Analysis of the Accuracy and Shooting Angles for Aceh Pétanque Athletes in 2025

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Abstract. Pétanque is a precision sport where players throw a metal ball as close as possible to a wooden ball, aiming to keep the target ball or their opponent's ball close to the Boka. Pétanque has two basic techniques, namely pointing and shooting. Biomechanical factors that affect throws, such as knowing the angle to throw the ball towards the target, taking into account the ideal angle in making backwards hand swings, and forward ball release, also need to be considered when making throws to get the desired ball throw. The purpose of this study is to determine the accuracy of the shooting angle of Aceh pétanque athletes. This study uses a type of quantitative research. The sampling technique is carried out using purposive sampling, which involves selecting participants based on specific criteria or goals, namely to rank the top 10 Aceh pétanque athletes according to their achievements.

Furthermore, the data is processed with the Kinovea software application to measure the angle of the throw, backswing and release. The angle of accuracy of the shooting of Aceh pétanque athletes was obtained as follows: The shooting accuracy of Aceh pétanque athletes is 40 with a low category, a percentage value of medium category with a frequency of 4 athletes with a percentage of 40%, and a low category with a frequency of 6 athletes with a percentage of 60%. The angle of the shooting throw in each session was obtained. The backswing angle of one athlete was very high, ranging from 116 to 1320, while another athlete's was very low, ranging from 25 to 410. The remaining eight athletes used a common angle, close to 59-69°. The release angle of one athlete was very high, ranging from 150 to 1650, while another athlete used a very low angle, ranging from 112 to 1290. The remaining eight athletes used a common angle, close to 126 to 135°.

Keywords: Biomechanics; Pétanque; Shooting; Angle.

INTRODUCTION

Pétanque is a branch of accuracy or precision sports that originated in France. Pétanque is a game where the aim is to throw the iron ball as close as possible to the target ball, with the thrower's foot within the circle. The ball in play is made of iron, while the target ball is made of wood. These wooden balls are used to start a game of pétanque. The game of pétanque has two techniques, namely shooting and pointing. Pétanque is usually played on hard, gravel and rocky grounds, but it can also be played on grass. The official international pétanque playing field is 4 meters wide and 15 meters long. The sport of pétanque can be played individually, one-on-one, or in teams of two or three players. Pétanque is a sport that requires basic body skills. These bodily abilities are in the form of mental factors, good physical condition, mastery of tactics, and mastery of techniques. There are two techniques in the game of pétanque, namely, the pointing technique and the shooting technique. The pointing technique involves throwing the ball to bring the bosi closer to the target, specifically the boka.

In contrast, the shooting technique involves throwing the ball to keep the opponent's ball away from the boka and hitting the target ball in

the shooting game. The sport of pétanque requires optimal technique to be able to win the game, in addition to good mental and physical condition. The achievement of good results cannot be ignored in the context of predetermined exercises.

Sports achievements are possible if the athlete has a basic physical condition. Physical condition is crucial for athletes, as it is an indispensable requirement that cannot be postponed. The author [1] states that in a very demanding sport, the components of physical condition are a prerequisite that an athlete must have.

Components of physical condition that play an important role in the sport of pétanque are arm muscle strength, precision, and concentration. These physical components require coaching and training programs that can help athletes improve their skills and achievements as much as possible. The factor of posture size, or said in terms of anthropometry, along with the body parts owned by each athlete, is one of the factors that influence sports performance. Height and arm length can also affect the initial height of the throw and the angle of the throw. Pétanque is a sport that aims to achieve maximum accuracy. This means that the throws made must be right on target to get winning points; good technique is needed to produce good throws. Throws made in the sport of pétanque generally apply parabolic motion, where the consistency factor of the force when throwing and the angle of the throw are the key to achieving a horizontal distance.

From a biomechanics point of view, pétanque is a type of skill that is classified as a throwing sport to reach a horizontal distance. Throwing the object in question means throwing the ball a certain distance. The right ball thrown at the target is influenced by several interrelated indicators, one of which is the angle of the throw. The ideal angle for backwards hand swings and forward ball release also needs to be considered to achieve the desired ball throw. A ball throw angle that is too high or too low will affect the shooting result, meaning that athletes must be able to place the ball according to the goal that has been set. The author [6] In the sport of pétanque, four indicators can affect the outcome of the ball throw: the first is the angle of the backswing, the second is the swing, the third is the angle of release, and the fourth is the height of the ball. The four indicators are interrelated and affect each other. Based on this quote, it is evident that the move-

ment of throwing the ball is influenced by numerous interrelated factors, which is why biomechanics plays a role in finding the ideal angle. Biomechanical factors, such as determining the ideal angle for throwing the ball towards the target, considering the optimal angle for backwards hand swings, and releasing the ball forward, must be taken into account to achieve the desired throw.

