

The effect of squat training on the fencing ability of south sulawesi athletes

Andi Muhammad Rizky Al Mufarid^{1*}, Andi Ihsan¹, and Muhammad Rizky Al Farizi¹

¹Faculty of Sports and Health Sciences, Universitas Negeri Makassar, Makassar, Indonesia

Abstract. This study aims to determine the effect of Squat exercises on the ability to attack epee weapons with South Sulawesi athletes. The research method used is a quasi-experimental design with a two-group pre-test-post-test design on a research sample of 10 people with squat exercise. The treatment was carried out for 16 meetings with a frequency of exercise 3 times a week, sets of 3 - 4 and repetitions of 10 - 14, and loading was carried out based on the individual ability of each sample. Based on the results of data analysis, it was found that squat exercise had a significant effect of $-8.200 > \alpha 0.05$ on the ability to attack epee weapons with South Sulawesi athletes. Squat exercises are more effective because the characteristics of the squat exercise are closer to the characteristics of the attack movement in fencing. The results of this study recommend to coaches, athletes in an effort to increase the dominant physical component to increase the ability of epee weapon attacks in fencing to choose the form of squat exercises.

1. Introduction

Fencing is a branch of game sports that uses a set of tools when practicing or competing. Fencing is a martial arts culture with the use of weapons that emphasize skill techniques such as stretching, stabbing or parrying. In fencing there are three types of weapons, namely *foil*, *degen (epee)*, and *sabre (sabre)*. Each weapon has differences in both shape, field of target and typical characteristics of the parry and grip techniques.

The fencing game has attack techniques where excellent physical abilities are needed, including strength, leg explosiveness and accuracy. Good leg strength and explosiveness are obtained only through regular, systematic and continuous physical condition training. Forms of exercise to obtain good leg strength and explosiveness through weight training include *Squat* exercises.

The form of squat training is a form of weight training to improve physical condition, especially the strength and explosiveness of the leg muscles with a movement process whose target training is on the leg muscles. Where this form of exercise focuses on increasing the strength and explosive components of the leg muscles. According to Soekarman (1988) "High physical condition can only be

* Corresponding author: rizkylmufarid@unm.ac.id

achieved through hard training, and the way of training is not enough by practicing the sport alone but must be specially prepared in accordance with each sport that it is engaged in. Thus, the form of squat training is expected to improve the ability of fencing athletes' weapon attacks.

According to Wibur P. Scott, 2024. The game of fencing has become a sport that focuses primarily on physical fitness and educational specs. The sport of fencing develops strength, endurance, and agility. In addition, fencing also forms personal qualities such as determination, courage, self-control, perseverance, enthusiasm to win and unlike other sports, fencing encourages a proactive attitude and the ability to think quickly. The game of fencing requires excellent physical condition to support the achievement of playing techniques, therefore a fencing player must have the physical components needed, including; strength, speed, power, coordination, precision and flexibility, especially in the leg muscles and arm muscles.

This physical component can be improved through various forms of regular, systematic and continuous exercise and one form of exercise that is effective to improve such physical components is weight training. As experts explain, weight training is an effective way to increase muscle strength and explosiveness. The most effective exercise program to increase muscle strength is a weight-bearing training program. Weight training to increase the strength of the leg muscles can be done by providing "an initial load of about 50 - 60% of a person's body weight with a number of repetitions of 10 - 12, number of sets of 3 - 5, rest intervals of 2 - 4 minutes with a moderate rhythm" (*Sajoto, 1995*). In implementing a good training program, it must be based on the principles of training along with the components of training to improve the physical quality of the athlete while still based on the physiological ability of each individual athlete concerned. Fox L. Bowers (1988) training is "a physical training program to develop an athlete in the face of important matches". Practice is a process of consciously improving the quality of athletes to achieve maximum achievement by being given physical and mental loads regularly, directed, gradual, increasing and repeatedly. Bompa (1994) explained that; "Exercise is a systematic sports activity over a long period of time, gradually and individually improved which aims to form human beings whose physiological and psychological functions in meeting the demands of tasks. Sharkley B.J. (1986) explained that in carrying out a weight-bearing training program to improve physical condition, some of the principles of the training program are referenced as follows; Overload principles, specialization principles; The principle of *individualization (individualization)*, the principle of variation of practice, the principle of recovery of origin, and the principle of modelling.

