hoseiynpour, S. (2015). Muscle stimulation timing while implementing Ura Mawashi Geri in Iranian elite women.

[11] Kurnia, O.N., Hartati., & Aryanti, S. (2017). Plyometric Medicine Ball Throw Exercise Against Free Throw Shot in Basketball Games. *Altius Journal*. 6 (2): 148-155.

[12] Manullang, J.G. (2015). Basic Karate Theory and Practice. *Palembang: RD Multicipta*.

[13] Manullang, J.G. (2017). The Relationship Between Pelvic Joint Determination and Mawashi Geri's Kick Ability in Karate Martial Arts in Fitra Abadi High School Palembang. *Journal of Achievement*.1 (2): 41-46.

[14] Nasution, J.N., & Heri, Z. (2017). The Effect of Front Kick Exercise From a Squat Position Using Exercise in the Foot Load Against the Result of Front Kick Speed in Men's Pencak Silat Athletes in Langkat Tiger Langkat Regency in Langkat Regency 2015. 2015. *Scientific Journal of Sport Coaching and Education*. 1 (1): 86-100.

[15] Nurcayo, F. (2010). The Effect of Kicking Motion Training on the Away Kick of Football in My 15-Year Student Football Game at SSB Selabora FIK UNY in 2010. *Journal of Media in Indonesian Sports Science*. 2: 74-81.

[16] Oktasari, et al. (2018). The Effect of Leg Power and Flexibility on the Mawashi Geri Kick Results of the Karate Extracurricular Student at Kalianda 2 High School. *Journal of Physical Education, Health and Recreation*. 3 (1): 53-5[illegible]

[17] Purba, P. H. (2019). Leg Muscle Explosive Power and the Speed of Kicking Mawashi Geri. *Jambura Journal Of Sports Coaching*, *1*(1), 47-51.

[18] Safitri, D.Y. Surendra, M., & Kinanti, R.G. (2018). Ankle Weight Training Program Against Volleyball Player Leg Power in Volleyball Activity Unit State University of Malang. *Journal of Sport Science*. 7 (1): 1-10.

[19] Sari, P.S. (2017). Karate Theory and Practice. *Palembang: Palembang PGRI University*.

[20] Sari, YK (2017). *The Relationship Of Current Power With Kick Of Mawashi Geri And Ushiro Mawashi-Geri In Karate Sport Branch* (Doctoral dissertation, Universitas Pendidikan Indonesia).

[21] Sepriadi, S. (2018). Contribution of Leg Muscle Power and Equilibrium to the Mawashi Geri Athlete Kempo Kick. *Indonesian Sports Science Media* , *8* (2), 31-39..

[22] Simbolon, B. (2014). Karateka Training and Training. *Yogyakarta: Griya Pustaka*.

[23] Simbolon, B. (2016). Training and Training in Karateka II Karate Techniques. *Medan: Uwais Idonesian Inspiration*.

[24] Syafruddin. (2013). Sports Coaching, Theory and Its Application in Sports Coaching. *Padang: UNP Press*.

[25] Syamsuramel., Hartati., & Rahmadani, T. (2019). The Effect of 30-meter Running Interval on the Ability of the Speed of Straight Kick Extracurricular Pencak Silat Students in MAN 3 Palembang. *Altius Journal*. 8 (1).

[26] Wahyuddin., Tahir, H., & Suyuti, A. (2019). The Effect of Leg Press and Leg Extension Exercises on the Increased Power of the Karate Athletes in South Sulawesi. *Journal of Physical Education, Sport and Recreation*. 2 (2): 95-100.

[27] Wiarto, G. (2013). Physiology and Sports. *Yogyakarta: Graha Science*.

DOI: 10.5373/JARDCS/V12I5/20201969
ISSN 1943-0[illegible]5
**Received: 30 Mar 2020/Accepted: 27 Apr 2020**

# Exercise of Mawashi Geri Kick Using Ankle Weight Load

ORIGINALITY REPORT

10%

SIMILARITY INDEX

PRIMARY SOURCES

| | | |
|---|---|---|
| 1 | ejurnal.ung.ac.id<br>Internet | 71 words — 2% |
| 2 | hdl.handle.net<br>Internet | 63 words — 1% |
| 3 | www.wbc.poznan.pl<br>Internet | 62 words — 1% |
| 4 | Scristia, Hapizah, Sumarni, J Araiku. "Flow-proof strategy in proof construction on geometry instruction", Journal of Physics: Conference Series, 2020<br>Crossref | 38 words — 1% |
| 5 | Hamidreza Kaviani, Roohollah Ghobadi, Bishnupada Behera, Marcelo Wu, Aaron Hryciw, Sonny Vo, David Fattal, Paul Barclay. "Optomechanical detection of light with orbital angular momentum", Optics Express, 2020<br>Crossref | 36 words — 1% |
| 6 | Lilia Sakaeva, Marat Yahin, Flyuza Fatkullina, Guzal Makayeva, Khanif Makayev. "Paradigms in construction terminology", IOP Conference Series: Materials Science and Engineering, 2020<br>Crossref | 36 words — 1% |
| 7 | idosi.org<br>Internet | 26 words — 1% |
| 8 | www.efsupit.ro<br>Internet | 25 words — 1% |
| 9 | www.tandfonline.com | |

Internet

19 words — < 1%

10 www.slideshare.net
Internet

16 words — < 1%

11 sinta3.ristekdikti.go.id
Internet

11 words — < 1%

12 Hartati, Destriana, S Aryanti. "Development of ball capture test based on vibration sensor", Journal of Physics: Conference Series, 2020
Crossref

8 words — < 1%

13 Hapizah, B Mulyono. "Mathematical modelling skills of prospective mathematics teachers in problem-solving", Journal of Physics: Conference Series, 2020
Crossref

8 words — < 1%

14 "Advances in Automation", Springer Science and Business Media LLC, 2020
Crossref

6 words — < 1%

| | | | |
|---|---|---|---|
| EXCLUDE QUOTES | OFF | EXCLUDE MATCHES | OFF |
| EXCLUDE BIBLIOGRAPHY | OFF | | |