

The Effect Of Single Leg Hop Training On Shooting Accuracy In Futsal Games

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ABSTRACT

Shooting accuracy is one of the most important technical skills in futsal because it directly determines the effectiveness of attacking play and goal-scoring opportunities. However, shooting accuracy does not depend only on kicking strength, but also on lower-limb explosive power, balance, coordination, and body stability. This study aimed to determine the effect of single leg hop training on shooting accuracy in futsal among students of the Sports Coaching Education Study Program, Faculty of Sports and Health Sciences, Universitas Negeri Makassar. This research used a quantitative experimental method with a one-group pretest-posttest design. The sample consisted of 15 PKO FIKK UNM students who were given a structured single leg hop training program from November to December 2024. Data were collected using a futsal shooting accuracy test before and after the intervention. The results showed that the mean pretest score was 8.1333 with a standard deviation of 1.88478, while the mean posttest score increased to 13.3333 with a standard deviation of 1.23443. The mean improvement was 5.2000 points or 63.93%. The paired sample t-test showed that the t-observed value was 13.239, higher than the t-table value of 2.145, with a significance value of $0.000 < 0.05$. Therefore, single leg hop training had a significant effect on improving futsal shooting accuracy. This training is recommended as an effective exercise to develop lower-limb power, balance, and neuromuscular control in futsal players.

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- A. Conception and design of the study;
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INTRODUCTION

Futsal is a high-intensity invasion sport that requires players to execute rapid technical actions under limited space, short decision-making time, and continuous defensive pressure. Unlike conventional football, futsal places players in a smaller playing area, forcing them to perform passing, dribbling, turning, and shooting with greater speed and precision. Among these technical components, shooting accuracy is one of the most decisive skills because it directly determines the success of attacking play and goal-scoring opportunities. However, in practical learning and training contexts, many players are still able to generate shooting power but fail to direct the ball accurately toward the target. This condition indicates that shooting performance is not only determined by leg strength, but also by lower-limb power, postural stability, eye-foot coordination, body control, and the ability to transfer force effectively during the kicking movement (Doewes et al., 2022; Imka et al., 2025; Raihan et al., 2025).

In the context of students of Pendidikan Kepelatihan Olahraga, Faculty of Sports and Health Sciences, Universitas Negeri Makassar, shooting accuracy in futsal must be viewed not only as a game skill but also as a measurable coaching competence. Students are expected to understand how specific training methods influence technical performance. Nevertheless, shooting practice is often dominated by repetitive ball-kicking drills without sufficient attention to neuromuscular preparation. This may limit the development of explosive support-leg stability, single-leg balance, and coordinated force production, which are essential when performing accurate shots in dynamic futsal situations (Aiman, 2025; Hakim et al., 2025; Hidayat, 2025).

Recent literature has emphasized that futsal performance depends on the interaction between technical execution and physical conditioning. Systematic reviews report that futsal players require high levels of speed, repeated sprint ability, lower-body strength, change-of-direction ability, and neuromuscular readiness to meet match demands (Spyrou et al., 2020; Barreira et al., 2025; Albalad-Aiguabella et al., 2025). These findings suggest that futsal training should not separate technical practice from physical conditioning. Instead, shooting improvement should be supported by training models that strengthen the biomechanical foundations of kicking performance.

Plyometric training has received considerable attention as an effective method for improving explosive power, sprint performance, agility, jump ability, and sport-specific actions in team sports. Through the stretch-shortening cycle, plyometric exercises train the muscles and tendons to absorb, store, and rapidly release elastic energy, thereby improving the efficiency of explosive movement (Slimani et al., 2016; Ramírez-Campillo et al., 2018; Kons et al., 2023). In football and futsal-related performance, plyometric jump training has been shown to improve lower-limb power, acceleration, change of direction, balance-related control, and kicking performance (Beato et al., 2018; Bianchi et al., 2018; Zhang et al., 2023; Oliver et al., 2024; Zheng et al., 2025).