Squat Exercises

Due to their specific movement characteristics, squat exercises—when performed with appropriate volume, intensity, and frequency—are highly effective for developing the physical components required for competitive fencing. Squat movements with isotonic contractions when performed repeatedly with a certain load can increase the strength, power and endurance of the leg muscles by itself having an impact on increasing the attacking ability of fencers. According to (Peling, 2011) *Squat* is "a form of strength training with a weight imposed on the

shoulders". The movement when doing *squat exercises* is with the position of the legs shoulder-width apart and the body upright with a barbell when the movement goes up and down squats. The muscles that can be developed when doing *squat exercises* are "developing the lower back (*erector spinae*), back (*gluteal muscle*), the front part of the upper leg (*quadriceps*) and the back of the upper leg (*hamstring*)". (Yuganthari, 2011). Stone (1991) explains that: "To perform squats, bars (*iron bars*) are placed on a rack, slightly below the shoulders. The athlete places the bar on the back, slightly below the shoulder blades on the trapezoidal muscle and lifts it off the rack. The back is kept straight in the squat by keeping the chest out and the head at all times while lifting weights, both while moving the iron off the rack and while demonstrating the movement". The analysis of movements in squat exercises as stated by Thompson (1991) is as follows: (1) upward movement to straighten the position of the legs (a) Hips; movement extensions, hamstrings, gluteus maximus (b) knees; movement of extension, quadriceps (c) Legs and ankles; plantar flexion, gastrocnemius, peroneus and soleus. (2) Movement back in the position of bending the knee (a) Hip; hip extensors (*eccentric contraction*) (b) knee; movement flexion, knee extensor (*eccentric contraction*) (c) legs and ankles; movement dorsal flexion, plantar flexors (*eccentric contraction*). With squat exercises it can "strengthen the buttocks, quadriceps, hamstrings, hips and calves responsible for every movement performed." (Zihan Berliana Ram Ghani)

The muscles that are trained in squat exercises are the lower body, as well as the muscles above the waist, as well as the gluteus maximus, minimus, and medius muscles, quadriceps, hamstrings, adductors, hip flexors and calves. In addition to the lower body muscles, squat exercises will also target core muscles, including the rectus abdominis, obliques, transversal abdominis and erector spinae muscles. "Core muscles help improve mobility and balance. Squat exercises not only increase leg strength, they also stabilize muscles, maintain balance and improve communication between the brain and muscle groups in the body." (Andre Kurniawan., Merdeka.com. February 19, 2021) For more details on the form of squat exercises, you can see the following picture:



Figure 2.2. Squat Exercises

Fencing Attack

One of the most frequently used and very decisive techniques to obtain points in any fencing match is the attack, since only by making an attack will a player get closer to the target against the opponent so that the possibility of obtaining points can be achieved. An attack in fencing is an attacking move that aims to hit the opponent's target area with a weapon, which consists of several types of attacks, namely: lunge, disengage, coupe and counter attack with each different technique and objective. (Dimas Nugroho, December 5, 2024). Therefore, a player in an attack must reach or hit the goal in order to get points to win a match. Attacks can only be done well if they are supported by good physical conditions, in this case leg muscle strength and leg muscle endurance to help a player in his attempt to attack so that the attack movement becomes effective. According to AFA, (1994). *"Attack is defined in the rules as: an offensive action made by a fencer who is extending his sword arm and is directing his epee point towards the opponent's trunk"* which means that an attack is a movement made by a fencer starting by straightening the arm holding the weapon with the tip of the weapon directed towards the target plane on the opponent's body. "An attack can be an action or a follow-up movement from a defensive position, a change from defensive to offensive attitude can start by taking a forward step aimed at approaching the opponent." (Andi.Ihsan, 2006).

Garret in A.Ihsan (2002) says that "in an attack, the hand holding the weapon is straightened quickly and smoothly, the body position is upright with the chest puffed out the soles of the front and back feet are not lifted and remain attached to the floor." The weapon is held gently but firmly and directly straightened at the opponent in the direction of the desired target, then returns to its original position, to further identify other forms of attack. Effective attacks can only be done through systematic training and continuing to develop the speed and strength of the leg muscles so that the attacks are on target. An attack is declared legitimate and scored if the tip of the weapon hits the opponent's target, with sufficient pressure characterized by the fault of the lamp on the weapon apparatus, and must therefore be practiced repeatedly and diligently. Based on the description of attack movements that have been presented, it can be concluded that what is meant by attack in this study is a process of movements carried out by a fencer to stab the opponent at the right target which starts by straightening the arm first, then stepping forward with the front leg assisted by the push of the back leg with the tip of the weapon pointing to the target plane, puncture precisely and obtain numbers.

