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Article

Biomechanical Analysis of T-Kick in Pencak Silat Sports Based on Speed Aspect

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ABSTRACT

The pencak silat technique greatly affects the success of a silat player as well as kicks. One of the kick techniques that is often used in pencak silat is the T kick. The purpose of this study is to analyze the biomechanics of the T kick in pencak silat sports based on the aspect of speed. The approach used in the research is qualitative descriptive. The data collection techniques in this study are in the form of observation and interviews. This study uses a descriptive qualitative approach. The data collection used is interviews and observations. Data analysis according to Mile and Hubermen. Based on the biomechanical analysis of the T-kick phase, the first, third, and fifth phases have equilibrium, the second phase has impulses and momentum, the third phase has Newton's law 1 and the fourth phase has Newton's law 3. Speed in pencak silat is influenced by weight, skill, and physical training. As well as the explosive power of the muscles provides high speed on the T kick with a whole movement.

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INTRODUCTION

Sports are currently a trend that is being crowded with the general public, both aiming to improve physical fitness and to achieve an achievement, one of the sports that is in great demand is pencak silat. Pencak silat is an indigenous Indonesian cultural heritage in the form of a sport that has been recognized by UNESCO. Each region in Indonesia has different characteristics of pencak silat, both moves, movements, and weapons used. However, pencak silat consists of four main aspects, namely spiritual, artistic, martial arts, and sports (Kriswanto 2015). Pencak silat has four patterns that are used in each movement such as the initial stance (tide), step pattern, attack, and return to the initial stance (Sudiana 2017). In addition, there are basic techniques that are the main movements in pencak silat including punches, kicks, cuts, and slams.

The pencak silat technique greatly affects the success of a silat player as well as kicks. Kicking is an attack technique that uses the legs and legs as a tool to attack and defend oneself (Harun, Hidayat, and Hadjarati 2020). One of the kick techniques that is often used in pencak

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silat is the T kick. T kick is a kick technique that uses one leg by being directed straight to the side at the target and the targeting tool is in the form of the outside of the sole (Arif, Aimang, and Nurhikmah 2021). The name T kick comes from its movement that makes the body in a sideways position parallel to the trajectory straight to the side so that it is seen to form the letter "T". The target of the T kick is aimed at the whole body but the chest and abdomen are the main targets. There are five phases of movement in the T kick technique starting from the posture of the tide, body position and footwork trajectory, movement balance, contact on target, and the end of the kick (Pratama and Candra 2021). According to (Dailimi 2018) the T kick has advantages, namely its range is free, power can be maximally expended when attacking, and is safe because the head distance is longer so that it is protected from counterattacks. Meanwhile, the weakness of the T kick is that it is difficult to do in a short-range attack, it is easy to be knocked down by the opponent's bottom attack, and its sideways position makes you lose sight. A T-kick is said to be good if it is difficult to avoid, read, and parry by the opponent. The T-kick technique is very effective in attacking the opponent if the movement is precise and good by the biomechanical aspect.

Biomechanics is a technique used to describe and analyze gestures. In the field of sports, especially pencak silat, biomechanics is related to the structure of the human body when moving in performing a movement (Irawan et al. 2023). Judging from biomechanics, pencak silat movements can be said to be efficient and effective in matches if supported by correct and good motor skills. The motor components found in pencak silat include coordination, endurance, flexibility, strength, and speed (Sugiharto and Rejeki 2023). One of the motor components that play an important role in the basic technique of pencak silat is speed.

Speed in motor components has an important role in achieving achievement (Bompa 1999). The relationship between speed and kicks can make the attack hit by the target more precise and hard so that the opponent will fall and provide value in a match. Speed is grouped into two parts including motion speed and reaction speed. Where the reaction speed consists of compound reaction speed and single reaction (Sukadiyanto 2002). Pencak silat is included in the reaction speed, precisely compound reaction because the opponent's movements will be difficult for the fighter to predict. This is in line with research (Budiara and Yudha 2019) that kick speed is closely related to more optimal attack movement.

Speed has a very important role in an attack, especially in the T-kick. The relationship of speed in biomechanics to T-kicks is useful as an effective attack in knocking down an opponent in a match. Based on this description, the researcher is interested in discussing the biomechanics of T kicks in pencak silat based on the aspect of speed. Therefore, this study aims to analyze the biomechanics of the T kick in pencak silat based on the aspect of speed.

METHODS

This research was carried out from November to December 2022 at Campus I IAIN Ponorogo. The research approach used is qualitative and descriptive with a case study method. In this context, the researcher examines and analyzes the research object to obtain an objective, accurate, and systematic picture according to actual conditions. The data collection techniques in this study are in the form of observation and interviews. The resource person who became an informant in this study was one of the pencak silat athletes. The data obtained will be collected and analyzed according to Mile and Hubermen with stages including data reduction, data display, and conclusion drawn.

RESULTS AND DISCUSSION

A T kick is a kick that is carried out on a straight trajectory to the side with a sideways body position using the feet of the soles and heels as a tool of attack. In performing the T kick technique, it must be balanced with speed so that it is difficult for the opponent to predict the attack that will be carried out. The T kick technique has several phases, namely the initial attitude or tide phase, the body position phase and footwork trajectory, the movement balance phase, the impact phase on the target, and the final phase of the kick (Dailimi 2018).