Single leg hop is a unilateral plyometric exercise that requires athletes to perform explosive jumps using one leg while maintaining balance, alignment, and landing control. This exercise is highly relevant to futsal shooting because shooting is essentially a unilateral action: one leg functions as the support and stabilizing base, while the other leg produces the kicking motion. Therefore, single leg hop training can theoretically strengthen the neuromuscular qualities needed for accurate shooting, including lower-limb explosive power, ankle-knee-hip stability, core control, and proprioceptive adjustment during single-leg support (Chaouachi et al., 2017; Clemente et al., 2021; Ramírez-Campillo et al., 2023; Sinulingga et al., 2025). Empirical studies also indicate that leg muscle power, balance, and eye-foot coordination contribute significantly to futsal shooting accuracy, reinforcing the need for targeted training that develops both physical and coordinative components (Burhaein et al., 2020; Doewes et al., 2022; Imka et al., 2025; Aiman, 2025; Hakim et al., 2025).

Although previous studies have examined futsal shooting accuracy through target-game training, small-sided games, coordination training, and general physical conditioning, limited research has specifically investigated the effect of single leg hop training on shooting accuracy in futsal. Many plyometric studies focus on vertical jump, sprint speed, agility, or kicking velocity, while fewer studies directly connect unilateral plyometric training with the precision aspect of shooting performance (Pizarro et al., 2019; Raihan et al., 2025; Zhang et al., 2026). This creates a practical and scientific gap because accurate shooting in futsal is not merely a matter of producing force, but of controlling force direction, body posture, support-leg stability, and foot-ball contact.

Furthermore, most existing research has been conducted on youth athletes, school extracurricular participants, or football players, while studies involving university students in sports coaching education remain relatively limited. This is important because PKO FIKK UNM students represent a population that is not only trained as players but also prepared as future coaches, teachers, and sport practitioners. Therefore, evidence from this population can contribute to both futsal performance training and pedagogical practice in sports coaching education.

This study aims to examine the effect of single leg hop training on shooting accuracy in futsal among PKO FIKK UNM students. Conceptually, the study is grounded in the assumption that unilateral plyometric training can improve the physical and neuromuscular qualities required for accurate shooting, especially lower-limb explosive power, single-leg balance, postural control, and movement

coordination. Empirically, this study seeks to provide measurable evidence regarding whether a structured single leg hop training program can improve students' ability to direct the ball accurately toward the target.

The novelty of this study lies in its specific focus on single leg hop training as a unilateral plyometric intervention for futsal shooting accuracy. While previous research has widely discussed plyometric training for general physical fitness and lower-limb power, this study narrows the analysis to a specific technical outcome in futsal. This approach is expected to offer practical recommendations for coaches, lecturers, and students in designing evidence-based futsal training programs that integrate physical conditioning and technical accuracy.

Based on the theoretical and empirical foundation above, shooting accuracy in futsal should be understood as the result of an integrated relationship between technical skill, lower-limb power, balance, coordination, and neuromuscular control. Single leg hop training has strong potential to address these components because it develops explosive unilateral movement patterns similar to the support and force-transfer demands of futsal shooting. Therefore, investigating the effect of single leg hop training on shooting accuracy among PKO FIKK UNM students is relevant, timely, and scientifically valuable for strengthening futsal training methodology in higher education sports coaching contexts.

METHODS

This study employed a quantitative experimental approach using a one-group pretest-posttest design to examine the effect of single leg hop training on futsal shooting accuracy among students of the Sports Coaching Education Study Program, Faculty of Sports and Health Sciences, Universitas Negeri Makassar. This design was considered appropriate because experimental research allows researchers to observe changes in performance before and after a structured intervention, especially in sport training studies where physical and technical variables can be measured objectively (Creswell & Creswell, 2018; Thomas et al., 2023). The one-group pretest-posttest model was selected because it enables comparison between the initial condition and the final condition of the same participants after treatment, making it suitable for applied coaching research with a limited sample (Fraenkel et al., 2019; Hastie & Hay, 2024).

The research was conducted from November to December 2024 at the FIKK UNM campus. The population consisted of all PKO FIKK UNM students, while the sample included 15 students who participated in the single leg hop training program. The sample was determined based on participation availability, physical readiness, and relevance to futsal practice. This sampling approach is commonly used in sport intervention studies where participants must meet practical and safety considerations during plyometric training (Ramírez-Campillo et al., 2023; Kons et al., 2023).