Degen Weapons

According to Kamaruddin, (2019) that degen weapons (*epee*) are "one type of fencing weapon that is used specifically for stabbing". A legitimate area of use on all parts of the body, namely from the tips of the feet to the tip of the head. This development eliminates the need for fencers to wear metallic jackets. In degen weapons, it is enough to use standard fencing clothes that are white and white. The degen weapon is relatively large in the shape of a V and is trenched with hand guard

(*kom*) on this weapon the round is much larger than the floret weapon. According to Andi Ihsan, (2006) that degen is; "The largest weapon with a minimum weight of 770 grams, minimum length of 110 cm, triangular shape with parts: *pointe d'arret*, a sword tip that can be pressed with a spring resistance (*veer*) of at least 500 grams, with a travel distance of 1 mm, a sword iron with a length of 90 cm to the tip of *pointe d'Arret*, hand guard (*kom*) It is circular in shape that can be passed by a cylinder-shaped tool with a height of 15 cm, and a diameter of 13.5 cm. The curved part with a depth of 3 cm to 5.5 cm. Finger guards, grips, pommel irons, socket bodywire connections, and sword cords".

2. Research Methods

The independent variable of this study was *squat* exercises. Variable bound fencing ability of degen weapon. This study is a semi-experimental study with a research sample of 10 South Sulawesi fencing athletes. The sampling technique by *purposive sampling* is the determination of the sample with certain considerations, namely only male gun fencing players and already understand fencing attacks. This research was carried out at KONI South Sulawesi Province condition training room and at the gymnastics building of FIK UNM in the city of Makassar, South Sulawesi. The data was analyzed using the SPSS program.

1. Hasil

The data obtained from the research were preliminary test data and final test data (posttest) of the ability to attack the fencing of the squat exercise of the South Sulawesi fencing athletes. The initial test *data for the ability* to attack the fencing of the weapon and squat exercises with a total of 10 samples, obtained an average score of 69.20 with a standard deviation result of 8.90 total score and a median score of 67.00 total score, as well as a variance value of 79.28 total score. For the range value, 27 total scores were obtained from the data difference of a minimum of 57 total scores and a maximum of 84 total scores. Final test (*Posttest*) The final test data of the ability to attack the fencing of the weapon and squat exercises with a total of 10 samples, obtained an average score of 80.30 with a standard deviation result of 7.00 total score and a median score of 79.50 total score, as well as a variance value of 49.12 total score. For the range value, 20 total scores were obtained from the data difference of a minimum of 70 total scores and a maximum of 90 total scores. Based on the results of the t-test, the data of the initial and final tests of squat exercises of South Sulawesi fencing athletes can be obtained: the t-observation value is -8,200 with a significant value of 0.000 smaller than the value of α 0.05. Consequently, the null hypothesis (H_0) was rejected and the alternative hypothesis (H_1) was accepted, indicating that the squat training treatment had a significant effect on improving the *épée* fencing attack. Fencing ability improved significantly following the squat exercise intervention; the average score increased from a pre-treatment mean of 69.20 to a post-treatment mean of 80.30. So that the effect of squat exercise treatment, when viewed from the average score range, has an increase in the effect of 11.10 total scores.

3. Discussion

Attacks in the game of gun fencing are one of the movement processes carried out by players to obtain points. Points are obtained when a player hits the target area or a legitimate target area on the opponent by using a degen weapon and one of the attempts made is to attack to get closer to the target area of the target area on the opponent's body. An attack is a series of movements carried out by a degen fencing player by starting to straighten the arm holding the weapon with the tip of the weapon directed towards the target plane on the opponent's body. Attack is a follow-up movement of the fencing position where the change from this position to an attacking attitude begins with stepping the front foot to approach the target, straightening the arm holding the weapon while maintaining the position of the body to keep it stable, where the front foot is in the stance and the back foot is in a straight position and both feet must remain tightly attached to the floor.

The process of a series of attack movements on a degen weapon begins with straightening the arm holding the weapon, then followed by stepping forward by lifting the leg approximately 10 cm high from the floor surface (*lover*) with the help of the push of the hind leg to the straight, the arm that does not hold the weapon is thrown back with the aim of helping to push the body forward and the tip of the weapon is directed towards the target plane of the opponent. After that, return by bending the hind legs to the original position. This attack movement requires strength and endurance from the two leg muscles so that the player can maintain a stable body position to anticipate counterattacks from the opponent.

