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The Effect of Plyometric Training and Soot Drills on the Shooting Accuracy of Futsal Club Members

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ABSTRACT

Futsal is a fast-paced team sport that requires players to master technical skills, particularly shooting accuracy, which plays a crucial role in determining match outcomes. However, many players still experience difficulties in executing accurate and powerful shots due to limitations in physical power and technical consistency. Therefore, this study aimed to determine the effect of plyometric training and shooting drills on the shooting accuracy of Pinang Bajek Futsal Club members in Tebo Ilir District, Tebo Regency. This study employed a quantitative experimental method using a one-group pretest–posttest design. The population and sample consisted of 30 club members, selected using a total sampling technique. The research instrument was a shooting accuracy test, in which the goal area was divided into several scoring zones. Data were analyzed using the Shapiro–Wilk normality test and paired sample t-test with a significance level of 0.05. The results showed a significant improvement in shooting accuracy, with a pretest mean of 6.87 increasing to a posttest mean of 14.43. The hypothesis test yielded a t-value of -12.986 with a significance value (Sig. 2-tailed) < 0.001, indicating a statistically significant difference. Furthermore, the effect size (Cohen's d = -2.37) was categorized as a very large effect, demonstrating the strong practical impact of the intervention. In conclusion, plyometric training combined with shooting drills significantly improves shooting accuracy. This integrated training approach is recommended for futsal players to enhance performance effectively.

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INTRODUCTION

Futsal has emerged as one of the most popular team sports worldwide, attracting participants across age groups due to its fast-paced nature, technical demands, and accessibility. As a modified form of football played indoors with five players per team, futsal requires high levels of technical proficiency, tactical awareness, and physical fitness (Aswadi et al., 2018; Rojabi et al., 2024). Unlike traditional football, the reduced playing space and time constraints in futsal intensify decision-making processes and demand rapid execution of fundamental skills such as passing, dribbling, and shooting.

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Among these skills, shooting accuracy plays a decisive role in determining match outcomes. Shooting in futsal involves not only the ability to strike the ball with sufficient force but also the precision to direct it toward specific target areas under pressure (Risal et al., 2022). The success of shooting performance depends on a complex interaction of physical, technical, and psychological factors, including lower limb strength, coordination, timing, and composure during critical situations. Inadequate shooting accuracy can significantly reduce scoring opportunities and ultimately affect team performance.

Despite regular training, many futsal players still experience difficulties in achieving optimal shooting accuracy. Observations conducted at the Pinang Bajek Futsal Club in Tebo Ilir District revealed that players frequently fail to convert scoring chances due to poor directional control and inconsistent shooting mechanics. This limitation has contributed to the club's inability to achieve competitive success since its establishment. Furthermore, players demonstrate limited understanding of structured training methods, particularly plyometric exercises and systematic shooting drills, which are essential for enhancing performance.

Therefore, addressing the issue of shooting accuracy through evidence-based training interventions becomes critical. This study focuses on evaluating the effectiveness of plyometric training and shooting drills in improving shooting accuracy among futsal athletes, specifically within the context of the Pinang Bajek Futsal Club.

Recent developments in sports science emphasize the integration of physical conditioning and skill-specific training to optimize athletic performance. Plyometric training has gained significant attention as an effective method to enhance explosive power through the utilization of the stretch-shortening cycle (SSC), which involves rapid eccentric–concentric muscle actions (Yunita et al., 2023; Markovic & Mikulic, 2019). Exercises such as box jumps, jump squats, lateral bounds, and tuck jumps have been shown to improve neuromuscular efficiency, lower limb power, and movement speed (Ramirez-Campillo et al., 2020; Suchomel et al., 2018).

In futsal, explosive leg power generated through plyometric training contributes directly to stronger and faster shooting performance. Mukti et al. (2023) reported that plyometric training significantly improves shooting accuracy among junior futsal players by enhancing force production and coordination. Similarly, other studies indicate that plyometric interventions can increase kicking velocity and precision due to improved muscle-tendon stiffness and neuromuscular synchronization (Loturco et al., 2019; Slimani et al., 2016).

In addition to physical conditioning, skill acquisition through repetitive practice is essential for motor learning. Drill-based training methods are widely used to develop technical proficiency by promoting movement automation and consistency (Rojabi et al., 2024; Saputra et al., 2024). Shooting drills, which involve repeated execution of shooting techniques under structured conditions, enable athletes to refine accuracy, ball control, and decision-making skills.

