

The Effect of Skipping Exercise on Lower Limb Muscle Power and Abdominal Muscle Strength to Support Heading Ability in Football at FIKES Sport Club.

Muhamad Rifqi Ridho¹, Suhadi²

^{1,2}Department of Physical Education, Faculty of Sport and Health Sciences, Yogyakarta State University, Yogyakarta, Indonesia

ABSTRACT: This study aims to examine the effect of skipping exercise on lower limb muscle power and abdominal muscle strength in supporting heading ability among football players of FIKes Sport Club. This research employed an experimental method using a one-group pretest–posttest design. The sample consisted of 15 football players selected using total sampling technique. Lower limb muscle power was measured using the vertical jump test, abdominal muscle strength was assessed through a 30-second sit-up test, and heading ability was evaluated using a standardized heading test. The training program consisted of structured skipping exercises conducted over a predetermined training period. Data were analyzed using a paired sample t-test with a significance level of 0.05, assisted by SPSS version 25. The results showed a significant improvement in lower limb muscle power, abdominal muscle strength, and heading ability after the skipping exercise program ($p = 0.000$). These findings indicate that skipping exercise has a significant effect on enhancing physical components that support heading performance in football. Therefore, skipping exercise can be recommended as an effective and practical training method to improve lower limb muscle power, abdominal muscle strength, and heading ability in football players.

KEYWORDS: skipping exercise, lower limb muscle power, abdominal muscle strength, heading ability, football

I. INTRODUCTION

Football is one of the most popular sports worldwide and requires players to master various technical skills supported by optimal physical conditions. Among fundamental football techniques, heading plays a crucial role both in offensive and defensive situations, particularly during aerial duels. Effective heading performance depends not only on technical proficiency but also on adequate physical components, especially lower limb muscle power and abdominal muscle strength.

Lower limb muscle power is essential for generating explosive vertical jumps, enabling players to reach optimal height during heading actions. Meanwhile, abdominal muscle strength contributes to trunk stability and body control, which are necessary for maintaining balance and generating force during heading movements. Insufficient development of these physical components may reduce heading effectiveness and overall playing performance.

Previous studies have shown that various training methods, such as plyometric exercises, squat jumps, and core strengthening programs, can improve muscle power and strength. One simple and practical plyometric-based exercise is skipping (rope jumping), which involves repetitive jumping movements that stimulate lower limb muscles and core muscles simultaneously. Skipping exercise is widely used due to its efficiency, low cost, and minimal equipment requirements, making it suitable for football training programs at various levels.

Several studies have reported positive effects of skipping exercise on vertical jump performance and lower limb power. However, research that simultaneously examines the impact of skipping exercise on lower limb muscle power, abdominal muscle strength, and their contribution to heading ability in football players remains limited. This gap highlights the need for further investigation to provide empirical evidence regarding the effectiveness of skipping exercise in supporting heading performance.

Based on preliminary observations of FIKes Sport Club football players, deficiencies were identified in lower limb muscle power and abdominal muscle strength compared to standardized norms. These limitations potentially affect the players' heading ability during matches. Therefore, an appropriate training intervention is required to enhance these physical components.

This study aims to analyze the effect of skipping exercise on lower limb muscle power and abdominal muscle strength in supporting heading ability among football players of FIKes Sport Club. The findings of this study are expected to contribute to the development of effective and practical training programs for improving heading performance in football.

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II. METHODS

This study was conducted to examine the effectiveness of a skipping exercise program in improving lower limb muscle power and abdominal muscle strength to support heading ability in football players. A quantitative experimental approach was applied to objectively measure changes in physical performance before and after the training intervention. The research procedures included participant selection, implementation of a structured training program, physical performance testing, and statistical analysis to determine the significance of the intervention outcomes.

A. Research Design

This study employed an experimental research design using a one-group pretest–posttest approach. This design was selected to determine the effect of skipping exercise on lower limb muscle power, abdominal muscle strength, and heading ability among football players by comparing measurements taken before and after the intervention.

B. Participants

The participants consisted of 15 male football players from FIKes Sport Club. A purposive sampling technique was used based on the following inclusion criteria: (1) male players aged 16–19 years, (2) actively participating in football training, (3) having experience in football competitions, and (4) being in good health as confirmed by the Physical Activity Readiness Questionnaire (PAR-Q). Participants with a history of severe injury or those who did not complete the training program were excluded from the study.

C. Training Program

The intervention involved a structured skipping exercise program conducted three times per week for six weeks. The exercise was performed using a skipping rope with both feet jumping simultaneously. Training intensity and volume were progressively increased to provide sufficient overload and adaptation stimulus. The skipping exercise targeted lower limb muscles and abdominal muscles to enhance muscle power and strength relevant to heading performance.

D. Instruments and Measurements

Lower limb muscle power was assessed using the vertical jump test. Each participant performed three trials, and the highest score was recorded. Abdominal muscle strength was measured using a 30-second sit-up test, with the total number of correct repetitions recorded. Heading ability was evaluated using a standardized football heading test that measured accuracy and performance consistency.

