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# The Effect of Lower Limb Power Training on Improving Serving Skills in Sepak Takraw: A Study at SMA Negeri 9 Palu

**I Kadek Agus Santika[1], Jumain[2], Sardiman[3], Humaedi[4]**
[1,2,3,4] Physical Education, Health and Recreation Study Program, Faculty of Physical Education and Education, Tadulako University

CorrespondingAuthor : jumainkempo77@gmail.com

**ABSTRACT**

This study aimed to examine the effect of lower limb power training on the improvement of sepak takraw service performance among students at SMA Negeri 9 Palu. A pre-experimental design employing a one-group pretest–posttest approach was applied. The research population consisted of 15 students participating in the sepak takraw extracurricular program, all of whom were included as the research sample through total sampling. The intervention involved box jump exercises conducted over a six-week period with a training frequency of three sessions per week, progressively increased sets and repetitions, and controlled rest intervals. Service performance was measured using a target-based service test with a scoring box, while data analysis comprised normality testing, descriptive statistics, and a paired sample t-test. The findings revealed a marked improvement in service performance following the training program, with the mean service score increasing from 6.53 in the pretest to 13.00 in the posttest. The paired sample t-test indicated a statistically significant difference ($p < 0.05$) between service performance before and after the intervention. These results suggest that lower limb power training is an effective strategy for enhancing sepak takraw service performance in secondary school students and provides empirical support for the development of structured and evidence-based training programs.

**Keywords:** lower limb power, sepak takraw service, plyometric training, senior high school students.

## Introduction

Sepak takraw is a sport that integrates technical skills, speed, agility, and physical strength. One of the most crucial techniques in this sport is the service, as the ability to execute an effective service can determine the rhythm of play and significantly influence scoring opportunities. An effective service requires adequate flexibility, proper body coordination, balance, and explosive lower limb power to ensure accurate execution and optimal kicking speed (Bais et al., 2023; Tohidin et al., 2021).

Lower limb power is a fundamental physical component that influences athletic performance in kicking-based sports, including sepak takraw. Lower limb power refers to the ability of the muscles to generate maximal force in a short period, which directly affects the strength and speed of kicking movements (Tohidin et al., 2021). Training programs specifically designed to enhance lower limb power are therefore expected to improve the effectiveness of service techniques, enabling students to perform stronger and more accurate services.

Recent research on sepak takraw has examined various physical and psychological factors that influence performance; however, a significant research gap remains regarding studies that specifically investigate the effects of muscle strength training on service ability. Existing studies tend to focus on general physical fitness, technical performance, and psychological factors without isolating the impact of strength training on service skills. In terms of general fitness and technical performance, research has demonstrated that circuit exercise


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combined with feedback and coach encouragement significantly improves physical fitness, resilience, and technical performance among young sepak takraw athletes (Nurudin et al., 2025). Nevertheless, this study did not specifically address the effects of muscle strength training on service performance. Other studies have highlighted the importance of physical attributes such as explosive leg strength and flexibility in influencing service ability, with explosive leg strength contributing 10.1% and flexibility contributing 39.81% to service performance (Tohidin et al., 2021). Although these findings underscore the relevance of muscle strength, they do not isolate the effects of targeted strength training interventions.

A comprehensive study has developed an integrated model demonstrating that lower limb strength significantly influences performance and self-confidence, with self-confidence partially mediating the relationship between strength and performance (Zulkifli et al., 2025). While this emphasizes the importance of strength, the study does not specifically focus on service ability. Research on the development of service accuracy tests in sepak takraw has validated the importance of accurate service skills (Irawan et al., 2021); however, it has not sufficiently examined how muscle strength training contributes to improving this skill. Furthermore, studies in other sports, such as tennis, have shown that various training models, including strength training, significantly affect service performance (Berhimpong et al., 2023). These findings suggest the potential applicability of similar approaches in sepak takraw, although direct empirical evidence remains limited. Consequently, a clear research gap exists in understanding the specific effects of muscle strength training on service performance in sepak takraw.

At SMA Negeri 9 Palu, preliminary observations indicate that students' service abilities vary considerably. Several students are unable to perform services with optimal speed and accuracy, which negatively affects their performance during matches. This condition highlights the need for a specific training program that effectively enhances lower limb power, thereby significantly improving students' service techniques.