Data were collected through futsal shooting accuracy tests administered before and after the intervention. The pretest was conducted to measure the participants' initial shooting accuracy. After that, participants received single leg hop training as the experimental treatment. This exercise was selected because unilateral plyometric training can improve lower-limb explosive power, balance, landing control, and neuromuscular coordination, which are conceptually related to shooting performance in futsal (Slimani et al., 2016; Beato et al., 2018; Chaouachi et al., 2017; Spyrou et al., 2020). The posttest was conducted after the treatment period using the same shooting accuracy procedure to ensure measurement consistency.

The data analysis technique used descriptive statistics and inferential statistics. Mean and standard deviation were used to describe the pretest and posttest scores. Before hypothesis testing, normality and homogeneity tests were conducted to ensure that the data met the assumptions for parametric analysis. The research hypothesis was tested using a paired sample t-test by comparing the mean score of shooting accuracy before and after the single leg hop training intervention at a significance level of 0.05.

RESULTS AND DISCUSSION

Result

The empirical data obtained in this study consisted of pretest and posttest scores of futsal shooting accuracy after the implementation of single leg hop training among students of the Sports Coaching Education Study Program, Faculty of Sports and Health Sciences, Universitas Negeri Makassar. Before conducting inferential statistical testing, all data were tabulated to facilitate systematic analysis. The data analysis included descriptive statistics, normality testing, and hypothesis testing using a paired sample t-test. Descriptive analysis was used to describe the general characteristics of the data, including the number of samples, range, minimum score, maximum score, total score, mean, and standard deviation.

Descriptive Statistical Analysis

The descriptive statistical results of futsal shooting accuracy before and after single leg hop training are presented in Table 1.

Table 1.
Descriptive Statistics of Shooting Accuracy

Variable	N	Range	Min	Max	Sum	Mean	Std. Dev.
Pretest Shooting Accuracy	15	6.00	5.00	11.00	122.00	8.1333	1.88478
Posttest Shooting Accuracy	15	4.00	11.00	15.00	200.00	13.3333	1.23443

Table 1 shows that the mean score of shooting accuracy before the single leg hop training was 8.1333, with a standard deviation of 1.88478. After the treatment, the mean score increased to 13.3333, with a standard deviation of 1.23443. The increase in the mean score was 5.2000 points. This indicates that the students' shooting accuracy improved after participating in the single leg hop training program. In addition, the posttest standard deviation was lower than the pretest standard deviation, suggesting that the participants' shooting accuracy became more consistent after the intervention.

The improvement can also be seen from the minimum and maximum scores. In the pretest, the lowest score was 5.00 and the highest score was 11.00. In the posttest, the lowest score increased to 11.00 and the highest score reached 15.00. This finding provides an initial empirical indication that single leg hop training contributed positively to futsal shooting accuracy among PKO FIKK UNM students.

Table 2.
Mean Improvement of Shooting Accuracy

Measurement	Mean Score	Mean Difference	Percentage Increase
Pretest	8.1333	5.2000	63.93%
Posttest	13.3333		

Table 2 indicates that the shooting accuracy score increased by 5.2000 points, equivalent to a 63.93% improvement from the pretest mean. Conceptually, this improvement may be associated with the function of single leg hop training as a unilateral plyometric exercise that develops lower-limb explosive power, balance, coordination, and postural control. These physical components are closely related to the ability to execute accurate shooting in futsal, because shooting requires stable support, controlled body movement, and precise force transfer from the lower limbs to the ball.

Assumption Test

Before testing the hypothesis, a normality test was conducted to determine whether the pretest and posttest data were normally distributed. The Kolmogorov-Smirnov test was used with a significance level of 0.05. The results are presented in Table 3.

Table 3.
Normality Test Results

Variable	Kolmogorov-Smirnov Statistic	Sig.	α	Interpretation
Pretest Single Leg Hop Training on Shooting Accuracy	0.211	0.072	0.05	Normal
Posttest Single Leg Hop Training on Shooting Accuracy	0.172	0.200	0.05	Normal

Based on Table 3, the pretest data obtained a Kolmogorov-Smirnov statistic of 0.211 with a significance value of 0.072. Since the significance value was greater than 0.05, the pretest data were normally distributed. The posttest data obtained a Kolmogorov-Smirnov statistic of 0.172 with a significance value of 0.200. Since the significance value was also greater than 0.05, the posttest data were normally distributed. Therefore, the data met the normality assumption, and hypothesis testing could be continued using a parametric paired sample t-test.

