

# Analysis of Leg Muscle Power and Leg Angle in Jerk Split Movement of SMAKOR Aceh Weightlifters

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**Abstract.** Weightlifting is a sport that relies on power to lift weights made of iron and covered by rubber; there are two kinds of force techniques in weightlifting, namely the Snatch and Clean and Jerk force types. The objectives of this study are: 1) to analyse the limb muscle power of Aceh SMAKOR weightlifters, 2) to analyse the front limb split jerk angle in Aceh SMAKOR weightlifters, and (3) to analyse the rear limb split jerk angle in Aceh SMAKOR weightlifters. This research uses a quantitative approach with descriptive methods. The sampling technique used total sampling, which amounted to 8 Aceh SMAKOR weightlifters. The collection technique uses test items as follows: 1) The results of leg muscle power in male athletes fall into the deficient category totalling two people (66.66%), and the good category totalling one person (33.33%), with an average value of 51.33, and for the results in female athletes are also in the deficient category totalling three people (60%), and two people are in the good category with an average value of 38.8; 2) From the split limb jerk angle results of male athletes of SMAKOR Aceh, three people (100%) obtained the optimum angle value per the standards set. The results of the front limb split jerk angle test of female SMAKOR Aceh athletes totalling five people (100%) also obtained the optimum angle value per the standards set; 3) The results of the front limb split jerk angle are as follows: the optimum angle value of the front limbs in male athletes has met the standard value set by PB PABSI with a value range of 90-110 and an average value of 104.12. Furthermore, of the five female athletes, 3 of them are in the predetermined value range, the remaining two people exceed the predetermined range with an average value of 111.23; 4) The results of the rear limb split jerk angle, as follows: the optimum angle value of the hind limbs in male athletes has met the standard value set by PB PABSI with a value range of 140-160 and an average value of 151.64, then in female athletes also obtained an angle value that has met the standard value that has been determined with an average value of 158.17.

**Keywords:** Leg Muscle Power; Sports; Leg Angle.

## INTRODUCTION

Weightlifting is a sport that relies on power to lift weights made of iron and covered by rubber. Weightlifting athletes must have good physical and mental conditions because weightlifting matches require the physical activity of muscle strength and endurance to lift as heavy as possible, so they must have a maximum power level to achieve optimal results [1]. To become a good weightlifter, a lifter requires mastery of basic techniques. This is because mastery of basic

weightlifting techniques is the main capital to lift as much weight as possible safely without causing injury, and getting a good and correct force in weightlifting basic techniques must be mastered by a lifter.

There are two kinds of force techniques in weightlifting, namely the Snatch and Clean and Jerk force types. The Snatch force type is a type of direct force without a pause, where the athlete must lift the weight from the floor without bending the knees until both hands lift the weight

straight above the head in a perfect standing position for a few seconds until the referee rings the bell signalling the force is valid. Type of Clean and Jerk force: athletes lift the barbell in two stages, first lifting the weight from the floor to the chest limit in a squatting position. After a short pause to take a stand, the athlete lifts the barbell until both hands are straight above the head, with a perfect standing position for a few seconds, until the referee rings the bell to signal the force is valid. These two types of forces can be competed individually but combined so that the athlete's record is the sum of the maximum load of the total Snatch and Clean and Jerk forces. The basic technique assessed in this study is the jerk split because the jerk split is very commonly used in weightlifting competitions. The jerk split movement makes it easier for athletes to receive the bar in a deep position while providing a wide platform or stance so that it is more stable. The main purpose of the jerk is as part of one of the two competitive lifts in the sport of weightlifting.

According to [2], in weightlifting, there are two barbell lifting techniques, namely:

1) Snatch technique: the hand holds a barbell 80-100 cm wide, then the barbell is pulled over the head in one direct movement along with the body movement in a squat position, and the arm supports the barbell with the position of both elbows straight. From a squatting position, the body changes to a standing position with a vertical push by both legs and arms remaining straight, supporting the barbell above the head;

2) Clean and Jerk techniques are two kinds of movements performed sequentially and quickly. Clean movement is a technique of lifting a barbell over the shoulders with the body starting in a squatting position, then slowly changing to a standing position using the help of a foot push. This is followed by the Jerk force, which is bending the knees slightly while lifting the barbell simultaneously when lifting it; the right leg (the strongest leg) is in front with a straight hand position supporting the barbell above the head.

From the two techniques above, we can conclude that leg muscles dominate this sport. Limbs or legs that are large in mass cannot produce heavy load forces; therefore, athletes must train in the physical condition component of strength, especially leg muscles.

The author [3] states that power is one of the most important basic biomotor components eve-

ry sport needs. Strength must be increased as the underlying foundation in forming other biomotor components. Training power aims to increase muscle power to overcome the load during sports activities. Power training done properly and well will increase the quantity and quality of producing athletes.