Aceh is one of the provinces recognised for its achievements in Pétanque sports. On this basis, the Pétanque sport in Aceh continues to be fostered and trained so that it can maintain the achieve ments that have been achieved, thus to produce a parabolic trajectory requires good body ability to estimate the ideal angle, such as how big the swing angle and the release angle when shooting the ball, the wrong angle can affect the placement of the ball so that it does not match the desired target. An imperfect angle placement has a great effect on the accuracy of the ball throw at the target. It is necessary to evaluate the shooting throw by identifying errors in making movement corrections. The purpose of this study is to determine the ideal angle of throwing, as reviewed from the principles of biomechanics, using motion analysis tools through Kinovea Software. So that athletes and coaches can know the right training for each athlete's shooting movement.

METHOD

This research is included in the quantitative approach because it uses data in the form of numbers. The collected data is of a type that can be processed using statistical techniques. Following the opinion [3], Quantitative research is defined as research that extensively utilises numbers, from data collection and interpretation to the presentation of results. The type of study used in this research is a descriptive study, which describes the results of video shooting recordings analysed using Kinovea software. The research location is where researchers conduct research, especially in capturing phenomena or research from the object under study, to obtain accurate research data. This research will be carried out in February 2025, which will take place at the Geulanggang Pétanque Sport Centre, Syiah Kuala University, Banda Aceh.

The population is the whole subject within the scope determined by the researcher. The popula-

tion in this study consists of all Aceh pétanque athletes, totalling 35 people. Samples represent a part or a small part of the number and characteristics of the population to be studied. According to [3], Samples are a part or representative of the population being studied. The sampling technique in this study is the Purposive Sampling technique, which involves selecting participants based on specific goals or criteria. This is in line with the opinion that [3] Purposive Sampling is a technique for determining samples with certain considerations or special selection. The steps to take samples are carried out by determining the top 10 rankings of athletes fostered by the FOPI Aceh provincial government, based on achievements from 2016 to 2024. The sample in this study consists of 10 Aceh pétanque athletes, with seven male and three female athletes.

The data collection techniques in this study are:

1. The angle measurement test uses a camera to capture videos from the front and side, documenting the movement of a pétanque ball during testing. The measurement of the shooting throw to be measured is the angle of backswing or swing backwards and release, i.e. the angle of release.

Figure 1 – Example of Shooting Movement Angle Points

2. Pétanque shooting ability measurement is a test to measure accuracy in shooting. The test is carried out by the tester, who stands in a circle, holding the ball, and then shoots at the target in front. The purpose of the test is to measure the shooting accuracy of Aceh pétanque athletes. After the test is carried out, the next step is to see the score obtained from the results of the shooting ability test at a distance of 6-9 meters.

3. The anthropometric measurements in this study were taken using a height scale, a meter, and stationery. The implementation of the test was carried out one by one by each Aceh pétanque athlete. The anthropometric measurement technique in this study included the measurement of the overall height and arm length of the sample of Aceh pétanque athletes.

RESULTS AND DISCUSSION

Based on the research data obtained from video footage captured by the camera, which can be played and converted into multiple images. The results of the research sample's shooting throwing movements were obtained through two observations of front and side video recordings. The angle to be measured is the backswing angle and the release angle. Data was obtained directly at the time of the study based on the results of the shooting accuracy test of pétanque athletes.

Based on the above results, it was found that the backswing and release angles of each distance and session were different.

Distances 6 and 7 athletes tended to use smaller angles, while distances 8 and 9 tended to use larger angles to get good throws. In each shooting session, it was observed that one athlete used a very high angle, one athlete used a very low angle, and the other eight athletes used a common angle.

The shooting accuracy of Aceh pétanque athletes is categorised as follows: 40% in the low category, 40% in the medium category, and 20% in the high category.

The shooting angle of the Aceh pétanque athlete was obtained from sample 1, with the angle given to obtain a ball possession of 75% of the 20 balls thrown, with a backswing angle between 25 and 410 and a release angle between 136 and 155°.

Sample 2, with the given angle, achieved a ball possession rate of 80% for the 20 balls thrown,

with a backswing angle between 74° and 84° and a release angle between 120° and 125°.

Sample 3, with the given angle, achieved a 70% ball possession rate among the 20 balls thrown, with a backswing angle ranging from 59 to 70 degrees and a release angle between 115 and 130 degrees.

Sample 4, with the given angle, achieved a ball accuracy of 65% for the 20 balls thrown, with a backswing angle between 42-500 and a release angle between 128-136°.