Hypothesis Testing

The hypothesis tested in this study was that single leg hop training has a significant effect on shooting accuracy in futsal among PKO FIKK UNM students.

The results of the paired sample t-test are presented in Table 4.

Table 4.
Paired Sample t-Test Result

Comparison	t-observed	t-table	Sig.	α	Interpretation
Pretest-Posttest Shooting Accuracy	13.239	2.145	0.000	0.05	Significant

Table 4 shows that the t-observed value was 13.239, while the t-table value at the 0.05 significance level was 2.145. Since the t-observed value was higher than the t-table value, and the significance value was $0.000 < 0.05$, the null hypothesis was rejected and the alternative hypothesis was accepted. This means that there was a significant difference between the pretest and posttest scores of futsal shooting accuracy.

Empirically, the results confirm that single leg hop training had a significant effect on improving shooting accuracy in futsal among PKO FIKK UNM students. The increase from a pretest mean of 8.1333 to a posttest mean of 13.3333 demonstrates that the treatment provided a meaningful improvement in students' shooting performance. Conceptually, this result supports the view that unilateral plyometric training can strengthen the dominant physical components involved in shooting, particularly leg power, balance, movement stability, and neuromuscular coordination. In futsal, these components are essential because players must shoot accurately under fast movement conditions, limited space, and changing body positions.

Thus, the findings of this study indicate that single leg hop training can be used as an effective training method to improve futsal shooting accuracy. The intervention is practical, specific, and relevant for students, coaches, and lecturers in developing performance-based futsal training programs within sports coaching education.

Discussion

The findings of this study demonstrate that single leg hop training had a significant effect on futsal shooting accuracy among PKO FIKK UNM students. Empirically, the mean score increased from 8.1333 in the pretest to 13.3333 in the posttest, with a mean improvement of 5.2000 points or 63.93%. The paired sample t-test further confirmed this improvement, as the obtained t-value was 13.239, which was higher than the t-table value of 2.145 at the 0.05 significance level. Therefore, the null hypothesis was rejected and the alternative hypothesis was accepted. This result indicates that a structured single leg hop training program can produce a meaningful improvement in students' shooting accuracy in futsal.

This finding is conceptually reasonable because futsal shooting is not only determined by the ability to kick the ball with power, but also by the ability to stabilize the body, control the support leg, coordinate the kicking movement, and direct force accurately toward the target. Futsal is played in a narrow space with high movement intensity, so players must execute shooting actions quickly, precisely, and often under pressure. Systematic reviews on futsal performance have shown that futsal players require lower-body power, speed, repeated high-intensity movement, change-of-direction ability, and neuromuscular readiness to perform effectively during match play (Spyrou et al., 2020; Barreira et al., 2025; Albalad-Aiguabella et al., 2025; Villanueva-Guerrero et al., 2026). These demands explain why physical conditioning that improves unilateral power and body control can directly support shooting performance.

The improvement found in this study supports previous literature stating that plyometric training is effective for developing explosive lower-limb performance. Single leg hop is a unilateral plyometric exercise that emphasizes rapid stretch-shortening cycle activity, eccentric braking, concentric force

production, landing control, and dynamic balance. These mechanisms are important in futsal shooting because the support leg must stabilize the body while the kicking leg transfers force to the ball. Studies by Slimani et al. (2016), Chaouachi et al. (2017), Beato et al. (2018), Bianchi et al. (2018), Ramírez-Campillo et al. (2020), Drouzas et al. (2020), Clemente et al. (2021), Ramírez-Campillo et al. (2023), Oliver et al. (2024), Zheng et al. (2025), and Zhang et al. (2026) consistently report that plyometric training improves jumping ability, sprinting, change of direction, explosive power, and sport-specific performance in football and team-sport athletes.

