

The effect of squat thrust, sit-up, and power leg exercises on football heading ability in 13-year-old students at persopi elang timur football academy

Wawan Nur Rohman¹, Syamsuryadin^{1*}, Ibnu Danang Pratama¹, Abyan Aufa Al Hanif¹, Haziq Hanantoseno Maramis¹, Hassan Naufal Yahya¹, Rouf Azzam Rozaq¹, Muhammad Aulia Wirawan¹, Rafi Fadhil Asmi¹, Thoriq Arkanudin¹, Fathiya Salsabila Nur Aini¹

¹Pendidikan Kepelatihan, Fakultas Ilmu Keolahragaan, Universitas Negeri Yogyakarta, Jl. Colombo No. 1, Karangmalang, Depok, Sleman, Daerah Istimewa Yogyakarta, Indonesia.

*Corresponding Author. Email: syamsuryadin@uny.ac.id

Abstract

The objective of this research is to determine the effect of squat-thrust, sit-up, and leg power training towards the football heading ability of SSB Persopi ELTI (Persopi ELTI Football School) students in the age group of 13 years old. The heading ability must be possessed by every football player to attack and defend.

This research was an experimental study with a squat pretest-posttest design. The research population included all SSB Persopi ELTI players in the age group of 13 years old totaling 24 students. The sampling technique was total sampling with the ordinal pairing division method. The research instrument was a heading test with a validation and reliability level of 0.746 and 0.818 while to analyze the data using the t-test.

Based on the research findings, there is a significant effect of training with squat-thrust, sit-up, and leg power on the heading ability of SSB Persopi Elang Timur students in the age group of 13 years old. If you look at the mean difference at 1.66 where the mean pretest jump heading is at 2.50 and the posttest jump heading increases at 3.58. And the pretest normal heading is at 3.08 and the posttest normal heading increases at 5.42. Hence, it can be concluded that training with squat thrust, sit ups, and leg power contributes positively to improving the heading ability. This difference reflects an increase in jump heading at 66.68% while for normal heading at 54.12%. While for the control group, the pretest jump heading is at 1.8 and the posttest jump heading is at 2.17 and the pretest normal heading is at 2.42 and the posttest normal heading is at 3.50.

Keywords: *Training, Squat Thrust, Sit-up, Leg Power, Heading*

INTRODUCTION

Football is a team sport that is very popular and growing rapidly in various countries, including Indonesia. This game requires players to master various important aspects, including technique, tactics, physical condition, and mental attitude in order to achieve optimal performance in matches (Luxbacher, 2011). Early age football training is the main foundation for producing accomplished athletes, because at this stage children are in a period of rapid motor and physical development (Bompa & Buzzichelli, 2019).

Football schools (SSB) serve as a platform for structured and continuous early age athlete training. Through SSB, young athletes are guided to master basic football techniques correctly, improve their physical condition, and instil the values of sportsmanship and teamwork (Ganesha, 2010). At the age of 12–13 years, athletes are in the learn to train phase, which is an important stage in the development of technical skills and physical condition components as a basis for long-term achievement (Balyi, Way, & Higgs, 2013).

In football, the basic techniques that players must master include passing, dribbling, shooting, ball control, and heading. One technique that plays an important role in both attacking and defending

is heading. Heading is used to score goals, pass the ball, and block the opponent's attack in aerial situations (Sucipto et al., 2000). Therefore, heading skills need to be trained systematically from an early age so that players can compete effectively in aerial duels.

Heading ability is not only influenced by mastery of the technique of heading the ball, but also depends heavily on the physical condition of the player. The physical components that play a dominant role in heading include abdominal muscle strength and leg power. Leg power is used to produce high and strong jumps, while abdominal muscle strength plays a role in maintaining body stability and assisting in the initial movement and swing of the body when heading (Suharjana, 2013; Irawadi, 2011). Without good physical condition, heading tends to be less than optimal even if the technique has been mastered.

One form of exercise that is effective and suitable for young athletes is body weight training. Squat thrusts are an exercise that involves many muscle groups, including the leg muscles, abdominal muscles, and core muscles, and has explosive movement characteristics that are relevant to the needs of football (Fardi & Risman, 2019). In addition, sit-ups have been proven effective in increasing abdominal muscle strength, while leg power training aims to increase the explosive power of the leg muscles, which is very much needed in jumping and aerial duels (Emral, 2017; Suharjana, 2013).