Figure 1. Initial attitude (tide)

In the first phase, which is the initial stance or tide which is done by facing the target, the position of the body facing the side of the opponent, and accompanied by the position of the light stance which can be seen in **Figure 1**. Biomechanically, the position of the light stance in the initial stance makes it easier to make a move quickly because it has a relatively small level of stability due to the distance between the point of gravity and the small landing plane so that it is effective to use the T kick. The position of the stance plays a very important role in the speed of kicking, especially the speed of reaction when attacking the opponent precisely and hard (Triaiditya, Setyaningsih, and Farhanto 2018). In a tidy stance, the fighter's hand will be stretched towards the target t where one hand is stretched out to give distance to the opponent and anticipate the attack and the other hand is useful for protecting the chest while still maintaining the position of the body facing the side.The initial attitude in the stance position will be a momentum of push on the legs so that the T kick hits the target. In this phase there is biomechanics, namely balance. Before taking the kick, the athlete balances his body with both legs forming a 68° angle, which is an ideal angle for balancing the body.

Figure 2. Phases of body position and footwork trajectory

The second phase is the phase of body position and footwork, where the body position of the silat in doing the T kick begins with rotating the foot of the pedestal and is followed by movements at the waist as shown in **Figure 2**. During the swing trajectory, the silat fighter's legs when lifting their legs have not been raised at chest level to determine the momentum of the kick or impulse. The impulse occurs when the silat raises the knee higher than the navel so

that the kick is on target. If the knee is not raised, the momentum and impulses have no effect. Kicks with the correct knee movement will give an impulse that it affects speed and accuracy (Taujiri, Mulyana, and Berliana 2012). The body position of the specilate is more inclined so that the body will be more balanced. The hands in this phase function to protect the front of the body.

Figure 3. Motion balance phase

The third phase is the movement balance phase which is carried out by dynamically moving the posture to maintain balance so that it does not fall, which can be seen in **Figure 3**. Balance in the T kick is a collaboration of body position, foot support, and leg movements. Balance in the T-kick movement can occur because the lumbar region and the steering bone become the point of weight (Taujiri, Mulyana, and Berliana 2012). Both of them are projected onto one of the legs as support when doing a T-kick. Balance will not occur if the balance point is leaning forward or backward. In the T kick the balance movement starts from the foot of the support, then the leg movement kicks straight towards the target, while to maintain balance the body position must be tilted sideways. When kicking, the movement of the legs should be in harmony with the position of the body leaning to the side so that the body forms a T. In this phase, Newton's law 1 occurs, which is when the object that was initially stationary remains stationary and the first moving object continues to move at a constant speed. This phase also has a balance that is located on one foot as a support, but this balance is labile (easy to fall) because it is done during the kicking position. Movement with good balance is very necessary for the speed of a kick (Suryadi 2009).

Figure 4. Impact phase on the target

The fourth phase is the phase of motion conformity, the phase of contact on the target, namely the movement of kicking the opponent with the legs in a straight position, which can be seen in **Figure 4**. When the target is the opponent's chest, the kick must use the outside leg that has good flexibility. In addition, when kicking using the soles of the feet, it is useful to minimize the momentum of the push when attacking the opponent and the exploration of the power provided is less than maximum. In this phase, there is also Newton's law of 3, which is

the law of reaction action located in the foot. In this phase, it belongs to the second type of lever group where the load point is between the power point and the fulcrum. Where the fulcrum is located at the tip of the foot, the load point is at the middle foot and the power is at the upper ankle.

Figure 5. Final phase of kicks

The fifth phase is the suitability of the movement in the final phase of the T kick, which is the movement back to the starting position (tide attitude) which can be seen in **Figure 5**. This movement is done by positioning the legs of the horses, with one hand stretched forward and one of them protecting the chest area from the opponent's attack. After doing a T kick, the silat will return to the starting position so that he does not have an opening to attack and avoid fatal mistakes. In addition to being reviewed from the biomechanical aspect, the T kick is also influenced by other factors in obtaining the maximum kick speed. According to Anggelyn (2022), several factors affect silat fighters when doing T-kicks to reach maximum speed, including the ability of the athlete himself such as physical training, veteran training, and also a tidal attitude (Anggelyn, 2022). In addition to the factors above, the weight of a silat player can also affect the speed of doing a T kick, because if the weight of the silat fighter is lighter, the kick will also be faster. T-kicks are also affected by muscles, especially muscle explosiveness which can affect the straightness of the kick to the target and has an important role in providing high speed. Muscle explosiveness can help the body's prisoners perform high-speed kicks in a complete movement (Hanif 2017). The speed of the T kick in Pencak silat is an important factor in achieving success when attacking the opponent.

CONCLUSION

A T kick is a kick that is made on a straight trajectory to the side with a sideways body position. The T-kick technique has several phases, namely the initial attitude or tide phase, the body position phase and footwork trajectory, the movement balance phase, the impact phase on the target, and the final phase of the kick. So it can be known that each movement of the five phases is related to biomechanics as in the initial phase there is balance, the second phase experiences impulses or momentum, the third phase experiences Newton's law 1 and balance, the fourth phase experiences Newton's law 3 and belongs to the second lever group, and the fifth phase experiences balance. The factors that affect the speed of the T kick are weight, skill, and physical training. As well as the explosive power of the muscles provides high speed on the T kick with a whole movement.

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