Weightlifting is a sport that relies on strength to lift materials from iron [2]. A weightlifter must have a good physical and mental component compared to other sports because the weightlifting athlete match requires physical activity, especially leg muscle strength and leg muscle endurance, to try to lift as heavy as possible so that it must have a good level of strength in achieving optimal performance because the best force of a lifter comes from good leg muscle strength too. Thus, good and prime strength is the main capital applied in the match.

SMAKOR Aceh is a school that fosters the talents of young athletes from Aceh Province so that they can take part and excel in sports. One of the sports fostered at SMAKOR is weightlifting. The Aceh weightlifting SMAKOR team has won various regional and national championship events. Like the Aceh XIV Pidie 2022 Sports Week, almost 70% of athletes can win. Aprilia won a silver medal during the national pre-Youth championship in Bogor. In another national championship at PPLP East Kalimantan, precisely in Samarinda, Aprilia managed to re-carve a bronze medal, and Nurfianti contributed a silver medal.

Based on observations made by researchers on December 05, 2023, various kinds of mistakes made by athletes include: when jerking the body and dipping, athletes often go forward, then when jerk split, the push is slow, dipping stops weak legs, some athletes have problems in the legs, and some are still weak in the hands. Another problem is when athletes jerk the front leg (right), do not move quickly and often hesitate so that the unstable push of the bar to hold the weight at the time of the split, the hand does not enter when doing the jerk (still not strong enough to hold the weight). The weak hand causes the iron to fall backwards; then, the weak hand causes an uncontrolled position that should be upright, making the weight held by the athlete unstable. Researchers also see frequent athlete errors during training, and failures often occur when athletes do jerk splits.

## METHOD

This study uses a quantitative approach with descriptive methods. According to [4], quantitative data is a research method based on positivistic (concrete data) research data in the form of numbers to be measured using statistics as a calculation test tool related to the problem under study to produce a conclusion.

The author [5] uses the research instrument to measure the observed variables. The instruments in this study were leg muscle power tests and angles in the split jerk movement.

## RESULTS AND DISCUSSION

*Calculating the Power Value of Leg Muscles.* The leg muscle power test measures the leg muscles' power towards the front of the Aceh SMAKOR weightlifter. The results of leg muscle power in male athletes are in the poor category of 2 people (66.66%), and those in the good category are one person (33.33%). The total number of male athletes in weightlifting at SMAKOR Aceh is three people. So, it can be concluded that the average leg muscle power is 51.33. The results of leg muscle power in female athletes are less than three people (60%), and in the medium category, there are 2 (40%). The total number of female athletes in weightlifting at SMAKOR Aceh is five people. So, it can be concluded that the average leg muscle power is 38.8.

*Calculating the Angle Value of the Front Leg Split Jerk.* The purpose of conducting the front leg split jerk angle test with the basic technique of the split jerk is to measure the optimal angle of the front leg at a distance of 90-110. The optimal angle of the front leg in SMAKOR Aceh weightlifting male athletes has met the standard values set by PB PABSI with a value range of 90-110. Of the five female athletes, three are in the value range of 90-110, and 2 exceed the value range, namely April Lianti, with an angle of 114.72, and Febrianti obtained a score of 121.99.

*Calculating the Rear Leg Split Jerk Angle Value.* The angle of the rear leg split jerk with an optimal distance of 140-160 is by the provisions of PB PABSI, which sets the angle distance between the front and rear limbs in weightlifters. The optimum angle of the hind limbs in SMAKOR Aceh weightlifting male athletes has met the standard values set by PB PABSI with a value range of 140-160. The optimum angle value of the hind limbs

in female weightlifters at SMAKOR Aceh has met the standard value set by PB PABSI with a value range of 140-160.

Based on the results of the researcher's analysis of the findings of the above research, it was found that the development of the coaching pattern was as follows:

1) The results of leg muscle power in male athletes were in the category of less than 2 people (66.66%), and the results in female athletes were also in the category of less than 3 people (60%).

2) The results of the front leg split jerk are as follows: the value of the optimal angle of the front leg in male athletes has met the standard value that PB PABSI has set with a value range of 90-110, and of the five female athletes, 3 of them are in the predetermined value range, the rest amount of 2 people exceed the predetermined range.

3) The results of the rear leg split jerk are as follows: the optimum angle value of the hind leg in male athletes has met the standard value that PB PABSI has set with a value range of 140-160, and in female athletes obtained an angle value that has met the standard value that has been set.

