

# **Roundhouse Kick Cinematic Analysis**

## ***The Comparison between Skill and Unskill in Pencak Silat***

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**Abstract:** This research was aimed at analyzing the roundhouse kick differences between skill and unskilled in *pencak silat*. There are three factors analyzed in this research: angular velocity, foot linear speed and impulse. The sample was 14 people consisting seven PPLD athletes from Bengkulu and Seven unskilled of non-athletes. The method was comparative due to the fact that this research was intended to discover the difference between knee angular velocity, foot linear speed and impulse between skill and unskilled in roundhouse kick of *pencak silat*. The result was obtained from kinoveo video analysis software. It was revealed that there are significant differences between foot linear speed and impulse from skill and unskilled on the athletes' roundhouse kick. Yet, there is no difference in knee angular velocity between skill and unskilled toward their roundhouse kick.

## **1 INTRODUCTION**

*Pencak silat* is one of the self-defending sports that requires skill and basic technique mastery. The basic techniques are kicking, punching and parrying. On the basis of basic technical skill analysis, kicking is the most dominant component of the match in the martial arts game, since kicking has several advantages, including they give two point for a match (Afiana, 2013; Nugraha, 2014; Nusufi, 2015). A good kick is a quick, hard shot with good motion coordination that make the opponent cannot defend or capture. Lots of types of kicks in the martial arts include: front kick, side kick, roundhouse kick, and back kick. Data have shown that attacking using legs is dominated by roundhouse kick (Nusufi, 2015). It is because the roundhouse kick is a relatively easy-to-learn and easy-to-train kick compared to other types of kicks, so many fighters use a roundhouse-kick in a game. The roundhouse kick is a circular patterned kick inside, aimed at all parts of the body, using the sole of the foot or the toes (Lubis, 2004).

Nowadays to master a roundhouse kick is usually done in a conventional way that the trainer gives instructions to the athlete to try to drill a roundhouse kick, after which the trainer evaluates the movements of the athlete based on what they observe (Subekti and Kristiyanto, no date). It thus has the disadvantage that athletes are often confused with the location of

motion errors that cause the process of developing the techniques inhibited.

The problems in the evaluation of the roundhouse kick technique can be overcome by Cinematic analysis. The Cinematic analysis in question is the process of motion analysis performed by taking video and then analyzed using software such as dart fish, kinovea, etc. (Hölbling, 2017).. has been a lot of research through a video analyzing basic techniques in martial arts (Pozo et al., 2011).. The benefit of using video analysis is that the athlete can easily know the error motion, so it can simplify the process of improving the techniques.

This study focused on linear analysis of velocity, angular velocity and momentum on sickle kicks. Linear velocity is the rate of change of position per one unit of time. Linear velocity in the roundhouse kick is the shift of foot dorsal position from stance position to impact on sand bag. Angular velocity is the rate of change of angular displacement. Angular velocity on the roundhouse kick is the rate of knee angle displacement from the stance to the impact (Ball, 2011). Impulse is the process of working force in a short period of time meaning that impulse in science is the result of force and time ( $I = F \cdot \Delta t$ ). (Srensen, 1996; Medrano and Smith, 2003).

The importance of this research is to know the criteria of mechanical motion by paying attention to angular velocity, linear velocity, and impulse. In Indonesia, the use of biomechanical analysis to

analyze the techniques undertaken by athletes is still lacking, there is still little research related to Cinematic analysis in the roundhouse technique. Therefore, the researcher is interested in analyzing this issue in order to provide some beneficial input for the coach in providing the appropriate coaching practice for the athlete.

## 2 METHODS

This study belongs to comparative research that investigate the differences of knee angular velocity, foot linear velocity and impulse between skill and unskilled toward the roundhouse kick in *Pencak silat*. Therefore, This study (Fraenkel et al., 2012). Was described as follows:

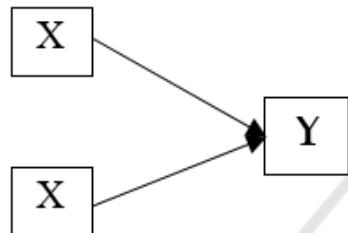


Figure 1: Research Design.

Figure 1 portrays the research design used in this study. Variable X1 skill knee angular velocity, foot linear speed and Impulse, Variable X2 unskilled knee angular velocity, foot and impulse linear velocity, variable Y roundhouse kick.

### 2.1 Participants

The participants of the study were 15-to-17-year-old local student training center (PPLPD) Bengkulu with 48-55 kg weight and 96-98 cm legs. The sample was selected using purposive sampling in which 7 athletes are those who have participated in national events (5 males and 2 female) and the other seven athletes are those who have participated in an event (5 males and 2 female).

