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Biomechanical Analysis of T-Kick in Pencak Silat Athletes in Tapak Suci, South Bengkulu

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Abstract

The aim of this research is to find out whether the T kick technique at Tapak Suci South Bengkulu school is good or still needs more practice in improving the T kick. The research method used in this research is a qualitative descriptive method. The population at Tapak Suci College, South Bengkulu and used in this research was approximately 50 athletes. And the samples used in this T-kick biomechanics analysis research were 20 athletes. The data collection technique used in this research is test and documentation, where the tests carried out are then adjusted to suitability indicators for T kicks and the documentation taken is in the form of an analysis process through the kinovea application. The results of this research are that the overall T kick ability of South Bengkulu Tapak Suci fighters from the first phase to the last phase, has different abilities, by looking at the suitability of the T kick movement, starting from phase one or the initial stance of all athletes who perform the T kick. a score of 64% and falls into the fair category, the second phase is 72% good, while the third phase gets a score of 72% good, the fourth phase gets a score of 64% fair and the last phase is the final phase of the kick and gets a score of 77% good, if calculated correctly Overall, the average obtained is 70% (sufficient)

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INTRODUCTION

South Bengkulu is one of the districts in Bengkulu Province with a lot of diversity both cultural, social, and various sports, one of which is pencak silat martial arts. In (Nopiyanto et al, 2023) said pencak silat is an original martial art sport from the Indonesia nation that has developed into an achievement sport. Pencak silat itself is a martial art inherited by ancestors which until now has not been studied too much by the people of South Bengkulu, especially young people because it is considered ancient and not very important.

Sports is an activity that cannot be separated from humans, sports use strength and health both physically and spiritually. There are many types of sports in Indonesia, especially in South Bengkulu, each sport has its own function and benefits. Sports can be distinguished by the type and procedure of implementation according to the age of the athlete, every physical activity is based on the struggle to master oneself, overcome others and the elements of nature.

Thus, pencak silat has fulfilled that requirement, because pencak silat has elements to encourage, awaken and

develop physical freshness and foster spiritual health, especially training devotion to the one God in every person. According to (Defi Yanti et al, 2016) pencak silat is "a martial art sport that was born and developed in the Malay community".

In the beginning, pencak served as a tool to defend oneself from various threats. Along with its development, the function of pencak silat is not only as a martial tool but also as a means of sports, a means of pouring love into the aspect of beauty (aesthetics), and a tool of mental and spiritual education (Chania et al, 20), According to (Halbatullah et al, 2019),

Pencak silat is one of the original cultures of the Indonesia nation where it is strongly believed by its warriors and pencak silat experts that the Malay community today has created and used this martial art since prehistoric times. The original martial art of South Bengkulu Regency is called kuntau, but this martial art cannot be taught to children because it does not have a certificate like pencak silat schools in general. has many pencak silat schools in Bengkulu Selaran.

In the past, pencak silat was one of the sports used to defend oneself from various kinds of crimes, but for now

pencak silat itself is usually used to achieve achievements, but it can also be used as a form of self-defense, usually pencak silat movements. Each college has different names for each of these movements, usually taken from several animal movements as they survive in their habitat.

According to (Billah & Irawan, 2022) "pencak silat is a martial art of the cultural heritage of the ancestors of the Indonesia nation". This is in line with (Yulienugroho & Kriswanto, 2018) pencak silat when viewed from its rules and identity is a means of spiritual mental education as a balancing of the body's physical cognition to form individuals who are able to supplement and appreciate the philosopher of noble ethics and as a sport that is often contested in ASEAN as well.

South Bengkulu itself has several schools that are under the auspices of the Indonesia Pencak Silat Association (IPSI) but this time I focus on the sacred site of South Bengkulu. The sacred site of South Bengkulu is one of the old schools in South Bengkulu, this school itself has various kinds of moves, one of which is the tiger opening the way or another name, namely the T kick. The number of students owned by the sacred site school

for now is around 50 people consisting of children, teenagers, to adults, there have been many achievements achieved by the South Bengkulu sacred site athletes themselves, both from the district to the national level.

The T kick or usually called the tiger move to open the way, is one of the side kick techniques using the foot slam, the T kick in pencak silat is usually used for side attacks targeting all parts of the body. According to (Muhammad Dailami, 2018), the T kick has advantages; the range to the target is more free, the distance between the head and the opponent is longer, the safer, the exploration of power can be maximized, therefore it can be interpreted that the T kick can be said to be a movement used to attack by positioning the body to the side and the power of the kick comes from the sole of the foot and the target to all limbs, but not a few athletes are often still wrong in doing this T kick, whether it is from the side of the tilt of the body or from the target when doing the T kick.

