ISSN 2964-4291
https://proceeding.unnes.ac.id/index.php/iset

Analysis Motion At The Release Stage of The Javelin Using Kinovea Software

Andri Tria Raharja[1*], Sulaiman Sulaiman[1], Sri Sumartiningsih[1], M. E. Winarno[2]

[1]Universitas Negeri Semarang, Indonesia

[2]Universitas Negeri Malang, Indonesia
*Corresponding Author: andri91@students.unnes.ac.id

Abstract. The purpose of this research is to analyze the movement in the javelin release stage. The method used in this research is descriptive quantitative. The data taken is the result of analysis using Kinovea software in the form of data on release velocity, angle of release, height of release and angel of attack. The results showed that on the release velocity factor, the first throw obtained a speed of 12.49 m/s while the second throw obtained a speed of 12.87 m/s. The release angle factor shows that the first throw angle is 38 degrees and the second throw is 35 degrees. The factor of the height of the release is that the javelin distance at the time of release is 185.04 cm in the first throw and 186.87 cm in the second throw. The angle of attack factor shows that the angle of the first throw is 3 degrees and the second throw is 2 degrees. The throwing distance shows that the first throw was obtained with a distance of 46.1 m and the second throw with a distance of 47.2 m. The results of the data analysis show that the greater the speed of release and the height of the release, the farther the throw is obtained, while the smaller the angle of release and attack angle, the farther the throw is obtained. Based on this analysis, it is hoped that it can provide a reference to the trainer on how to make good training pattern in achieving achievement.

Key words: javelin throw; kinovea software; analysis of motion.

How to Cite: Raharja, A. T., Sulaiman, S., Sumartiningsih, S., Winarno, M. E. (2022). Analysis Motion At The Release StageOf The Javelin Using Kinovea Softwaree. *ISET: International Conference on Science, Education and Technology* (2022), xxx-xxx.

INTRODUCTION

One of the throwing numbers in athletics is the javelin throw. The javelin throwing category is growing rapidly in the world of athletics. In recent years, javelin throwing in China has experienced rapid development. This is evidenced by the medals won at the 2018 asian games, where the gold medal was won by Liu Shiying (China); Silver medal: Lyu Huihui (China) and Bronze medal: Gim Gyeong Ae (South Korea) (https://asiangames.antaranews.com). Looking at the data, the host country ofIndonesia did not get good results because it did not get a medal in the javelin throwing category. Theseresults make the Indonesian coaching team have to evaluate the training program. What is the cause of the javelin throwing movement not being maximized by Indonesian athletes? If you look at the results of the throw, speed becomes very important, it is based on the quality of movement speed in influencing the speed of the javelin (Ma & Wan, 2018).

The javelin biomechanical parameters have a major impacton the resulting success. First, when viewed from the height, angle and ejection speed, deflection angle,stride length, knee position, and others. All of them, have an influence in the placement of movements on the outcome of the throw (Pavlovi, 2020). Saratlija, Zagorac, & Babić (2013) in their research resultsshow that the correlation between the ejection speed parameter, followed by the foot placement speed, has an important role in the distance of the throw. On the other hand, the release of the javelin is an important part of the throwing technique (Hussain & Bari, 2012). The angle of release is considered an important part to achieve the maximum throwing distance, where the lower and upper body parts have an important role in the javelin throw (Krzyszkowski & Kipp, 2019).

Therefore, this study was conducted to examine the parameters of the release of the javelin. The assessment process was carried out using the kinovea software. Adnan, Ab Patar, Lee et al (2018) concluded that the integration of HD Video Cam–Kinovea has the potential to be a reliable move in capture-analysis systems. Besides, it is low cost, portable and easy to use. It is hoped that this research can provide a solution to the trainer regarding the parameters of the release of the javelin with the kinovea software so that the trainer can create a new program and shorten the training process related to the release of the javelin. If this researchis not carried out, the training process requires a long term to produce an effective and long throw.

The aim of this study was to analyze the stages of the javelin release movement which included

speed of release, angle of release, height of release and angel of attack in influencing the javelin release movement. In order to provide benefits for both athletes and coaches regarding which components influence and have a better impact on performing the javelin release movement.