### 2.2 Instrument

The Cinematic analysis on the roundhouse kick requires a camera and kinovea software. The camera was used to record the motion to be analyzed biomechanically. The specification for the camera is; Mega Pixels: 20.1 million de pixels, Optical Zoom: 26x, Wide Angle Lens: 22,3 mm, LCD screen: 3.0/7.5 cm, Burst: 0.8 picture/second. There were two cameras used in this research.

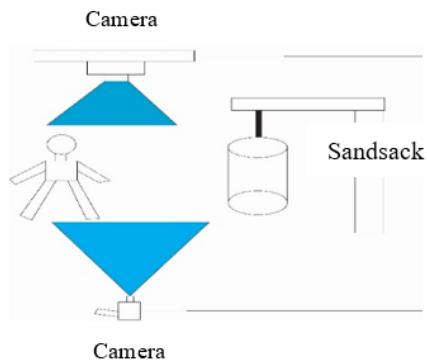


Figure 2: Analytical Video Capture Position.

Figure 2 describes the position of video capturing. The camera is placed on the right and top, as it suits the need for this research to record motion during a roundhouse kick, from start sandsack to see results from Linear speed of the foot using a camera placed on the right side and to see angular velocity knee using the camera from above.

### 2.3 Research Procedure

In this research, The following steps were carried out: 1) performing body scales to determine the athlete's body length, 2) measuring the length of the athlete's leg 3) measuring the distance between the stance and sandsack 4) the athlete performs the sickle-kick movement of *pencak silat*, 5) video recording of roundhouse kick movements in analysis using kinovea software, 6) data generated from kinovea software reprocessed using biomechanical formulas, 7) processing data of calculation of biomechanics formula, 8) concluding the result of data analysis.

### 2.4 Data Analysis

The data analysis used comparative approach by using independent sample t-test.

## 3 RESULTS

The data were analyzed using kinovea video analysis. After the initial data was obtained, the data was then analyzed using biomechanical equation.

Skill sample has foot linear velocity as much as 11,39 m/s, knee angular velocity 904,32 rad/s, and impulse 631,27 N.s. Unskilled sample has foot linear velocity as much as 6,56 m/s, knee angular velocity 985,16 rad/s, and impulse 311,75 N.s.

To test the hypothesis, Independent t test was carried out to compare the result of both groups.

Linear velocity with t value as much as 2.367 with  $0.035 < 0.05$  implies that Ho was rejected. It leads to the conclusion that there is significant difference between foot linear velocity between skill and unskilled on the roundhouse kick. And for the knee angular velocity, the observed value is -0.724 with  $0.483 > 0.05$  means that ho was accepted. it means that there is no significant difference between knee angular velocity from skill and unskilled. And for the Impulse, the observed value is 2.809 with  $0.016 > 0.05$  means that ho was rejected. it means that there is no significant difference between knee angular velocity from skill and unskilled.

## 4 DISCUSSION

The total score from each group shows the differences. Skill group has the average 11.39 m/s foot linear velocity which is bigger than the unskilled (Nusufi, 2015). According to Imam Hidayat (2003) "velocity has quantity" In view of analysis and video results, samples that have linear rear leg speed, then the impact on sandsack will be greater. Like the speed of the car with 90 km/h of speed and the speed of 20 km/hour will have different impact when hitting a tree.

Skill has knee angular velocity of 904.32 rad/s which is lower than unskilled with 985.16 rad/s knee angular velocity. At the time it was analyzed the average skill had a smaller knee angular value compared to unskilled, but in the sandsack kick result was greater than the unskilled beyond the factor of having large leg muscle power, because when the impact skill at the time of the follow-up movement gave more impetus against sandsack (Srensen, 1996; Medrano and Smith, 2003; Bonnefoy, 2008; Faria, 2013; Coventry, 2015).

Then, for an average skill having an impulse of 631.27 N.s greater than unskilled has an average impulse of 311.75 N.s. At the time of analysis, it turns out that skill has a greater force than unskilled, because the impulse is related to the force given to other objects and time. The larger the force is given and the less time that works on the force the greater the impulse is.

## 5 CONCLUSIONS

The key of the effective roundhouse kick was that all part of body spin, it will result in more impacts. Then at the time of the kick, the angular velocity produced is small because it performs the force at the time of

the kick, not the kick it is swung. From other factors such as having a great power, such is needed to support the progress of training. When someone starts the exercise from the beginning, this is the factor we should teach first. So there will be no mistakes when practicing a roundhouse kick.

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