

# The Throwing Techniques in Martial Arts for Beginner on Match Category

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**Abstract**— The purpose of this paper is to illustrate the composition of motion throwing techniques in martial arts in accordance with qualitative biomechanical analysis for beginners. The throwing techniques are done with series of complex motion, so the fighter needs a model of exercise that can facilitate in studying such technique, especially for beginners on match category. The fighter will more easily master the techniques and assist the trainer in the training process. The design of the study is qualitative. The researcher collected the data through observation. The findings are presented into some motions: the initial attitude (ready position), the catch process, the process of eliminating the opponent's balance, and the follow-through phase.

**Keywords**— *throwing techniques, match category, beginner.*

## I. INTRODUCTION

The martial arts sport has a variety of techniques that must be mastered by the fighter, especially the fighter who will compete in the match category. The technique consists of three basic techniques, namely attack techniques (kicks, punches, and strokes), defense and throwing technique (Widiyanto and A. Hariono, 2015). The techniques used in the game of martial arts have different values, among which is the throwing technique that has the greatest value aiming to drop the opponent by preceding the catch. The throwing technique is a technique used by the fighter in the comparative category to drop opponents beginning with the catch process. According to the research conducted by Nugroho (2005), the dominant techniques used in the game of martial arts were: (a) 44% kick techniques, (b) 33% stroke technique, (c) 14% throwing technique with a catch, (d) 5% dropping technique, (e) 3% defensive technique with kicking, and (f) 1% cutting technique with punch.

According to Bompaa and Carerra (2015) at the age of post-puberty or adolescence age, someone who engages in sports activities will enter the stage of specialization skills, meaning that teenage athletes have practiced the skill of a sport. Bompaa further states that "in specialization stage, athlete may improve and perfect the technique of the sport. It is biomechanically correct and physiologically efficient. Athletes should perform difficult technical skills frequently during training sessions, incorporate them into specific tactical drills, and apply them in competitions". Similarly, according to Hariono (2004), the technique of slamming is one of the techniques in martial arts

which has relatively high difficulty, therefore the technique of throwing is given after the fighter master some techniques such as punch and kick techniques, while in the process of tracing a technique that has high difficulty requires a clear picture when going to do the technique for athletes to better understand the stages of movement to do. To achieve this, a motion analysis technique required drop so that the movement will be done effective and efficient. Furthermore, Good mastery of the technique will affecting on the level of energy efficiency for the fighters, so as to perform the activity repeated in quite a long time without experiencing physical exhaustion and psychological (A. Hariono, 2015).

The throwing technique has a series of variation in which the catch is very diverse in a martial arts match. According to Hariono (2004) there are approximately seven kinds of falling techniques that are dominantly used during the game. Because the technique of throwing is a relatively difficult technique, then when the throwing technique given to the fighter must go through the correct stages, it means that the trained technique movements should start from the initial stage, the stage of implementation, the final stage which certainly does not harm the fighter. On the basis of these assumptions, this paper will take several types of techniques that are safe and can be done by teenage fighter using sports biomechanics analysis. Sports biomechanics is a science that elaborates the forces and effects of the forces that occur in the human body during exercise. Through the application of sports biomechanics to technical exercises, it will be very useful to form the correct movement of techniques. In addition, someone who is directly involved in sports exercises such as trainers will be very helpful to carry out the exercise, for example they can precisely analyze the techniques performed by athletes, determine the movements which will improve athlete performance, determine the tools to be used in training appropriately, be able to identify movements that might lead to injury, and identify the type of exercise to be performed to improve athlete quality (P. McGinnis, 2013).

The technique of throwing is still dominantly used as a technique that will produce the greatest value. Based on observations in some practice sites, the current model of throwing techniques is still seen from previous experiences of a senior athlete and tends to athletes focus more on the final result regardless of the correctness of the motion techniques performed. The researchers found that in a 28 games of youth

martial arts match, the throwing technique happened 171, 122 unsuccessful techniques failed to score and 49 throwing techniques produced value, resulting from the observation of 71% athletes experience failure and 29% throwing techniques successfully produce value. However, this is only seen from the success of the athlete dropped the opponent, while in terms of the truth of throwing technique is not clear. The technique of throwing is more advantageous because the fighter can stop the opponent's attack so that the opponent does not get a chance to do a counterattack. Furthermore, the fighter who does the throwing technique appropriately and correctly will be able to drop the opponent and get the greatest score.

## II. MATERIALS AND METHOD

The method used in this paper is direct observation by recording throwing techniques with handycam and analyzed through kinovea software. Then the researcher analyses the movement and gives an indicator in the motion of the technique of throwing, which will support the successful implementation of the technique.