METHODS

The method used in this research is descriptive quantitative. The subject used in this study was a UNY male javelin thrower who was active in the National Championships. The activities were carried out at the UNY Football Field. The data taken is the result of analysis using kinovea software in the form of data on speed of release, angle of release, heightof release and angel of attack. There are three stages of data collection procedure in this study, namely: First; The preparatory phase includes: a) Preparing the condition of the research sample both physically and mentally. b) Check the condition of the camcorder that will be used. Second; the video capture (recording) stage, this activity includes: a) The camera is placed perpendicular to the research subject with the distance adjusted. Three cameras are used to collect data for the purpose of motion analysis, namely the camera is placed perpendicular to the initial position of the shot, the result of the hit, and behind the hitter, the standard meter is placed in an adjacent position. b) With the start signal, the research subject begins to make the initial strokes and the final results. c) Research subjects hit 2 times. Third: the analysis phase is carried out as follows: a) Inserting video recordings into a laptop using a card reader. b) Choose the analyzer facility in the Kinovea software to determine the video of slow-motion shots and stop at the desired stages. c) Save each video by previously giving its file name. d) Enter the results of the analysis into the observation table. e) Start doing the analysis.

RESULTS AND DISCUSSION

Based on the results of data analysis on speed of release, angle of release, height of release and angel of attack using kinovea software, the following data is obtained:

Speed of release on the First Throw

Figure 1. Speed of Release First Throw

Based on figure 1, at this stage of javelin release the speed undergoes a gradual change from the process of holding the javelin until the javelin comes off. The change in speed starts from 0 m/s to 12.49m/s. This greatly proves that the athlete's movement is good, where the speed of release changes so thatit affects the result of the throw.

Speed of release on the Second Throw

Figure 2. Speed of Release Second Throw

Based on throwing figure 2, the speed when removing the javelin has increased, namely from 0 m/sto 12.87 m/s. So the athlete experienced a very good increase in speed. When compared between the first and second throws, it shows a significant difference to the distance of the throws. Here's a comparison between the first and second throws in the javelin release process:

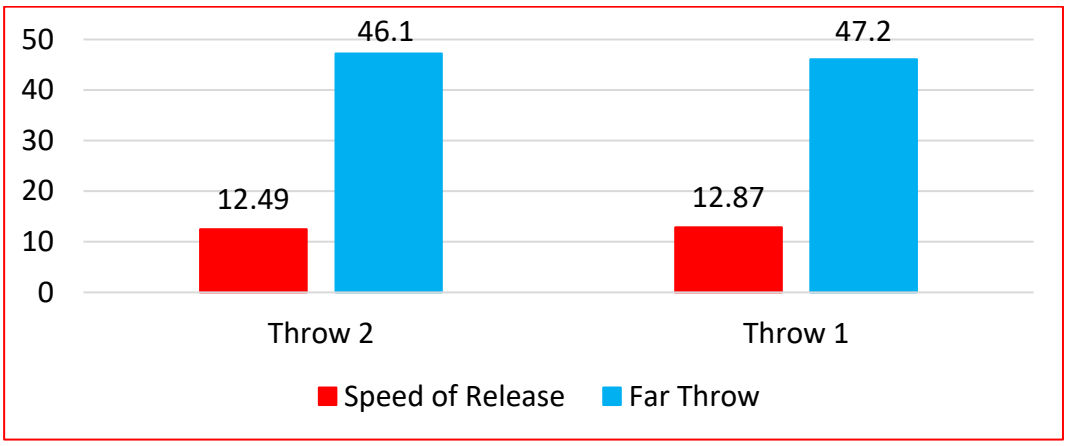

Figure 3. Comparison Diagram Speed Of Release With Far Throw

Based on figure 3, it shows that the speed of the athlete at the time of the release of the javelin greatlyaffects. This is proven at the time of the second throw with a maximum speed of 12.49 m/s, the distancereached was 46.1 m while the first throw with a maximum speed of 12.87 the distance reached was 47.2

m. So the speed at the release of the javelin greatly affected the distance of the throw. The tightening is used to guide between the coordination of the legs, waist, and shoulders at the right time. It is this momentum that should need to be observed by each coach in which the level of coordination between the parts of the body is carried out sequentially.