Empirical evidence supports the effectiveness of drill methods in futsal training. Rizki et al. (2023) found that systematic shooting drills significantly improve shooting accuracy and coordination among university-level players. Furthermore, repeated practice enhances motor memory and reduces variability in movement execution, leading to more consistent performance outcomes (Schmidt & Lee, 2019; Magill & Anderson, 2021).

Recent studies have also explored the combined effect of plyometric training and technical drills. Fasrah and Hulfian (2025) demonstrated that integrating plyometric exercises with shooting drills yields superior improvements in shooting performance compared to isolated training methods. This integrated approach aligns with contemporary training principles that emphasize specificity, overload, and progressive adaptation in sports performance development (Bompa & Buzzichelli, 2019).

Although numerous studies have examined the effects of plyometric training and drill-based practice independently, several gaps remain in the current literature. First, most previous research focuses on either physical conditioning or technical training in isolation, with limited investigation into their combined impact on performance outcomes, particularly in futsal contexts. While studies such as Mukti et al. (2023) and Rizki et al. (2023) provide valuable insights, they do not fully address the interaction between explosive power development and skill-specific repetition. Second, there is a lack of empirical studies conducted in community-based or amateur futsal clubs, especially in regional settings such as Tebo Regency. Most existing research is concentrated on school or elite athlete populations, which may not accurately represent the characteristics and training needs of grassroots players. This creates a contextual gap in understanding how training interventions can be effectively implemented in local club environments. Third, methodological limitations in prior studies, including small sample sizes, short intervention durations, and limited use of comparative experimental designs, reduce the generalizability of findings. There is a need for more robust experimental approaches that evaluate multiple training methods simultaneously to determine their relative effectiveness. Finally, few studies have specifically examined shooting accuracy as a primary outcome variable using integrated training models. Considering that shooting accuracy is a critical determinant of success in futsal, this gap highlights the importance of conducting focused research on training strategies that directly enhance this skill.

Based on the identified gaps, this study aims to analyze the effect of plyometric training and shooting drills on the shooting accuracy of members of the Pinang Bajek Futsal Club in Tebo Ilir District, Tebo Regency. Specifically, this research seeks to: Examine the individual effect of plyometric training on shooting accuracy. Analyze the impact of shooting drill methods on shooting performance. Evaluate the combined effectiveness of plyometric training and shooting drills in improving shooting accuracy.

The novelty of this study lies in its integrative approach, combining physical conditioning (plyometric training) and technical skill development (shooting drills) within a single experimental framework. Unlike previous studies that focus on isolated training

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methods, this research provides a comprehensive evaluation of how these interventions interact to enhance performance.

Additionally, this study contributes to the literature by focusing on a community-based futsal club, thereby offering practical insights into training applications in non-elite settings. The findings are expected to provide evidence-based recommendations for coaches and practitioners in designing effective training programs tailored to the needs of amateur athletes.

In conclusion, shooting accuracy is a fundamental skill in futsal that requires the integration of physical power, technical precision, and psychological control. While plyometric training and shooting drills have been individually proven to enhance performance, limited research has explored their combined effects, particularly in grassroots futsal settings. This study addresses these gaps by investigating the influence of both training methods on shooting accuracy among players of the Pinang Bajek Futsal Club. The results are expected to contribute to the development of more effective, science-based training models in futsal, thereby supporting athlete performance improvement and competitive success.

METHODS

This study employed a quantitative experimental approach to examine the effect of plyometric training and shooting drills on shooting accuracy among futsal players. The research design utilized a one-group pretest–posttest design, which is widely recognized in sports science research for evaluating the effectiveness of training interventions by comparing performance outcomes before and after treatment (Thomas et al., 2015; Gravetter & Forzano, 2018). In this design, participants were assessed at baseline (pretest), exposed to a structured training program, and subsequently re-evaluated (posttest) to determine performance changes attributable to the intervention. Although lacking a control group, this design remains appropriate for exploratory and applied field studies, particularly in community-based sports settings (Fraenkel et al., 2019).

The research was conducted at Beteberu Field, Teluk Rendah Ilir Village, Tebo Ilir District, Tebo Regency, Jambi Province, over a period of one month in October 2025. This duration aligns with prior studies indicating that short-term training interventions (4–6 weeks) can produce measurable improvements in neuromuscular performance and technical skills (Ramirez-Campillo et al., 2020; Suchomel et al., 2018). The training program consisted of structured sessions integrating plyometric exercises and shooting drills, designed according to the principles of progressive overload, specificity, and repetition.

The population and sample of this study consisted of all 30 members of the Pinang Bajek Futsal Club, making it a total sampling technique. Total sampling is recommended when the population size is relatively small and homogeneous, allowing researchers to maximize data representativeness and statistical power (Sugiyono, 2020; Etikan & Bala,

2017). The participants were active male futsal players with regular training backgrounds, ensuring consistency in baseline skill levels.