## III. RESULT AND DISCUSSION

Based on the analysis that has been done with kinovea software tool, it is found that the stages of motion of throwing technique are: (1) ready position, (2) Implementation process: (a) catch process; (b) the process of eliminating the opponent's balance, (3) follow-through phase.

Throwing technique is one of the techniques used in a martial arts match to knock an opponent that begins with the process of capturing a foot or kicking attack.

Throwing techniques are including in defensive technique. Defensive methods in most martial arts have been classified into five types of movements; throw, evade, block, fend off and *makan gerak*. These classifications were made based on personal observations and experiences in martial arts.

The defensive moves in this paper refer to the preliminary move taken as a response towards the striking force and all these techniques are widely used and are considered as the initial steps which are included in the whole technique. Throw is a technique with which the defender catches the attacker's limb that is being used to apply the force. The defender would normally utilize the momentum of the attacker to complete the defensive formation. Even though more than one style of martial art uses the grab technique, it is more commonly observed among Judo practitioners when they apply the throw technique (Mustapha, G., Mahmud, J., Zakaria, M., Sulaiman, W, 2015).

### a. Biomechanics Principles of Throwing Techniques

Biomechanics according to Hay (1982) is the study of the internal and external forces that work on the human body with the consequences of the forces generated. The definition is in line with the opinion of Hamill et al (2015) namely, "biomechanics is the study of the structure and function of

biological systems by means of the methods of mechanics". Meanwhile, according to Hall (2012) "biomechanics is the application of mechanical principles in the study of living organism". From some of these definitions, biomechanics is a field of science that studies the internal and external forces with the principles of mechanics. If biomechanics is applied in the field of sports and sports exercise it can be said that sports biomechanics is a science that studies the internal and external forces and their effects on the human body when doing exercises and sports.

The biomechanics applied in sports certainly has specific sports-related benefits that are aimed at achieving the best performance, while according to McGinnis (2013) the primary objective of sports biomechanics is the improvement of sports or exercise performance, while the secondary goal is injury prevention and rehabilitation. This secondary objective is closely related to the former and is almost regarded as part of the main goal, because an unscathed athlete will perform better than the injured athlete.

McGinnis further makes the items that are the primary goal for (a) technique improvement; the most common method for improving performance in many sports is to improve an athlete's technique. The application of biomechanical analysis to improve techniques can occur in two ways namely qualitative biomechanical analysis methods and quantitative biomechanical analysis methods. In the first method, the trainer observed the motion practiced by the athlete. Then the trainer directly gave feedback about the motion. In the second method, the trainer videoed the motion of the athlete and it will be analysed using certain software. The software will give the result in the form of graphic and number accurately. Based on this result it will be seen which motion that should be corrected. In other words, a trainer or teacher uses biomechanics to determine what actions can improve the performance of his athletes, (b) the improvement of the equipment, the equipment used will obviously affect the performance of the sport, either directly or through injury prevention, (c) quality training, biomechanics have the potential to produce modifications in training and thus improve athlete performance. This biomechanical application can occur in several ways, the analysis of the athlete's technical deficiencies can help the trainer or teacher in identifying the type of training the athlete needs to improve. Secondary objective of biomechanics application in sport is to prevent injury and rehabilitation.

Biomechanics can be used to provide a technological change base for more efficient, equipment changes, or training to prevent or rehabilitate injuries. Movement techniques performed by an athlete should be done efficiently, if the movement is efficient then the athlete can control the movement and master a game in the field. According to Hidayat (1999) the motion is said to be efficient when: (a) large muscle groups work first, (b) intelligent exertion, meaning good coordination when appropriate timing, (c) moves proportionally, meaning that it is economically viable and automated. Conversely, inefficient movements will cause: (a) excessive labor and tension, (b) excessive physical fatigue, (c) lethargy, (d) pain, (e) frustration.

In the sport of martial arts, a throwing technique that successfully knocks the opponent will produce the highest score. The technique of throw is a technique preceded by a catchment process and then followed by means of dropping the opponent with simultaneous movement simultaneously. To form the technique of kickback for martial arts athletes, it is important to have an exercise model that can be done in stages in accordance with the sequence of techniques that will be done. The stages for performing throw techniques are: (a) initial attitude stages, (b) catch stage, (c) implementation stage or process of eliminating opponent's balance, (d) follow-through phase. Based on the sequence of stages, the athlete's technique moves involves forces that will cause the movement to occur.