Based on initial observations at SSB Persopi Elang Timur for the 13-year-old age group, players' heading ability is not yet supported by systematic measurement data. The training programme implemented still focuses more on technical and tactical aspects, while physical conditioning exercises such as squat thrusts, sit-ups, and leg power have not been optimally utilised as part of training to improve heading ability. This condition indicates the need for scientific studies that empirically test the effect of these exercises on the heading ability of young players.

Therefore, this study is important to determine the effect of squat thrust, sit-up, and leg power exercises on the heading ability of 13-year-old SSB Persopi Elang Timur students. The results of this study are expected to contribute scientifically to the development of sports coaching science and serve as a basis for coaches in developing more effective, measurable training programmes that are appropriate for the characteristics of young athletes.

METHOD

The purpose of this study was to determine the effect of squat thrust, sit-up, and leg power exercises on the heading ability of SSB Persopi ELTI KU-13 Year students. This is because every football player must have heading ability for both attacking and defending. This study was an experimental study with a squat pretest-posttest design. The population involved in the study included all 24 players of SSB Persopi ELTI KU-13. The sampling technique used was total sampling with the ordinal pairing method. The instrument used was a heading test with a validation and reliability level of 0.746 and 0.818 to analyse the data using a t-test.

RESULTS AND DISCUSSION

This study aims to determine whether squat thrust, flexibility, and power training have a significant effect on the heading ability of SSB PERSOPI Elang Timur KU-13 students. This study was conducted over a period of approximately one month, with training intensity three times a week. Pretest and posttest data were collected, and squat thrust, sit-up, and power training were conducted over 16 sessions.

After the pretest, the participants were divided into group A, which received treatment, and group B, which did not receive treatment. The treatment was then administered over 16 sessions. The treatment was given during the regular training sessions of SSB PERSOPI Elang Timur KU-13, which included a training programme of squat thrusts, sit-ups, and power exercises to improve heading ability. The normality test in this study used the Shapiro-Wilk test. In this test, the hypothesis tested was whether the sample came from a population with a normal distribution. The decision to accept or reject the hypothesis was made by comparing the Asymp. Sig value with 0.05. If the Asymp. Sig value was > 0.05 , the hypothesis was accepted, but if the Asymp. Sig was < 0.05 , it was rejected.

Based on the data above, the Asymp. Sig results for each variable are > 0.05 . It can be stated that the sample comes from a population with a normal distribution. Thus, the variable data from this study can

be processed using a parametric statistical approach. The results of the homogeneity test using the F test above show a significant value > 0.05 . This value indicates that it comes from a population with the same variation. Therefore, it can be concluded that the heading ability test data is considered homogeneous in accordance with the homogeneity test criteria.

To determine whether training with squat thrusts, sit-ups, and power has an effect on the heading ability of SSB PERSOPI Elang Timur KU-15 students, a t-test was conducted. The t-test results are presented in the following table:

Table 1. Results t-test

| Treatment | t-test for equality of means | | | |
|--------------------------------|------------------------------|---------|----------------|-----------------|
| | T-count | T-table | Sig. (2tailed) | Mean Difference |
| Squat thust, sit-up, leg power | 3.745 | 1.679 | 0.001 | 1.667 |

Based on the t-test results, it was concluded that the t-count value of $3.745 > 1.679$ t-table value, with a significance level of $0.001 < 0.05$. Therefore, H_0 was rejected and H_a was accepted. Thus, it can be concluded that there is a significant effect of squat thrust, sit-up, and power training on the heading ability of SSB PERSOPI Elang Timur KU-13 year students. Looking at the mean difference of 1.667 and the pretest mean jump heading A of 2.50 and pretest normal heading A of 3.08, it can be concluded that squat thrust, sit-up, and power training contribute positively to improving football heading ability. This difference reflects an increase of 66.68% and 54.12% from the initial value (pretest). This means that training with squat thrusts, sit-ups, and power has a positive impact and can improve football heading ability by that percentage.

The results of the study show that squat thrust, sit-up, and leg power exercises have a significant effect on improving heading ability in 13-year-old students at SSB Persopi Elang Timur. These findings indicate that a combination of physical conditioning exercises involving core muscle strength and leg explosive power is very effective in supporting the execution of heading techniques in young athletes. Physiologically, heading ability is highly dependent on the coordination between muscle strength, movement speed, and jump timing. Leg power plays an important role in producing optimal vertical thrust, enabling players to reach the highest point when heading the ball. This is in line with Irawadi's (2011) opinion, which states that power is the ability of muscles to produce maximum force in a short time, and is very much needed in explosive activities such as jumping and heading the ball. With increased leg power, players have a greater chance of winning aerial duels.