The study included two independent variables, namely plyometric training and shooting drills, and one dependent variable, namely shooting accuracy. Plyometric training focused on enhancing explosive power of the lower limbs through exercises such as box jumps, jump squats, and lateral bounds, which are known to improve stretch-shortening cycle (SSC) efficiency and force production (Markovic & Mikulic, 2019; Slimani et al., 2016). Meanwhile, shooting drills emphasized repetitive and structured execution of shooting techniques to enhance motor coordination, accuracy, and movement automation (Magill & Anderson, 2021; Schmidt & Lee, 2019).

The instrument used in this study was a shooting accuracy test, adapted from standard futsal skill assessment protocols (Reilly et al., 2018). The goal area was divided into multiple scoring zones to objectively evaluate shooting precision. Each participant was given five shooting attempts from a distance of 10 meters in front of the goal. The scoring system was structured as follows: a score of 1 for central targets, 2 for upper and lower central areas, 3 for mid-side targets, 4 for lower corner targets, and 5 for upper corner targets. Shots that hit the goalpost, rope, or fell outside the designated target area were scored zero. This zonal scoring system has been validated in previous studies as an effective method for measuring shooting accuracy in invasion games (Ali et al., 2016; Sarmento et al., 2018).

Table 1.
Shooting Accuracy Score Classification

No	Score Range	Category
1	0 – 5	Very Poor
2	6 – 10	Poor
3	11 – 15	Moderate
4	16 – 20	Good
5	21 – 25	Very Good

The data analysis techniques included both descriptive and inferential statistics. Prior to hypothesis testing, a normality test using Shapiro–Wilk was conducted, as it is considered the most appropriate test for small sample sizes ($n < 50$) (Ghasemi & Zahediasl, 2019). Homogeneity assumptions were also considered to ensure the validity of parametric testing. Subsequently, the research hypothesis was tested using a paired sample t-test, which compares mean differences between pretest and posttest scores within the same group (Field, 2018). Statistical analysis was performed using IBM SPSS software.

The decision criterion for hypothesis testing was based on a significance level of $\alpha = 0.05$. If the value of Sig. (2-tailed) < 0.05, the alternative hypothesis (Ha) was accepted, indicating a significant effect of the training intervention on shooting accuracy (Nisfianoor, 2009). This analytical approach is consistent with standard practices in experimental sports research and provides robust evidence for evaluating training effectiveness.

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Overall, this methodological framework integrates both conceptual rigor and empirical relevance, ensuring that the findings contribute meaningfully to the development of evidence-based training programs in futsal.

RESULTS AND DISCUSSION

Result

Descriptive Statistics

This study involved 30 members of the Pinang Bajek Futsal Club, with data collected through shooting accuracy tests conducted before (pretest) and after (posttest) the implementation of plyometric training and shooting drills. The descriptive statistics of the pretest and posttest results are presented in Table 2.

Table 2.
Descriptive Statistics of Pretest and Posttest Results

Source of Variation	N	Range	Max Score	Min Score	Mean	Std. Deviation
Pretest	30	8	12	4	6.87	2.38
Posttest	30	16	22	6	14.73	3.64

Based on Table 2, the pretest results indicate that the initial shooting accuracy of the players was in the low to moderate category, with a mean score of 6.87. Following the intervention, the posttest mean increased substantially to 14.73, reflecting an improvement of 7.86 points. This improvement demonstrates a notable enhancement in players' shooting performance after undergoing plyometric and shooting drill training.

The categorical distribution of scores further supports this finding. In the pretest phase, no players were categorized as good or very good, with only 3 players (10%) in the moderate category, 17 players (56.67%) in the poor category, and 10 players (33.33%) in the very poor category. After the intervention, the posttest results showed a significant shift: 3 players (10%) reached the very good category, 7 players (23.33%) were classified as good, 19 players (63.33%) fell into the moderate category, and only 1 player (3.33%) remained in the poor category. This shift indicates a substantial overall improvement in shooting accuracy levels among participants.

Normality Test

The normality of the data was assessed using the Shapiro–Wilk test, given the sample size of fewer than 50 participants. The results indicated that both pretest and posttest data had significance values greater than 0.05 ($p > 0.05$). Therefore, it can be concluded that the data were normally distributed, satisfying the assumptions required for parametric statistical testing. Consequently, the use of the paired sample t-test for hypothesis testing was deemed appropriate.