The athlete's body movements are influenced by the principles of mechanics in performing the motion of the technique, following the mechanical principles affecting the throwing technique:

#### 1) Acceleration

Acceleration is a change of pace (P. McGinnis, 2013). McGinnis further states that "when an object speeds up, slows down, starts, stops, or changes direction, it is accelerating". Acceleration that occurs at the time of doing the throwing technique is on the whole series of motion. One of them is when the fighter catches the kick from the opponent and their hands were motionless. Then the fighter catches the kick quickly.

#### 2) Force

The force according to Hall (2012) is the product of mass and acceleration, where the formula for finding a force is  $F = ma$  ( $F$ : force,  $m$ : mass, and  $a$ : acceleration), either by push or pull. A force in moving something has a direction therefore a force is a vector quantity. In the implementation of the technique of throw, if the fighter has a large body mass then at the time of moving will produce a great style as well. In addition, if the fighter has a high speed at the time of doing the throwing technique will affect the force needed. In throwing techniques, the application of greater force is generated at the stage of execution and the advanced stage, because the fighter will try to knock the opponent, while in teenagers martial arts is arranged with classes based on weight by the difference of 5 (five) kilograms. Therefore, fighters who have weight on the lower averages will require a greater force that is by adding speed during the process of throwing to drop the opponent with the weight that is in the upper average.

#### 3) Angular Motion

Angular motion is based on McGinnis' idea (2013) with regard to rotation. This happens when a body or object moves around or part of a spin on an axis. Angular motion can occur in the axis that is outside the body or in the body. In motion angular motion techniques always occur both on the joints of the body and the wheelbase on the opponent's foot. In this research will take some form of throwing technique with the assumption that the technique is a simple throwing technique and not dangerous to be done by adolescent fighter. Examples of angular motion that occurs in the shape of a dribble as in the movement of the catch, the arm will move in a circle to catch

the kick, then after being caught then the position of the foot that is in front of the parallel with the right foot and then throw the foot caught with the rotation of the fighter's body so that the opponent's body will lose balance and eventually fall.

#### 4) Centre of gravity and balance

According to Blazeovich (2007) "the point at which the mass of the body is evenly distributed in all directions is the center of mass". So according to Balzevich the center of gravity and center of gravity have almost the same terms, except that the center of gravity is only used to show when the body is in a vertical direction, thus the lower the center of gravity the body gets more balanced. In addition, the balance according to Hall (2012) is a person's ability to control equilibrium.

In the execution of the technique the center of gravity of the body weight will vary according to body movement and body position. The success of the kickback technique is that when the fighter managed to drop the opponent without falling together or fallen after doing business to slam. This means that the fighter has to perform a series of fast and simultaneous technique movements so that the opponent does not have time to anticipate during the kickback process. The rapid and simultaneous movement starts from the catch process, the process to eliminate the balance of the opponent, until the final process is to keep the body from falling along with the opponent.

The movement response when capturing the opponent's kick is very influential to the implementation of the throwing technique, the more timely the reaction and the target will facilitate the fighter to perform the technique of throwing. For that attitude the pairs of arms or palms determine the speed to capture the kick.

#### 5) Momentum

Momentum is the magnitude of the thrust force of an object. In other words, it is the momentum as a force of motion (Sudarmada and Wijaya, 2015). In the technique of throwing momentum can occur when the two fighter make the movement of catch, when the two fighter have the same weight of the type of catch can be done in unison with the kick process, but when the fighter will slam with a catch that tends to wait for the opponent's kick then the fighter must pay attention to the proximity of the amount of weight with the opponent.

### **b. Analysis of Throwing Technique in Martial Arts**

The motion of throwing technique in martial art occurs very fast. Therefore, the author will focus on the dynamics of movement from stage to stage. According to Arus (2012) the movement of techniques in sports martial arts very quickly different from sports related with distance and speed, therefore in the martial arts a little difficult to determine in detail related to speed, acceleration, momentum, work, energy, power, angle movement. The extremities of the body involved in throwing techniques are the upper and lower extremity, on the upper part of the body especially the arms (biceps, palms, arms, and hands), brachioradialis, palmaris longus, the majority of the flexors, abductor pollicis, pectoralis minor and major, deltoid (all three parts), trapezius and latissimus dorsi (E. Arus, 2012).



The following is a descriptive analysis of the stages of motion in performing the throwing technique:

1) Ready position, namely the attitude of right foot pairs in front (front and rear legs are not on a straight line). The position of the hand is in front of the chest and ready to catch the kick, but still relax. A straight forward view (Fig. 1).



Fig.1. Ready position (private doc, 2018)

Attitude pairs (ready position) to do the throwing technique at athletes who are not left-handed the head position following the eye view of the opponent's shoulder position, it is very influential for the reaction process at the catch kicks because if a fighter will kick the other limbs that will following the movement is a shoulder movement. The position of the right arm and left is in front of the chest. The magnitude of the knee flexion angle that is in front is smaller than the angle of the back foot flexion, the right arm flexion angle is greater than the flexion angle of the left arm. The position of the foot is not aligned and the distance adjusts to the shoulder width of the athlete.