Squat thrust exercises contribute significantly to improving heading ability because they involve many muscle groups simultaneously, including the leg muscles, abdominal muscles, and core muscles. The explosive movements in squat thrusts resemble the movement patterns in football, especially when starting, pushing off, and stabilising the body before heading. According to Fardi and Risman (2019), squat thrusts are an effective exercise for improving overall strength and coordination, making them relevant for young athletes. In addition, sit-ups have been shown to play a role in increasing abdominal muscle strength, which supports body stability when heading. Abdominal muscle strength is essential for controlling body position, especially when players lean backwards before heading the ball. Emral (2017) explains that the abdominal muscles play an important role in maintaining balance and transferring energy from the lower body to the upper body. With strong abdominal muscles, players are able to produce more directed and powerful headers. The findings of this study are in line with the research by Ridho Adi Bagas Wahyono (2017), which states that sit-up exercises have a significant effect on increasing the distance of headers in SSB students aged 13–15 years. Similarly, research conducted by Yanu Setiawan (2013) shows that improvements in heading ability are influenced by structured physical training specific to the technical requirements of heading. The similarity of these results reinforces that appropriate physical conditioning training has a real contribution to improving heading skills.

The relationship between power and heading ability is very close because power plays a role in producing a high jump and a powerful head thrust upon contact with the ball. Explosive leg muscles allow players to reach their highest point when jumping, while neck and upper body muscle strength helps generate optimal ball direction and speed. Therefore, the better a player's power, the greater their chances of winning aerial duels and producing effective headers (Widiastuti, 2015).

In the context of early age training, the results of this study support the Long Term Athlete Development (LTAD) concept, which emphasises the importance of developing basic physical abilities in the learn to train phase (ages 9–12–13 years). At this phase, athletes need to be given training that is fun, varied, and appropriate for the characteristics of child growth, including basic strength training using their own body weight (Balyi, Way, & Higgs, 2013; Bompa & Buzzichelli, 2019). Squat thrusts and sit-ups are safe and effective exercises for early age athletes if given under proper supervision.

Soccer coaching at ages 10–13 is a crucial stage in the development of young athletes, as it represents a transitional phase from basic introduction to mastery of specific skills. At this age, children begin to develop better coordination skills, develop an increased cognitive understanding of the game, and are ready to receive more structured training than at earlier ages. Therefore, coaching must be tailored to the characteristics of a child's physical growth and psychological development (Febrianta & Sabillah, 2022).

In terms of long-term development, age 13 is also a crucial stage in the process of talent identification and development. Factors determining player development at this age include not only technical ability but also physical and psychological aspects, as well as the ability to play within a team. Therefore, development must be holistic and integrated to ensure optimal player development (Bidaurrazaga-Letona, I., et al. 2019).

In addition to technical, physical, and tactical aspects, coaching for 13-year-olds also plays a crucial role in developing psychological and character traits. Through training and competition, players learn discipline, responsibility, sportsmanship, self-confidence, and the ability to work as a team. Therefore, coaches play a role not only as technical instructors but also as educators who shape the personalities of young athletes (Sucipto, 2015).

The implications of these research findings indicate that SSB coaches need to pay more attention to physical conditioning exercises as an integral part of the technical training programme. Until now, heading training has often focused solely on technical aspects without considering the athletes' physical readiness. In fact, without adequate abdominal muscle strength and leg power, the execution of heading techniques will not achieve optimal results (Suharjana, 2013). Thus, the improvement in heading ability among SSB Persopi Elang Timur KU-13 students cannot be separated from the contribution of squat thrust, sit-up, and leg power exercises carried out in a programmed and continuous manner. These exercises have been proven to increase physical capacity, which directly supports heading technique performance in football.

CONCLUSION

Based on the results of data analysis, hypothesis testing and research results, the following conclusions can be drawn:

- a. There is a significant effect of squat thrust training on the heading ability of SSB Persopi ELTI KU-13 students.
- b. There is a significant effect of sit-up training on the heading ability of SSB Persopi ELTI KU-13 students.
- c. There is a significant effect of leg power training on the heading ability of SSB Persopi ELTI KU-13 students.
- d. There is a significant effect of squat thrust, sit-up, and power training on improving the heading ability of SSB Persopi ELTI KU-13 students.

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