There are several movements contained in the martial art of pencak silat, including, scythe kicks, T-kicks, punches, slams, sweeps and cuts and these movements are classified as biomechanics, biomechanics itself is a

science that studies the forms and types of human movements in sports on the basis of mechanical principles and analyzes these sports movements to be understood. (Peter M. McGinnis, 2013), in the book *Biomechanics of sport and exercise*, 3rd ed, states that the concept in the study of biomechanics is to study its power and influence in living systems.

In terms of sports biomechanics, this concept is applied in sports activities. The movements of the human body (exercising) are tied to the body's anatomical system. What can be done by the legs, what can be done by the arms, what can be done by the body/torch is tied to the body structure system, but there are still many athletes who do not know the role of sports biomechanics in pencak silat martial arts.

In fact, if we study more deeply about the science of sports biomechanics, there are a lot of things that we can take and then apply to pencak silat martial arts, one of which we can know how to make movements that can prevent us from injuries that we don't want, because basically sports biomechanics is one of the sciences that studies movement systematically (Irawan, 2023). Researchers are interested in raising this research because there are still many

athletes who are not perfect in doing this T kick and there are also several other factors that affect the imperfection of this T kick, namely the shape of the o-shaped legs that affect the target distance, body position when doing the T kick movement, and also the power produced when doing the T kick is still too weak and the posture is not too high and also the difference in the legs in each athlete affects the target range of the T kick. The existence of some of these problems, the researcher wants to know the skills of the T-kick movement in the athletes of the sacred site of South Bengkulu, therefore the researcher raised a study entitled 'Analysis of the skills of the T-kick movement in the athletes of the Pencak Silat Tapak Suci South Bengkulu'.

METHODS

In this research process, the author uses a type of field research, namely the author collects data directly from the field/research location. More specifically, the author uses a qualitative descriptive method, which is research that tries to analyze a phenomenon that occurs at this time. Therefore, the author will analyze how the T kick technique in pencak silat is good and correct or appropriate. According to the opinion (Sugiyono, 2015) explains that

descriptive research is research that aims to analyze data through describing the data collected properly without having the intention of creating conclusions that apply to the general public or generalization.

The implementation of this research was in South Bengkulu Regency, precisely at the Tapak Suci pencak silat college. This research was conducted from September 14 to October 14, 2023. According to (Arikunto, 2016) the subject of research is to limit the subject of research as an object, thing or person to which the data for the research variable is attached, and which is in question. And for the subjects in this study, there are 50 people.

According to (Sugiyono, 2015), the object of research is a scientific goal to obtain data with certain purposes and uses about an objective, valid and reliable thing about a thing (certain variables). The determination of the research subject uses the purposive sampling technique. (Sugiyono, 2015) explained that *the purposive sampling* technique is a technique for sampling data sources with certain considerations, such as people who are considered to know about what to expect. The object I used in this study was 20 people each from 5 people from

each class that was contested and these 20 athletes were taken based on the class that was contested and I took classes A, B, C, and D according to the athletes in Tapak Suci Bengkulu Selatan.

The data collection techniques in this study are surveys, tests and documentation where when researching the movement of the t-kick to get a systematic, factual and accurate picture of the facts, properties, symptoms and relationships of the biomechanical analysis of the t-kick in pencak silat athletes in the sacred site of South Bengkulu. In this study, the data collection techniques used are test and documentation. The percentage technique used in this study uses the following formula (Arikunto, 2021):

$$P = \frac{F}{N} \times 100\%$$

Keterangan :

P = Persentase yang dicari

F = Frekuensi

N = Responden

According to (Sugiyono, 2015) "a research instrument is a tool used to measure observed natural and social phenomena" While according to (Lestari et al, 2018), a research instrument is basically a tool used to collect data in research. Data collection in this study requires the right instruments or tools. So that the tool is able to measure what is to be measured.