Hypothesis Testing

Prior to conducting the paired sample t-test, a paired correlation analysis was performed. The results showed a correlation coefficient of 0.407 with a significance value of 0.026 ($p < 0.05$), indicating a moderate and statistically significant relationship between pretest and posttest scores.

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The results of the paired sample t-test are presented in Table 3.

Table 3.
Paired Sample T-Test Results

Group	N	Mean Pretest	Mean Posttest	t-value	t-table	Sig. (2-tailed)
Pretest–Posttest	30	6.87	14.43	-12.986	2.045	< 0.001

Based on Table 3, the calculated t-value (-12.986) with degrees of freedom (df = 29) and a significance value less than 0.001 indicates a statistically significant difference between pretest and posttest scores. Since the significance value is lower than the alpha level of 0.05, the alternative hypothesis (Ha) is accepted, and the null hypothesis (H0) is rejected.

This finding confirms that plyometric training combined with shooting drills has a significant effect on improving shooting accuracy among members of the Pinang Bajek Futsal Club. The mean difference of -7.57 further indicates that posttest scores were significantly higher than pretest scores, demonstrating the positive impact of the intervention.

Effect Size Analysis

To determine the magnitude of the treatment effect, an effect size analysis using Cohen's d was conducted. The results showed a Cohen's d value of -2.37, with a 95% confidence interval ranging from -3.07 to -1.66. According to conventional benchmarks, this value falls into the category of a very large effect size, indicating a substantial impact of the intervention on shooting accuracy.

Additionally, the Hedges' correction value of -2.34 further confirms the robustness of the effect size, particularly in small sample conditions. These findings suggest that the combination of plyometric training and shooting drills not only produces statistically significant improvements but also yields practically meaningful and highly impactful performance gains.

Overall, the results demonstrate a significant and strong improvement in shooting accuracy following the intervention. The integration of plyometric training and shooting drills effectively enhanced players' performance, as evidenced by increased mean scores, improved categorical distribution, statistically significant t-test results, and a very large effect size. These findings highlight the effectiveness of combining physical conditioning and technical training in futsal performance development.

Discussion

The findings of this study demonstrate that the combination of plyometric training and shooting drills has a statistically significant and practically meaningful effect on improving shooting accuracy among members of the Pinang Bajek Futsal Club. This improvement is reflected not only in the increase of mean scores from pretest to posttest but also in the substantial shift in performance categories, indicating a transformation from predominantly low-level performance to moderate and high-level shooting accuracy. From a sports science perspective, these results can be explained through the integration of neuromuscular adaptation, motor learning theory, and training

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specificity principles, which together contribute to enhanced performance outcomes (Bompa & Buzzichelli, 2019; Suchomel et al., 2018).

One of the primary factors underlying the observed improvement is the role of plyometric training in enhancing explosive power. Plyometric exercises operate through the stretch-shortening cycle (SSC), which involves rapid eccentric muscle contraction followed by a powerful concentric contraction. This mechanism enhances muscle-tendon elasticity and neural efficiency, allowing athletes to generate greater force in a shorter period of time (Markovic & Mikulic, 2019; Ramirez-Campillo et al., 2020). In the context of futsal, explosive leg power is crucial for executing effective shooting techniques, particularly when players must produce high-velocity kicks within limited space and time (Loturco et al., 2019).

The significant increase in posttest shooting scores in this study suggests that plyometric training effectively improved the players' force production capacity, which directly influenced the strength and speed of their shots. This finding is consistent with previous research indicating that plyometric interventions can enhance lower limb power, kicking velocity, and overall athletic performance (Slimani et al., 2016; Chaouachi et al., 2017). Furthermore, improved neuromuscular coordination resulting from plyometric training contributes to better control of movement patterns, which is essential for accurate shooting execution (Cormie et al., 2016).

In addition to physical conditioning, the role of shooting drills as a method of technical skill development is equally important in explaining the study results. Shooting drills involve repetitive execution of specific motor tasks under controlled conditions, which facilitates the development of motor learning and movement automation (Schmidt & Lee, 2019; Magill & Anderson, 2021). Through repeated practice, athletes are able to refine their technique, reduce variability in movement execution, and improve accuracy and consistency.

The improvement in shooting accuracy observed in this study aligns with the principles of deliberate practice, which emphasize repetition, feedback, and progressive refinement of skills (Ericsson et al., 2018). By consistently practicing shooting techniques, players develop more efficient motor programs, allowing them to execute movements more precisely under game conditions (Davids et al., 2017). This is particularly relevant in futsal, where rapid decision-making and precise execution are required in high-pressure situations (Sarmento et al., 2018).