Sample 5, with the given angle, achieved an accuracy rate of 60% for the 20 balls thrown, with a backswing angle between 116 and 1320 and a release angle between 131 and 148°.

Sample 6, with the given angle, achieved a ball accuracy of 60% for the 20 balls thrown, with a backswing angle between 60 and 770 and a release angle between 112 and 129°.

Sample 7, with the given angle, achieved a ball gain of 65% of the 20 balls thrown, with a backswing angle between 72 and 800 and a release angle between 138 and 146°.

Sample 8, with the given angle, achieved a ball gain of 60% of the 20 balls thrown, with a backswing angle between 29 and 440 and a release angle between 124 and 135°.

Sample 9, with a given angle, obtained a ball gain of 55% of the 20 balls thrown with a backswing angle between 79-92° and a release angle of 150-165°.

Sample 10, with a given angle, obtained a 55% ball gain from 20 balls thrown with a backswing angle between 57-61° and release 128-133°.

Aceh pétanque athletes tend to have higher shooting accuracy in sessions I and III, as these sessions do not involve obstacle balls or obstacles under the target ball. In contrast, sessions II, IV, and V show lower accuracy, with only 1 or 2 balls hitting the target out of the four thrown. Aceh pétanque athletes have the highest shooting accuracy obtained from 6 athletes with a shooting accuracy percentage of 60% or in the poor category, and four athletes with a percentage of 40% or in the medium category, while in the shooting accuracy of the very good and good category, Aceh petaque athletes have not been able reach this category, but are also not in a position of less than once. The average shooting accuracy of 40 falls within the category of lack. According to [7], the maximum value of 100 points is 1) the official men's world record of 67 Cristope Sevilla in 2011 in France and Diego Rizzi in 2017 in Poland; 2) Women 61 Angelique Papon in 2006 in France and Audrey Bandiera in 2015 in Thailand.

Based on this quote, it is evident that no world athlete has ever achieved a maximum score of 100 in shooting. Acehnese pétanque athletes are at the national level, ranking fourth after world, Asian, and ASEAN athletes. Achieving a shooting accuracy score of 40 marks a significant milestone, as it has reached half of the world record score, making it very satisfying for athletes at the national level. In addition, achieving good shooting accuracy is influenced by the magnitude of the throw angle, which varies according to the distance and condition of the target ball, as well as the individual player's style. This follows the opinion [8] that shooting throws in pétanque have different backswings and release angles for each athlete; the longer the athlete's arms, the smaller the angle used.

On the other hand, the shorter the athlete's arms, the greater the angle used. The quote explains that the angle used to achieve shooting accuracy lacks a universally effective benchmark. This is because each athlete employs a unique backswing and release angle, influenced by anthropometry, throwing distance, and the condition of the target ball at the time of shooting.

The results of the data analysis above show that the shooting throw in the sport of pétanque has different backswing and release angles for each athlete. The angles used at each distance and throwing session are also different. The distance of 6 and 7 meters of the angles used is smaller, the smaller the angle of backswing and release is. On the other hand, the shorter the athlete's body and arms, the greater the angle. The results of the angle analysis indicate that the angle of backswing and release affects the accuracy of shooting. However, the ideal shooting angle varies depending on several factors, including height, arm length, distance, energy given, ball speed, and many others, to achieve a good angle and ball accuracy. The results of the angle analysis indicate that the angle of backswing and release affects the accuracy of shooting. However, the ideal shooting angle varies depending on several factors, including height, arm length, distance, energy given, ball speed, and many others, to achieve a good angle and ball accuracy. The angle is also different in each shooting session. In sessions I,

III, and V, the angles used were lower because there were no obstacles under the target ball.

In contrast, sessions II and IV required the athletes to use larger angles to achieve the ball's height, reaching the target by passing through the obstacles. The height of the ball also influences the acquisition of shooting angle accuracy. A ball that is too high or too low will cause the ball to fall faster or slower than expected.

CONCLUSIONS

Based on the data obtained from the results of the accuracy analysis and the analysis of the angle of the throw of the discussion of the research results, it can be concluded as follows:

The shooting accuracy of Aceh pétanque athletes is categorised as follows: 40% in the medium category, with four athletes, and 60% in the low category, with six athletes.

The shooting angle of Aceh pétanque athletes was obtained, revealing that one athlete used a very high angle (116-132°), while another used a very low angle (25-410°). The remaining eight athletes used angles generally close to 59-69°. The release angle of one athlete was very high, ranging from 150° to 165°, while another athlete used a very low angle, ranging from 112° to 129°. The remaining eight athletes used a common angle, close to 126° to 135°.

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