RESULT

a. Result Test

In this study, it is to provide an overview of the analysis of the biomechanics of the T-kick in pencak silat athletes in the sacred site of South Bengkulu. This study uses the indicator of the suitability of the T kick movement where in the indicator of the suitability of the T kick movement there are phases that must be carried out by the athlete and then analyze the movement of the T kick using the kinovea assistance application so that more accurate data can be obtained. Based on the test results that have been carried out, the data results can be seen in the following table:

Table 1. T Kick Test Results

Interval	Fx	Fr	Assessment Criteria
88-100	0	0%	Excellent
71-87	9	45%	Good
54-70	10	50%	Enough
37-53	1	5%	Less
20-36	0	0%	Very Less
Total	20	100%	

According to the table above, it can be concluded that athletes who master the T kick with the "good" category are as many as 9 athletes, and athletes who master the T kick technique with the "moderate" category are as many as 10 people, and athletes with the T kick technique in the "poor" category is as

many as 1 person. And if calculated as a whole based on the results of the tests that have been carried out, the athletes of the South Bengkulu holy site get a T kick category with a sufficient category, which is 70%. The following is an overview of the diagram of the results of the T-kick test conducted by athletes from the sacred site of South Bengkulu.

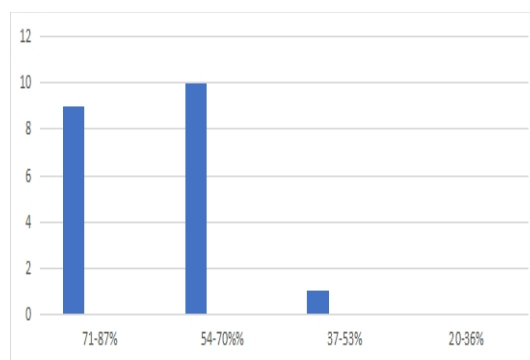


Figure 1. Diagram of Test Results at Pencak Silat College, Tapak Suci, South Bengkulu

b. Documentation

Based on the data from the documentation that has been carried out in the research that has been carried out, the data processing process of the T-kick biomechanical analysis uses the kinovea application as a supporting tool in assisting the data processing process, which can be seen in table 4.2 below.

Tabel 2. Class Percentage Results.

Kelas	Persentase	Kategori
A	71%	Good
B	64%	Enough
C	71%	Good
D	74%	Good



Figure 2 Documentation of the Data Processing Process Using the Kinovea Application.

In the kinovea application we can find out several things, one of which is the angle, speed, muscles that affect the existence of a movement and others, in this case the researcher only wants to know whether the movements made by the athlete are in accordance with the biomechanics of the T kick indicator or not



Figure 3. Analysis Documentation T-Kick Using the Kinovea App

DISCUSSION

This study uses the kinovea application as a supporting medium in obtaining the necessary data. At this stage,

there are several stages carried out by the first athlete, namely attitude one, attitude two to the final attitude, and from the results of the analysis above, the researcher will get data that is in accordance with what the researcher wants.

Based on the data from the analysis of the movement of the T kick using the kinovea application to obtain biomechanical analysis, the following results were obtained, where athletes in class A obtained a result of 71% where this result is included in the good category, this can be obtained because of their perseverance in carrying out the instructions given by the coach and also they often make several achievements for the holy site.

Furthermore, athletes who are in class B obtained 64% results, this result is included in the sufficient criteria. Following the athletes who are in class C, the athletes in this class get a result of 71% and are classified as good criteria, just like athletes who are in class A, athletes in class C also often make achievements.

Next are the athletes who are in class D where the athletes in this class get the largest score, which is 74% which puts them in the highest position in mastering this T kick technique, this can happen because most of these athletes have been

attending this holy school for a long time, so they are very proficient and understand what is conveyed by the coach, And of course, the achievements of athletes in this class are also quite good, some have even won third place in the Kemenpora Cup at the national level.

There are several factors that cause and are the reason why the test results carried out by each class are different, including: Class A, where based on the results of the percentage obtained, which is 71%, the percentage obtained is of course inseparable from the training and hard work done by the athletes so that in the implementation of the T kick test get satisfactory results.

Class B, namely, obtained a percentage of 64% and became the lowest percentage compared to the four classes that conducted the T kick test, which is the cause of the low percentage obtained by athletes in this class, namely, at the time of the implementation of the test the athletes were not so serious in carrying out the test, and also according to the opinion of the coach they also often did not participate in training sessions according to the predetermined training schedule. Class C, as well as class B, athletes who occupy this class also have a percentage of 71% and the main factor why they can get this

percentage is because they are active in practicing their kicking techniques on the sidelines of their training breaks, and they also often get champions when participating in championships. Class D, is the class with the highest percentage of T kicks, which is 74%, when compared to the existing classes, the difference that is very visible is in the training sessions they do, where this class is very diligent and diligent when getting orders from their coaches, and also this class is a champion subscription for selections in South Bengkulu district.