Based on the figure it can be seen that the attitude of pairs (ready position) can be explained as follows: (1) the view leads to the opponent; (2) the right arm is in front of the chest, palms are waist-deep, and the elbows are slightly bent and the position of the hand is parallel to the legs that are in front; (3) the left hand is in front of the chest with the position of the arm bent; (4) center of gravity tend to be perpendicular to both feet. Attitude of pairs on every technique that will be done athletes is very influential on the results of engineering movements that will be done, because the attitude of the tide is the initial attitude of the body to perform techniques that are continuous movement.

Attitude that is done with both legs is not parallel between the front and rear legs, because the motion of the technique is a technique to kick the elimination of the opponent's balance then the attitude of the tide is done tide attitude that gives base of support (BOS) is wider, with the better balance gets. The attitudes tend to place the weight on both legs, so that the front leg knees are not bent too much and not too low because it will inhibit the movement or process to eliminate the opponent's equilibrium, because the athlete will require a greater force to eliminate the opponent's equilibrium. In addition, with the weight in the middle will speed up the catch because the

distance between the palms of the hands with the feet to be caught closer.

2) The implementation process, which is an effort where the athlete moves to eliminate the opponent's equilibrium with a series of planned slings. The explanation of the stage of execution of the first type of throw: (a) the position of both hands to catch the kick with the position of the right hand is under the opponent's ankle, and left hand holding the opponent's limb in the top position; (b) The position of both legs is fixed, then the held leg is pulled forward from the opposite position and positioned the foot downward along with the pulling of the right foot pedestal so that the right foot parallel to the left foot. The next movement, if the foot is on the mattress about 30 cm then the foot that has been captured rotated towards the right quickly coincided with stepping right foot to the right and followed with the left foot forward.

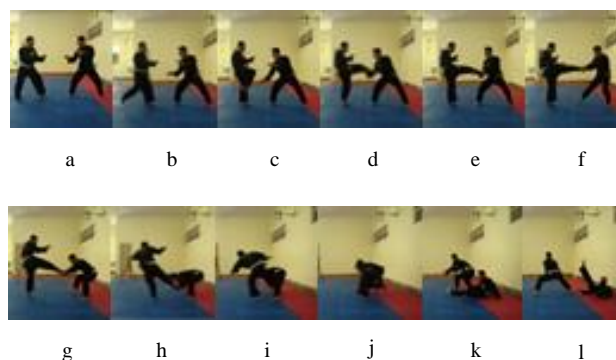


Fig. 2. (a, b, c): ready position, (d, e): the catch process, (f, g, h and i): the process of eliminating the opponent's balance, (j, k, l): follow-through phase.

Based on the picture above (Fig. 2), the movement analysis on the implementation process is done by the steps as follows: (1) athletes do catch with the right hand palm, while the palm of the left hand holding the top of the opponent's foot so that the catch will be stronger. The position of the horses is still maintained to maintain balance when accepting style (kicks); (2) the athlete pulls his body backward so that the center of gravity shifts and the foot pedestal moves on the left leg, while the opponent's position becomes unstable because with the effort to pull the opponent's foot quickly will cause the balance of his body disturbed, the speed of the pull can be seen from the foot the lifted athlete to obtain the mechanical advantage of increasing pressure on the mat; (3) the athlete pulls the opponent's leg downwards using the direction of the force, thus affecting the acceleration; (4) accelerated acceleration is used to change the direction of force (towards the left side of the opponent) so that the centripetal force experienced by the opponent, with the application of the centripetal force, the opponent's body will instantaneously change direction quickly (cannot control the force that occurs on his body) and in the end it will be easy to drop.

3) Follow-through phase, the body rotates to the right after both hands turn the foot to the right, performed simultaneously. A follow-up movement by turning the body to the right will end with the final attitude as an attitude that supports the athlete not to fall over with the opponent being thrown.

Therefore the final attitude of this throwing technique is to do the horses.

#### IV. CONCLUSION

The forms of throwing technique are very diverse. It is determined by the type of kick that will be caught and dropped. In the implementation of throwing techniques, there are several stages to be done so that the technique of throwing can be done effectively, efficiently, and will not be dangerous for beginner fighters. The stages are (1) ready position, (2) the catch process, (3) the process of eliminating the opponent's balance, and (4) follow-through phase. The four stages are the process of learning the motion of the throwing technique that became the core of every motion. In addition, these stages will be useful for trainers to provide technical training more easily and efficiently.

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