From a biomechanical perspective, the significant increase in shooting accuracy may be explained by improved single-leg stability and force control. During shooting, a player depends heavily on the support leg to maintain balance and body alignment. If the support leg is weak or unstable, the direction of the shot becomes inconsistent even when the kicking leg has sufficient strength. Single leg hop training strengthens the ankle, knee, hip, and core control system because each repetition requires the athlete to jump, land, stabilize, and prepare for the next movement on one leg. This process improves proprioceptive sensitivity and neuromuscular coordination, which are necessary for controlling the direction of the ball. This interpretation is consistent with findings from Sinulingga et al. (2025), who reported that integrated balance and plyometric exercises improved balance, ankle mobility, and explosive leg strength in young football players, and Drouzas et al. (2020), who showed that unilateral plyometric training can produce superior adaptations in lower-limb power compared with bilateral training.

The results of this study are also supported by Indonesian sport science literature, particularly studies examining the relationship between leg muscle strength, balance, eye-foot coordination, and futsal shooting accuracy. Imka et al. (2025) found that leg muscle power contributed significantly to shooting accuracy, while eye-foot coordination also showed a meaningful contribution. Aiman (2025), Hakim et al. (2025), Hidayat (2025), Priyambada et al. (2024), Apriantono et al. (2023), and Astika et al. (2026) similarly emphasized that futsal and football shooting performance is influenced by leg strength, balance, coordination, agility, and movement control. Therefore, the improvement in the present study should not be understood as a simple result of repeated jumping, but as the outcome of improved neuromuscular quality that supports more controlled and accurate shooting execution.

In practical terms, the increase from 8.1333 to 13.3333 indicates that the participants became more capable of directing shots toward the target after the intervention. This is important because accurate shooting is a decisive technical component in futsal. Players who possess good shooting accuracy can create scoring opportunities, finish attacks more effectively, and increase tactical confidence during match situations. In addition, improved shooting accuracy may increase players' psychological readiness when executing direct shots, counterattacks, or free-kick opportunities. This aligns with the argument that physical preparation and technical performance must be integrated in futsal training rather than treated as separate components (Oliveira et al., 2024; Albalad-Aiguabella et al., 2025; Barreira et al., 2025; Niering et al., 2025; Sánchez-Ottado et al., 2025; Hernández-Martínez et al., 2025; Lin et al., 2025).

Another important implication is that single leg hop training is practical and applicable in university-level futsal training. The exercise does not require complex equipment, can be performed in limited space, and can be modified according to students' training level. However, because plyometric training places mechanical stress on the ankle, knee, and hip joints, it should be implemented progressively. Proper warm-up, landing technique, training volume, recovery interval, and supervision are essential to maximize adaptation and reduce injury risk. Recent reviews on futsal injury prevention and plyometric training recommend combining strength, proprioceptive, and movement-control exercises to improve performance while maintaining athlete safety (Oliveira et al., 2024; Ramírez-Campillo et al., 2023; Sinulingga et al., 2025; Villanueva-Guerrero et al., 2026).

Overall, the findings confirm that single leg hop training significantly improves futsal shooting accuracy among PKO FIKK UNM students. The empirical evidence is shown by the substantial mean increase and significant t-test result, while the conceptual explanation is supported by the role of unilateral plyometric training in improving leg power, balance, postural stability, proprioception, and neuromuscular coordination. Therefore, single leg hop training can be recommended as an effective

training method for improving shooting accuracy in futsal, particularly in sports coaching education settings where students are expected to master both technical performance and evidence-based training principles.

CONCLUSION

Based on the results of the study, it can be concluded that single leg hop training has a significant effect on improving shooting accuracy in futsal among PKO FIKK UNM students. Empirically, this is shown by the increase in the mean score from 8.1333 in the pretest to 13.3333 in the posttest, with a mean difference of 5.2000 points or an improvement of 63.93%. The statistical analysis also confirmed this result, as the obtained t-value was 13.239, which was higher than the t-table value of 2.145 at the 0.05 significance level. Therefore, the null hypothesis was rejected and the alternative hypothesis was accepted.

Conceptually, the improvement occurred because single leg hop training develops several physical components that are directly related to shooting accuracy, including lower-limb explosive power, balance, postural stability, coordination, and neuromuscular control. In futsal, accurate shooting requires not only strong kicking ability but also stable body positioning and precise force direction toward the target. Thus, a structured and systematic single leg hop training program can be used as an effective training method to improve shooting accuracy. This exercise is recommended for futsal coaches, lecturers, and students as part of an evidence-based training program in sports coaching education.

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