Angle Of Release

Figure 4. Angle of Release On First and Second Throws

Figure 4, shows that the magnitude of the angle of release at the first throw is 38 degrees and in the second throw the angle of release is 35 degrees. The angle is used when the position of the javelin and arms is at the desired angle which is less than 45 degrees, because with an angle of 45 degrees it produces maximum height. With a maximum height, the javelin has a fairly far range with the presence of factors from outside in the form of wind. In addition, angles can have an effect in producing the distance of the throw caused by the impact of the earth's gravity which works to pull objects that resist gravity towardsthe earth so that any object if thrown will fall back to the earth due to the gravity of the earth. The ideal angle of throw is about 30-35 degrees, but from some studies it shows an odd t angle of 34 degrees. Here's a comparison of the angle of release against the distance of the throw:

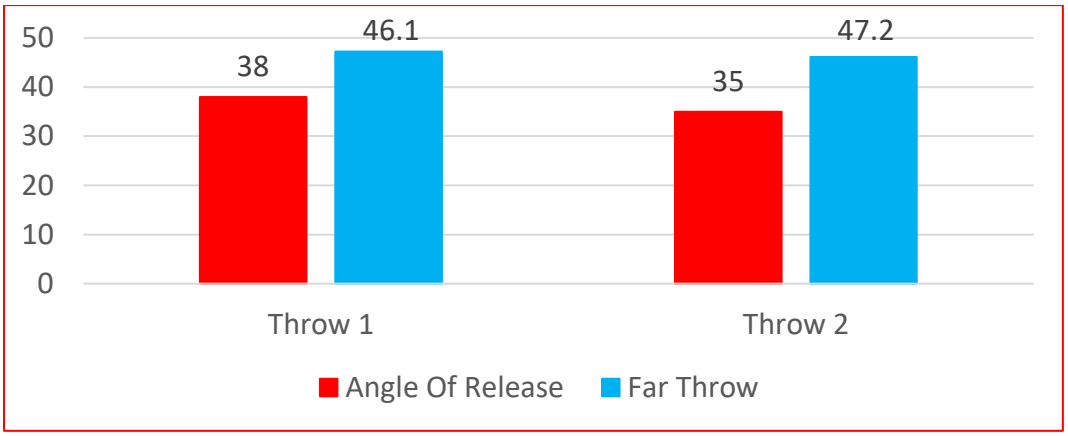

Figure 5. Comparison Diagram Angle of Release with Far Throw

Based on figure 5, it shows that the smaller the angle of the javelin at the time of the release javelin,the farther the throw is produced.

Height of Release

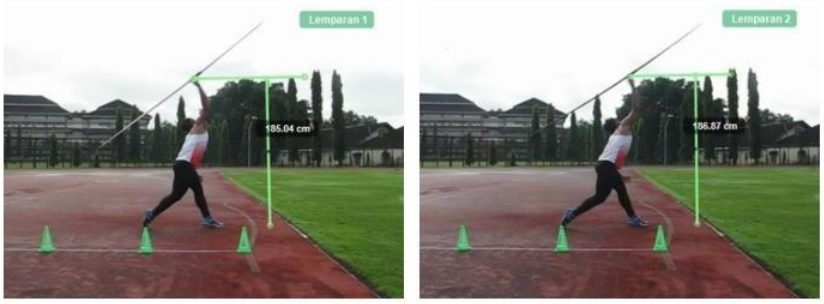

Figure 6. Height of Release On First and Second Throws

The height when throwing a javelin is the distance between the ground and the height of the javelin,because with such height it is interrelated with the angle of the throw. Figure 6 shows how high the javelin is and the track/ground surface. In the first throw the height of release obtained was 186.87 cm while in the second throw the height of release was obtained by 185.04 cm. The data showed that the first and second throws had a height difference between the javelin and the ground level at the time of discharge. The principle of height between the javelin and the track surface suggests that the height of the height at release then the far throw will be better. This is evidenced by the result of the first throw at the time of measurement of the height of release of the first throw was 47.2 meters away and the second throw was 46.1 meters away. Here's a comparison diagram of the first and second throws at thetime of height of release;