The integration of plyometric training and shooting drills represents a holistic training approach, combining physical and technical components to produce synergistic effects. The large effect size (Cohen's d = -2.37) reported in this study indicates that the combined intervention was not only statistically significant but also highly impactful in practical terms. This finding supports the concept that performance improvements are maximized when training programs address multiple dimensions of athletic performance simultaneously (Turner, 2017; Bompa & Haff, 2021).

From a theoretical standpoint, this study reinforces the principle of training specificity, which states that adaptations are specific to the type of training performed

(Behm & Sale, 2017). Plyometric exercises improved the physical capacity required for powerful shooting, while shooting drills enhanced the technical execution of the skill. The combination of these methods ensured that improvements in strength were effectively translated into functional performance gains in shooting accuracy.

The findings of this study are consistent with previous empirical research. Mukti et al. (2023) reported that plyometric training significantly improves shooting accuracy in futsal players by enhancing explosive power and coordination. Similarly, Rizki et al. (2023) demonstrated that drill-based training methods effectively improve shooting precision and technical consistency. Moreover, Fasrah and Hulfian (2025) found that the combination of plyometric exercises and shooting drills produces superior performance outcomes compared to single-method training approaches. These studies collectively support the results of the present research and highlight the effectiveness of integrated training models.

In addition, other studies have emphasized the importance of combining strength and skill training in team sports. For example, Young et al. (2015) and Comfort et al. (2018) suggest that improvements in power output must be complemented by skill-specific practice to ensure transfer to sport performance. Similarly, Jeffreys (2019) argues that training programs should integrate physical conditioning and technical drills to maximize performance outcomes in dynamic sports such as futsal.

The observed improvement in shooting accuracy can also be linked to psychological factors, such as increased confidence and reduced anxiety during performance. As players become more proficient in executing shooting techniques through repeated practice, their confidence levels increase, which positively influences performance under pressure (Weinberg & Gould, 2019). This psychological adaptation further enhances the effectiveness of the training intervention.

Despite the positive findings, it is important to acknowledge certain limitations of this study. The use of a one-group pretest–posttest design without a control group limits the ability to fully isolate the effects of the intervention from other external factors. Additionally, the relatively small sample size and short duration of the intervention may affect the generalizability of the results. Future research is recommended to employ randomized controlled trials, larger sample sizes, and longer intervention periods to strengthen the validity of findings (Hopkins et al., 2016).

Nevertheless, the practical implications of this study are significant. Coaches and practitioners can incorporate plyometric training and shooting drills into regular training programs to improve shooting accuracy and overall performance in futsal players. The findings suggest that a structured and integrated training approach is more effective than isolated methods, providing valuable guidance for training program design in both amateur and professional settings.

In conclusion, this study confirms that the combination of plyometric training and shooting drills significantly enhances shooting accuracy in futsal players. The improvement is driven by increased explosive power, improved neuromuscular coordination, and enhanced technical execution through repetitive practice. These

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results contribute to the growing body of evidence supporting integrated training approaches in sports performance and offer practical recommendations for optimizing futsal training programs.

CONCLUSION

Based on the results and discussion of this study, it can be concluded that plyometric training combined with shooting drills has a significant effect on improving shooting accuracy among members of the Pinang Bajek Futsal Club in Tebo Ilir District, Tebo Regency. This conclusion is supported by both statistical and practical findings. The mean posttest score (14.43) was substantially higher than the mean pretest score (6.87), indicating a clear improvement in shooting performance following the intervention. Furthermore, the paired sample t-test results ($t = -12.986$; Sig. < 0.001) confirm that the difference between pretest and posttest scores is statistically significant, leading to the acceptance of the alternative hypothesis.

In addition, the effect size analysis using Cohen's d (-2.37) demonstrates that the intervention had a very large effect, highlighting the strong practical impact of combining plyometric exercises with shooting drills. This indicates that the training program not only produced measurable improvements but also delivered meaningful performance enhancements in real-game contexts.

From a conceptual perspective, the findings show that plyometric training effectively increases lower limb explosive power, which is essential for generating strong and accurate shots. Meanwhile, shooting drills contribute to improved coordination, control, and precision through systematic and repetitive practice. The integration of these two training methods creates a synergistic effect, enabling players to develop both the physical capacity and technical proficiency required for optimal shooting performance.

Therefore, it is recommended that coaches and players integrate plyometric training and shooting drills into regular training programs, either on a daily or weekly basis, to enhance shooting accuracy and overall performance in futsal. For future research, it is suggested to include a control group, extend the training duration, and explore additional variables such as psychological factors, biomechanics, or tactical elements that may influence shooting accuracy.

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