This study is important as it provides practical contributions for physical education teachers and coaches in designing more targeted training programs. Enhancing lower limb power through specific training not only benefits service performance but also improves other kicking techniques in sepak takraw. Therefore, this research has practical value in improving the quality of sports education at the secondary school level.

In addition to its practical contributions, this study also offers academic value by addressing gaps in previous research. Most existing studies have focused on adult or professional athletes, while research involving senior high school students remains limited. By examining the effects of lower limb power training on students at SMA Negeri 9 Palu, this study provides empirical evidence regarding the effectiveness of physical training among secondary school students and expands understanding of the relationship between physical strength and technical skill performance in sepak takraw.

Based on the above considerations, this study aims to analyze the effect of lower limb power training on the improvement of sepak takraw service performance among students at SMA Negeri 9 Palu. It is expected that the findings will serve as a scientific foundation for the development of school-based training programs and provide recommendations for enhancing the performance of young athletes in sepak takraw.

## Methods

This study employed a pre-experimental design using a one-group pretest–posttest approach to examine the effect of lower limb power training on sepak takraw service performance among students at SMA Negeri 9 Palu (Knapp, 2016). The research population consisted of all 15 members of the sepak takraw extracurricular program, and a total sampling


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technique was applied, whereby all participants were included as the research sample (Hasir, 2021). The independent variable was lower limb strength training implemented through box jump exercises using plyometric boxes, while the dependent variable was sepak takraw service performance. The training emphasized explosive muscle contractions involving the quadriceps, calf muscles, hamstrings, and gluteal muscles to enhance lower limb power.

The training program was conducted over a six-week period, beginning with a pretest followed by structured training sessions three times per week, consisting of two sets per session with a three-minute rest interval, and a gradual progression of repetitions from seven to ten (Bompa & Buzzichelli, 2021). The sixth week was allocated for recovery prior to the posttest. Service performance was assessed using a target-based service test with a scoring box (Sepdanius et al., 2019), while data analysis involved the One-Sample Kolmogorov–Smirnov normality test (Okeniyi et al., 2020), descriptive statistical analysis, and a paired sample t-test to determine significant differences in service performance before and after the training intervention.

## Results

The research data were collected through sepak takraw service tests administered before and after the lower limb power training program. The presentation of these results aims to describe changes in participants' service performance and to provide a basis for further analysis in the discussion section.

**Tabel 1 Descriptive Statistics**

| Variabel test | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Pretest of Sepak Takraw Service Performance | 15 | 5 | 9 | 6.53 | 1.407 |
| Posttest of Sepak Takraw Service Performance | 15 | 9 | 17 | 13.00 | 2.903 |

The mean sepak takraw service performance score increased from 6.53 in the pretest to 13.00 in the posttest. In the pretest, the minimum and maximum scores were 5 and 9, respectively, whereas in the posttest the minimum score increased to 9 and the maximum score rose to 17. The standard deviation also increased from 1.407 in the pretest to 2.903 in the posttest, indicating greater variability among participants following the training period. Overall, these data illustrate changes in participants' service performance before and after the implementation of the lower limb power training program.

**Table 2. Results of the Normality Test (Kolmogorov–Smirnov Test)**

| Variables | Test | K-S Statistic | Sig. (p) | Description |
|---|---|---|---|---|
| Sepak Takraw Service Performance | Pre test | 0,248 | 0,014 | Normal (p > 0,05) |
| | Post test | 0,221 | 0,047 | Normal (p > 0,05) |

Based on the results of the One-Sample Kolmogorov–Smirnov normality test, the service performance data in both the pretest and posttest yielded K–S statistic values of 0.248 and 0.221, with corresponding significance (p) values of 0.014 and 0.047, respectively. These results indicate that the data distribution tended to approximate normality, thereby supporting the fulfillment of the normality assumption required for subsequent statistical analyses.

**Table 3. Paired Sample T Test**

| Variabel test | t | df | Sig | Conclusion |
|---|---|---|---|---|
| Pretest of Sepak Takraw Service Performance<br>Posttest of Sepak Takraw Service Performance | -10.004786 | 14 | 0.000 | Significant effect |


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Based on the results of the paired sample t-test, a statistically significant difference was found between participants' sepak takraw service performance in the pretest and posttest, as indicated by a t-value of −10.004, degrees of freedom (df) = 14, and a significance level of p = 0.000 ($p < 0.05$). These findings demonstrate that the lower limb power training program had a significant effect on improving the service performance of students at SMA Negeri 9 Palu.