Based on the results obtained, athletes have experienced obstacles in the vertical jump test; namely, athletes have not been able to get very good scores. The role of leg muscle strength is very influential on the lift results for a weightlifter because the role of the leg muscles is to support the body as well as a support (stance). Also, the leg muscles function and provide a driving force when weightlifters perform lifting movements [6]. Here, it can be explained that what distinguishes the power ability of the leg muscles is the length or duration of training during the child's time as an athlete and depends on the ability of the physical condition of the athlete himself. It could be an athlete who has been practising for a long time and is superior in ability. Still, over time, the new athlete can catch up and match the ability of the more senior athlete if he is active and diligent in following the training program given by the coach. Because the leg muscles are stronger, lifting clean and jerk weights will improve accuracy.

Vertical jumping is one of the health limits for measuring dangerous power by estimating the level of competitor jumping. Leg muscle power greatly affects lifters, especially in weightlifting sports, looking at the condition of athletes during

physical training in vertical jump movements on leg muscle power. If the athlete does not correctly move on the vertical jump, it also greatly affects the explosive power, which is not maximal in achieving these results. So, the power training of the leg muscles in the vertical jump is very important because exercising power movements to gain speed and strength supports the training of snatch, clean, and jerk movements. This motivation has a very important effect on the achievement of weightlifting, especially later in the future when conducting research; there are still changes in the field, so this research supports weightlifting sports to increase achievement at SMAKOR Aceh.

Getting a good and correct type of force and a force declared valid is not only seen from how much burden can be lifted. But balance, straight knee and elbow positions are also considered, and how the weight lifted can be controlled properly to get the correct force by the referee. To get strong leg muscles to lift as many weights as possible, athletes must have good physical condition, including leg muscle strength, weight lifting speed, and concentration to get the perfect leg angle.

The leg angle in the jerk split movement uses the basic jerk split technique test by assessing the angle of the front and back limbs; according to the results that have been obtained in the field, it can be concluded that most of the male and female weightlifting athletes of SMAKOR Aceh have obtained a very maximum score where almost all athletes have a very good basic jerk split technique and even almost all of them have obtained a perfect angle according to the standards that have been obtained determined by PB PABSI with the optimal angle of the front limb at a distance of 90-110 and the optimum distance of the rear limb at a distance of 140-160, and this has been recognised as true and wrong by PB PABSI because it has been proven by a Pelatnas athlete named Eko Yuli Irawan who has won a gold medal 4 times in a row in an international event, namely the Olympics.

## CONCLUSIONS

Based on the results of the interviews obtained, it can be concluded as follows:

1) The ability of leg muscle power of 3 male athletes of SMAKOR Aceh obtained an average score of 51.33. It was dominantly in the deficient category (66.66%), while the ability of leg muscle power of 5 female athletes of SMAKOR Aceh obtained an average score of 38.8 in the deficient category (60%).

2) From the results of the jerk split angle test of the front leg of SMAKOR Aceh male athletes totalling three people, the optimum angle value by the standards that have been set amounted to (100%). Meanwhile, the split jerk angle test results towards the front leg of SMAKOR Aceh female athletes, which amounted to 5 people, were quite varied. Three people (60%) obtained the optimum angle value by the standards that had been set, while two people (40%) obtained results that were not by the standards.

3) From the results of the jerk split angle of SMAKOR Aceh, male athletes totalling three people (100%) obtained the optimum angle value per the standards set. Meanwhile, the results of the split jerk angle test of the front leg of SMAKOR Aceh female athletes totalling five people (100%) also obtained the optimum angle value per the standards set.

4) The jerk angle of the front leg split as follows: the value of the optimal angle of the front leg in male athletes with a value of 90-110 and the average value of 104.12. Furthermore, of the five female athletes, three are in the predetermined value range, and the remaining two people exceed the predetermined range with an average value of 111.23. Following the results obtained on the field, it can be concluded that the male and female weightlifting athletes of SMAKOR Aceh have obtained very maximum scores, where almost all athletes have excellent basic jerk split techniques, and almost all of them have obtained perfect angles.

5) The angle of the split jerk of the hind limbs is as follows: the optimum angle value of the hind limbs in male athletes was 140-160, and an average value of 151.64; then, female athletes also obtained an angle value that met the standard value that has been set with an average value of 158.17. Following the results obtained on the field, it can be concluded that the male and female weightlifting athletes of SMAKOR Aceh have obtained very maximum scores, where almost all athletes have excellent basic jerk split techniques, and almost all of them have obtained perfect angles.

Trainers must provide a more effective training program, especially in improving the quality of

leg muscle power and leg angle in the jerk split movement.

2) Athletes must be able to train harder to have leg muscle power and leg angles in the jerk split movement to get maximum results.

3) For weightlifters, practising discipline and improving overall skills will help achieve high performance.

4) The results of this study can be used as guidelines for other researchers in relatively similar situations or contexts in different fields to improve the performance of sports experts.

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