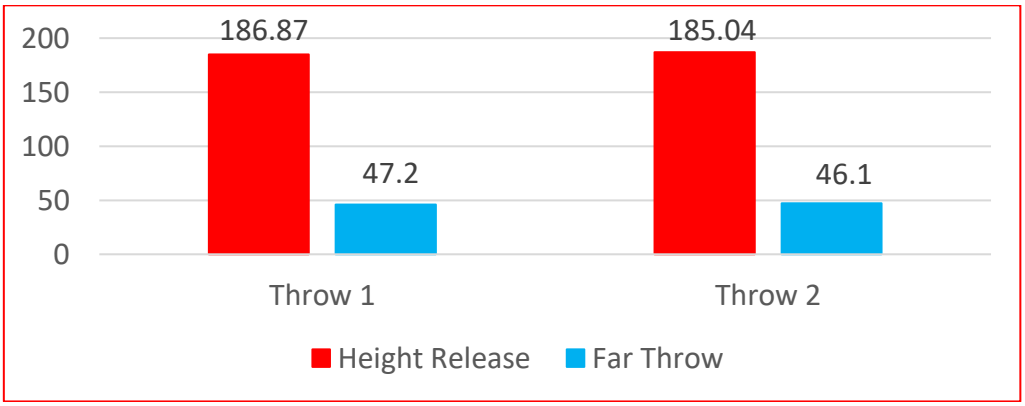

Figure 7. Comparison Diagram Height of Release with Far Throw

Angle Of Attack

Figure 8. Angle of Attack on The First and Second Throws

Based on figure 8, it shows that the magnitude of the angle of attack in the first throw is 2 degrees and the second throw is 3 degrees. If you look back at the difference, it greatly affects the result of the throw where the angle produced if the smaller the angle of attack, it will produce a distance of the throw.This is in line with the inersia where the prisoner that inhibits or changes the motion (resistance to action) of an object, so that the angle of attack is smaller, the better the result.

CONCLUSION

The results showed that in the speed of release factor, the first throw obtained a speed of 12.49 m/s while the second throw obtained a speed of 12.87 m/s. The angle of release factor shows that the first throw angle is 38 degrees and the second throw is 35 degrees. The height of release factor is that the distance of the javelin at the time of release is 185.04 cm in the first throw and 186.87 cm in the secondthrow. The angle of attack factor shows that the angle of the first throw is 3 degrees and the second throw is 2 degrees. As for the distance of the throw, it shows that the first throw is obtained with a distance of 46.1 m and the second throw with a distance of 47.2 m. The results of the data analysis showthat the greater the speed of release and the height of release, the farther the throw is obtained, while thesmaller the angle of the angle of release and angle of attack, the farther the throw is obtained. Based onthis analysis, it is hoped that it can provide a reference to coaches on how to make good training patterns in achieving achievements.

REFERENCES

Adnan, N. M. N., Ab Patar, M. N. A., Lee, H., Yamamoto, S. I., Jong-Young, L., & Mahmud, J. (2018).Biomechanical Analysis Using Kinovea For Sports Application. *In IOP Conference Series: Materials Science And Engineering*, 342 (1),. 012097. IOP Publishing.

Asiangames.antaranews.com. 28 Agustus 2018. Daftar Pemenang Medali Asian Games 2018 Hari Ke 10. Diakses pada 12 Juli 2022, dari https://asiangames.antaranews.com/berita/742759/daftar-pemenang-medali-asian-games-2018-hari-ke-10

Hussain, I. K. R. A. M., & Bari, M. A. (2012). Javelin Throwing Technique: A Biomechanical Study. *Computer Engineering and Intelligent Systems*, 3 (1), 20-24

Krzyszkowski, J., & Kipp, K. (2019). Prediction Of Throwing Distance In The Men's Javelin At The 2017Iaaf World Championships. *ISBS Proceedings Archive*,37 (1), 344.

Ma, G., & Wan, B. (2018, May). Kinematics Analysis Of The Throwing Pace Of The Men's Javelin Champion In The 2017 Summer Universiade. *In 2018 International Conference on Advances in SocialSciences and Sustainable Development* (ASSSD 2018), 182-184. Atlantis Press.

Pavlović, R. (2020). Biomechanical Analysis in Athletics: The Influence of Kinematic Parameters on TheResults of Javelin Throw of Elite Athletes. *The Swedish Journal of Scientific Research*, 7.

Saratlija, P., Zagorac, N., & Babic, V. (2013). Influence of Kinematic Parameters on Result Efficiency inJavelin Throw. *Coll. Antropol*., 37 (2), 31–36.