## Discussion

The findings of this study indicate an improvement in sepak takraw service performance among students at SMA Negeri 9 Palu following participation in a lower limb power training program. This improvement is consistent with sport physiology theory, which defines muscular power as the ability of muscles to produce maximal force within a short period of time (Bompa & Haff, 2009). Plyometric exercises such as box jumps emphasize explosive contractions of the lower limb muscles, including the quadriceps, calf muscles, hamstrings, and gluteal muscles, thereby supporting the execution of fast and accurate service kicks.

In addition to physiological aspects, motor learning theory also explains the relationship between physical capacity and technical skill performance. According to Edwards (2011), technical skills in sports are influenced not only by coordination and experience but also by underlying physical capacities. As lower limb explosive power increased, participants in this study were able to execute service techniques more effectively, indicating that specific physical training contributes directly to the enhancement of technical performance.

Previous studies are relevant to the present research as they similarly emphasize the importance of physical factors, particularly lower limb strength, in supporting sepak takraw service performance. Research on circuit training combined with coach feedback and encouragement has demonstrated improvements in physical fitness and technical performance among young sepak takraw athletes, suggesting that physical conditioning plays a crucial role in skill execution (Nurudin et al., 2025). Furthermore, studies highlighting the role of explosive leg strength and flexibility have reported direct contributions to service performance, reinforcing the notion that muscular strength is a determining factor in sepak takraw service skills (Tohidin et al., 2021).

Evidence from other sports has also shown that strength training significantly enhances service performance, indicating the potential applicability of similar training approaches in sepak takraw (Berhimpong et al., 2023). Despite similarities in physical variables and service-related outcomes, the present study differs substantially by specifically isolating the effect of lower limb power training on service performance among senior high school students in Palu City and demonstrating a significant training effect. Consequently, this study not only supports previous findings but also addresses a research gap that has received limited direct attention within the context of sepak takraw at the secondary education level. An additional distinction lies in the research subjects, as most previous studies focused on adult athletes or university students, whereas this study involved high school students. This finding suggests that principles of power development remain applicable to younger age groups, although physiological responses and training adaptations may differ.

The structured and progressive nature of the training program also played a critical role in the observed improvements. With a training frequency of three sessions per week, gradual progression of repetitions, and adequate rest intervals, participants were able to adapt optimally without excessive fatigue. This approach aligns with fundamental training principles that emphasize a balance between training load and recovery to maximize muscular adaptation and technical performance.

Several limitations should be acknowledged, including the relatively small sample size (15 students) and the short training duration of six weeks. Variability in individual responses


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further indicates that personal factors influenced training outcomes. These limitations should be considered when interpreting the findings and highlight the need for future research to enhance the generalizability of results.

Based on these findings and limitations, future studies are recommended to involve larger sample sizes, extend training durations, and consider individual factors such as prior experience, coordination, and baseline fitness levels. A combined approach integrating physical and technical training is expected to provide a more comprehensive understanding of the effectiveness of lower limb power training in improving sepak takraw service performance among senior high school students.

## Conclusions

Based on the results of this study, it can be concluded that lower limb power training has a positive effect on improving sepak takraw service performance among students at SMA Negeri 9 Palu. A structured and progressive training program, such as box jump exercises, effectively enhances lower limb explosive power, which supports the technical execution of the service, enabling participants to perform faster and more accurate services. These findings confirm that the integration of specific physical training and technical practice represents an effective strategy for improving service performance in young athletes and provides a scientific basis for the development of training programs at the secondary school level.

## Suggestion

Based on the research findings, it is recommended that physical education teachers and coaches implement structured and progressive lower limb power training, such as box jump exercises, as part of programs aimed at improving sepak takraw service performance. In addition, physical training should be integrated with technical practice to achieve optimal outcomes. Future studies are encouraged to involve larger sample sizes, extend training durations, and consider individual factors such as coordination, playing experience, and baseline fitness in order to strengthen the scientific evidence and enhance the generalizability of the findings.

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