E. Data Collection Procedure

Pretest measurements of lower limb muscle power, abdominal muscle strength, and heading ability were conducted prior to the training intervention. Following the six-week skipping exercise program, posttest measurements were administered using the same procedures to ensure measurement consistency.

F. Data Analysis

Descriptive statistics were used to summarize the data. Inferential analysis was conducted using a paired sample t-test to examine differences between pretest and posttest results. Statistical analysis was performed using SPSS version 25, with the level of significance set at $p < 0.05$.

III. RESULT

This section presents the results of the skipping exercise intervention on lower limb muscle power, abdominal muscle strength, and heading ability among football players of FIKes Sport Club. Data were obtained from pretest and posttest measurements and analyzed using a paired sample t-test with a significance level of $p < 0.05$.

A. Effect of Skipping Exercise on Lower Limb Muscle Power

The results of the paired sample t-test indicated a significant difference between pretest and posttest scores of lower limb muscle power after the skipping exercise program. This finding demonstrates that skipping exercise had a significant effect on improving lower limb muscle power among the participants.

B. Effect of Skipping Exercise on Abdominal Muscle Strength

Statistical analysis showed a significant improvement in abdominal muscle strength following the skipping exercise intervention. The posttest scores were significantly higher than the pretest scores, indicating that skipping exercise effectively enhanced abdominal muscle strength.

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C. Effect of Skipping Exercise on Heading Ability

The results also revealed a significant increase in heading ability after the training program. The improvement in heading performance suggests that enhancements in lower limb muscle power and abdominal muscle strength contributed positively to heading ability.

Table 1. Paired Sample t-Test Results of Pretest and Posttest Measurements

Variable	Test Type	Sig. (p-value)	Description
Lower limb muscle power	Paired sample t-test	0.000	Significant difference
Abdominal muscle strength	Paired sample t-test	0.000	Significant difference
Heading ability	Paired sample t-test	0.000	Significant difference

Significance level: $p < 0.05$

D. Summary of Results

The results indicate that the skipping exercise program significantly improved lower limb muscle power, abdominal muscle strength, and heading ability among football players of FIKes Sport Club. All tested variables showed statistically significant differences between pretest and posttest measurements.

IV. DISCUSSION

The purpose of this study was to examine the effect of skipping exercise on lower limb muscle power and abdominal muscle strength in supporting heading ability among football players of FIKes Sport Club. The results demonstrated that the skipping exercise program produced significant improvements in all measured variables, indicating that skipping exercise is an effective training method for enhancing physical components essential for heading performance in football.

The significant improvement in lower limb muscle power observed in this study can be attributed to the repetitive jumping movements involved in skipping exercise. These movements stimulate fast-twitch muscle fibers and enhance neuromuscular coordination, which are critical factors in the development of explosive power. Improved lower limb muscle power enables football players to generate higher vertical jumps, thereby increasing their ability to compete effectively during aerial duels. This finding is consistent with previous studies reporting that plyometric-based exercises, including skipping, significantly improve lower limb power and vertical jump performance.

In addition to lower limb muscle power, this study found a significant increase in abdominal muscle strength following the skipping exercise program. During skipping exercise, the core muscles play a crucial role in maintaining postural stability and controlling body movements during repeated jumping actions. Strengthening the abdominal muscles contributes to improved trunk stability, which is essential for efficient force transfer from the lower limbs to the upper body during heading movements. This result aligns with earlier research indicating that dynamic jumping exercises can effectively enhance core muscle strength.

The improvement in heading ability observed in this study is likely a combined effect of enhanced lower limb muscle power and abdominal muscle strength. Effective heading performance requires explosive jumping ability, proper body alignment, and trunk control at the moment of ball contact. Increased muscle power allows players to reach optimal height, while stronger abdominal muscles support balance and coordination during heading actions. These findings support the concept that physical conditioning plays a vital role in the successful execution of football-specific technical skills.

From a practical perspective, the results of this study suggest that skipping exercise can be integrated into football training programs as an efficient and low-cost method to improve physical attributes related to heading performance. Skipping exercise requires minimal equipment and can be easily implemented across different age groups and training levels.

Despite the positive findings, this study has several limitations. The use of a one-group pretest–posttest design without a control group limits the ability to attribute improvements solely to the intervention. Additionally, the relatively small sample size may affect the generalizability of the results. Future research is recommended to employ randomized controlled designs with larger samples and longer intervention periods to further validate the effectiveness of skipping exercise in football training.

V. CONCLUSIONS

Based on the results of this study, it can be concluded that skipping exercise has a significant effect on improving lower limb muscle power, abdominal muscle strength, and heading ability among football players of FIKes Sport Club. The structured skipping exercise program effectively enhanced physical components that play an important role in supporting heading performance in

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football. The findings indicate that improvements in lower limb muscle power and abdominal muscle strength contribute positively to better heading ability. Therefore, skipping exercise can be considered an effective, practical, and economical training method that can be integrated into football training programs to enhance players' physical performance, particularly in aerial skills. Future studies are recommended to apply experimental designs with control groups, larger sample sizes, and longer training durations to further investigate the long-term effects of skipping exercise on football performance.

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