Squat exercises are simple exercises that are effective in strengthening body muscles and burning calories, where the benefits for the body and its various types are effective in training muscle strength and nourishing the body in a practical way. According to Patricia Lukas Goentoro (April 23, 2024), squat exercises are a form of sports training to help improve fitness and strengthen muscles, which is done by bending the legs to resemble positions such as squatting or kneeling on a chair. The benefits of squat exercises help strengthen the core muscles of the body such as calves, quadriceps and back, buttocks and back. (<https://hellosehat.com>). Squat exercises are dynamic exercises that require the cooperation of several lower and upper body muscles, but the main focus is on the strength of lower body muscles such as quads, hamstrings and buttocks. Squat training as one of the training models that is carried out on fencers with the internal weight of each individual based on their weight, has been carried out regularly, systematically and repeatedly with predetermined reps and sets. This exercise can increase the strength of the leg muscles which are needed by fencing players in making in-game attacks to get points or points.

The process of doing squat exercises can be done in two ways or techniques (1) by using bars (*iron bars*) placed on a rack, slightly below the shoulders. The testee places the bar on the back slightly below the shoulder blades on the trapezoidal muscle and then lifts it off the rack. The back is kept straight in the squat while keeping the chest position bent and the head up at all times while lifting weights both while removing the iron from the rack and also temporarily in demonstrating the movement. (2) Squat movements can be performed using the

weight of each individual without any external weight such as bars or iron bars. These two forms of squat exercises can improve the strength of the leg muscles, thigh muscles and stability of the back muscles when done regularly, systematically with a certain period of time.

The increase in leg muscle strength is due to the squat exercises that have been carried out during the eight weeks of the meeting have a positive effect on the ability of degen gun fencing attacks on the fencing player, because there is an increase in energy in the leg muscles so that when the player attacks the range is very wide due to the expansion of movement in the legs so that the target can be reached properly. The results of this study are in line with the findings of the study which said that squat exercises significantly increased leg muscle strength after being trained within 8 weeks with an increase at the time of the pre-test found an average of 91.88 increasing to 128.84 at the time of the post test (*Andi. Ihsan, 1994*). Squat movements can be done in three ways, namely quarter squat, half squat and deep squat. In this study, the athletes performed the half-squat variation of the squat exercise. To get maximum results from squat exercises, athletes must be sure to do squat movements with half squats, as Stone (1991) said that; The half squat exercise is done with your feet shoulder-width apart, your back flat, bend your knees and push your body down (*lower*) until your thighs are at level with the floor and keep your heels attached to the floor. This is in line with the results of research conducted by Agung Supriyoko (2018) who said that: Strength plays an important role in fencing, especially leg muscle strength. Leg muscle strength is needed because the support (*leg*) in playing fencing must remain active and move to support attacking and defensive movements.

Analysis of movements in squat exercises physiologically when analyzing movements to straighten the position of the legs, then in the hips there are *movements of extension, hamstring, gluteus maximus*. In the knee there is an *extension movement, quadriceps*, while in the foot and ankle there are *plantar flexion, gastrocnemius, peroneus and soleus* movements. The process of movement back in the position of bending the knee on the hip occurs the movement *of hip extensors (eccentric contraction)*, in the knee there is a *flexion movement, knee extensor (eccentric contraction)*, while in the legs and ankles there is a movement *of dorsal flexion, plantar flexors (eccentric contraction)*. Squat training as a treatment given to fencing athletes through this study with certain loads, sets, reps and duration of exercises affects the ability of fencing attacks by South Sulawesi fencing players.

Based on the results of data analysis in this study, it is explained that the form of squat training has a positive influence on the attack ability of the South Sulawesi fencing players. On average, squat exercises have an effect on fencing attacks of 80.30. Thus, it can be concluded that squat exercises have a positive influence on the degen's fencing attacking ability. This improvement was obtained after giving a 5-week treatment of squat training with a frequency of 3 weekly meetings, 10 - 14 reps, 3 - 4 sets and weights based on each individual's weight. The determination of the load of exercises, sets and reps is also supported by the opinion of Christine Ayu, June 12, 2020, who said that squats are done by lowering the body while pushing the back back, when lowering the body as if it were going to sit or

squat. Do it with a frequency of 3 - 4 times a week, with reps between 8 - 12 times and 3 - 4 sets. This study also found that squat exercises are effective in improving the ability of the deer of south sulawesi fencers.

Squat training treatments have increased the strength of leg muscles, thigh muscles, calf muscles, ankles and legs in fencing players, thus having an impact on improving the ability of degen weapon attacks in fencing games. This research is in line with the results of the research of A. Muhammad Rizky Al Mufarid (2020), who found that there is a positive role of limb power and eye coordination on the ability of simple attacks in fencing. Muscle strength increases through the adaptation of the nervous system that allows the player to move an enlarged number of units of motion at a time.