Based on the data that has been obtained, it shows that the criteria for the movement of the T kick of pencak silat athletes in Tapak Suci South Bengkulu obtained the "sufficient" criterion, which is 70%. Thus, I hope that the silat fighter will be able to improve the movement of the T-kick movement. Each phase is concluded as follows: The suitability of the movement of the initial attitude phase (tide attitude), when the tide stance is carried out facing the target, the direction of the body is facing the side and is accompanied by a slightly bent stance or commonly called light stance.

According to Yusup Taujiri (in Pratama, 2012:97) biomechanically, light horses are faster to perform T kick

movements, because the stability level is small due to the horizontal distance from the weight point to the side of the pedestal plane is small, so the tie stance with light stances is more effective to do T kicks. Keeping your distance and anticipating your opponent's and other hand's attacks to protect your chest while keeping your body facing sideways, athletes do it well. The foot position is completely always in the stance position during the tide phase, the stance position gives the momentum of the push to the leg to make a T kick towards the target, the athlete does it enough.

When the hand is in a tidal position, there are still athletes who ignore the position of the palm above the navel, so this can provide a gap for the opponent to attack. The suitability of the phase of body position and footwork trajectory, the athlete's body position when doing a T-kick starts by rotating the footrest and followed by a well-done waist movement. The swing trajectory of the athlete's legs when lifting the legs has not been raised at chest level so that it can provide an opening for the opponent to attack, besides that the function of the legs being raised at chest height is to determine the momentum of the kick or stimulus (impulse).

According to (Pratama & Candra, 2021) states that impulses occur when

athletes lift their legs or knees higher than the navel, then as a result of these impulses there is an extensor movement or kicking to the target. So if the knee is not raised or there is an impulse, the momentum that will be generated will be meaningless or in other words, the kick will become swinging. The position of the athlete's body when lifting the legs does not have a good waist flexion so that the swing of the legs has not covered the chest.

This movement is followed by the position of the athlete's body that is tilted to maintain body balance. The position of the hands at this stage is that the hand protects the chest area and the other hand protects the genitals. From now on, athletes have the impression that they are always ready to anticipate the opponent's attack, but they do not do it. The athlete only focuses on his kicks. The athlete's hands are open and do not cover the chest and pubic area, causing the opponent to be more free in carrying out attacks. Suitability of balance phase movement, balance movement is the dynamics of posture to prevent someone from falling.

The balance movement of the T kick is a combination of leg movements, foot support and body position. According to (Munzir, 2022) states that the balance in the side kick movement (T) occurs when

the point of weight located between the lumbar and the bone is then projected on the plane of support, namely one of the legs that is the plane of support when performing the T kick. Because if the balance point is tilted forward or backward, there will be no balance.

For balance movements in the T kick, it starts from the foot of the pedestal and continues with a leg movement kicking straight towards the target accompanied by a body position that leans sideways to maintain body balance (Pratiwi, 2018). When doing a kick, the movement of the legs must be at the same time as the body that is leaning sideways so that the shape of the body when doing the kick is like forming a T.

The suitability of the impact phase movement on the target, when doing the kick movement, the leg movement when kicking comes from the legs. When the legs kick, try to position the legs straight, just like athletes do. To be able to accurately hit the opponent's chest area, you must have excellent leg flexibility. Athletes do it precisely, kicks with the outside (foot knife) right on the opponent's chest, but there are still athletes who kick their kicks using the soles of their feet, as a result of which it can reduce the momentum of the push on the opponent

and the exploration of power is not maximum. According to Muhammad Dailami (in Pratama, 2012), "the T kick has an advantage; The longer the range, the longer the distance between the head and the opponent, the safer, the maximum energy exploration". The suitability of the movement of the final phase of the T kick ends with the return of the body position to the initial phase, as well as the initial attitude phase (tide posture). With the position of the hands in a tidal attitude so that they are alert if there is an attack carried out by the opponent.

CONCLUSION

Based on the results of the research and discussion, the conclusion in this study is a biomechanical analysis on the T kick movement skills of Pencak Silat athletes of Tapak1 Suci South Bengkulu. So, the total average of the overall T-kick movement in each phase carried out by the athletes of Tapak Suci South Bengkulu obtained a total score of 70% with the category of "adequate". Referring to the description above based on the results of the overall motion analysis, it is said to be enough, but there are still phases that need to be improved, namely in the phase of body position and footwork trajectory which is shown in the category of adequate, because the trajectory when lifting the legs has not

been lifted to cover the chest area due to poor waist flexibility and the position of the hands does not protect the chest and pubic area. The implementation of hand positions to protect the chest and pubic area and the trajectory of the legs raised at chest height is important to protect the chest area and determine the momentum of the target direction.

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