The adaptation of the nervous system to strength training is at least as important as the adaptation of muscle-based hypertrophy. When muscles are trained regularly, systematically and continuously according to the principles of weight training, physiological changes occur, both muscle biochemical changes and muscle hypertrophy. As explained by Fox (1991), hypertrophy that occurs in muscle fibers is characterized by the presence of one or several changes as follows: (1) an increase in the number or size of myofibrils in each muscle fiber (2) an increase in the total number of contractile proteins, especially myosin filaments, (3) an increase in the density of each muscle fiber (4) an increase in the size and strength of connective tissue, tendons and ligaments (5) even an increase in the number of muscle fibers is found.

4. Conclusion

Based on the results of data analysis and discussion of the research results, it can be concluded that: There is a significant influence of squat training on improving the ability of degen gun fencing in the fencing game of South Sulawesi athletes. It is recommended to fencing coaches in an effort to improve attack abilities for fencing players, so weight training is very important to be an option to improve the physical condition of athletes where the recommended weight training is a form of exercise Squat

Bibliography

1. AFA., 1994. *Know The Game Fencing*. London; A & C Black Publishers Ltd 35 Bedford Row.
2. Bompa., O.Tudor.,1983. *Theory and Methodology of Training*. Philadelphia; Kemdall/Hunt Publishing Company.
3. Brian Pitman. 1996. *Fencing Techniques of Foil, Epee and Sabre*. London; The Crowod Press.
4. Fox, E.L. Bowers.,R.W. The Late. 1991. *Sport Physiology*, 3th ed, WCB. WM. C. Brown Publishers
5. Harsono. 2008. *Coaching dan Aspek-Aspek Pskologis dalam Coaching*. Jakarta: CV. Tambak Kusuma.
6. Ihsan, A. 2006. *Permainan Anggar*. Makassar: Badan Penerbit Universitas Negeri Makassar.
7. Ihsan, A. 2002. *Efektivitas serangan langsung dalam Permainan Anggar*

- Senjata Floret*. Program Pascasarjana Universitas Negeri Jakarta.
8. Kamaruddin, I. 2011. Kontribusi Kekuatan Pegangan, Keseimbangan, dan Daya Ledak Tungkai terhadap Ketepatan Tusukan dalam Permainan Anggar Senjata Degen. (*Jurnal Ilara, Volume 11, Nomor 1 Juni 2011. Hal.10 – 21.*
 9. Patricia Lukas Goentoro. 2024. <https://:hellosehat.com>.
 10. Peling, sri widhari yuganthari. (2011). *Perbedaan Pengaruh Metode Latihan Beban Leg-Press Dan Sqat Terhadap Peningkatan Prestasi Lari 100 Meter Ditinjau Dari Waktu Reaksi.*
 11. Reza Adhi Nugroho., Rizki Yuliandra., Aditya Gumantan., Imam Mahfud. 2021. Pengaruh Latihan Leg press dan Squat Trust terhadap Peningkatan Power Tungkai Atlet Bolavoli. *Journal Jendela Olahraga Supported Universitas PGRI Semarang.*
 12. Rizky Al Mufarid Andi, 2020. Analisis Power Tungkai dan Koordinasi Mata Tangan terhadap Kemampuan Serangan Sederhana Beladiri Anggar Senjata Degen Atlet Sulawesi Selatan
 13. Sajoto. 1995. Peningkatan dan Pembinaan Kekuatan Kondisi Fisik Dalam Olahraga. Semarang: Dahara Prize, Efthar Offset.
 14. Scott Wibur P. 2024-2025. *The Complete Fencing Masterclass: The Step-By-Step Guide to Learn Fencing For Self Defense.*
 15. Soekarman. 1988. *Dasar Olahraga Untuk Pembina, Pelatih dan Atlet.* Inti Idayu Press, Jakarta.
 16. Stone, J.W., Kroll, E.L. 1991. *Sport Conditioning and Weight Training*, 3th ed.,Programa for Athletic Competition. Philadelphia; WCB.WM.C. Brown Publishers.
 17. Supriyoko Agus,. 2018. Kondisi Fisik Atlet Anggar Kota Surakarta., (*Jurnal Sportif: Jurnal Penelitian dan Pembelajaran; Volume 4. Nomor 2.*)
 18. Whitley, J.D.,Smith, E.L. 1971. *Infulence of Different Training Program on Strength and Speed of Limb Movement. Res.Quart.*