

The effect of shooting a stationary ball and a moving ball to wear the shooting accuracy of soccer academy

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Abstract

Research Problems: Many young soccer players struggle to maintain consistent shooting accuracy when transitioning between shooting a stationary ball and a moving ball during gameplay. This study examines the impact of the ball's condition—stationary versus moving—on the shooting accuracy of 14-to 15-year-old soccer players. **Research Objectives:** This study aims to determine the effect of stationary ball and moving ball shooting training on improving shooting accuracy in soccer. **Methods:** The research used a two-group pretest-posttest design with a total sample of 26 participants, divided evenly into two groups of 13. The first group underwent stationary ball shooting training, while the second group participated in moving ball shooting training. A shooting accuracy test was used as the research instrument to measure performance before and after the intervention. **Results:** The pretest results showed that the stationary ball group had an average value of 63.08, which increased to 77.69 in the posttest. Similarly, the moving ball group increased from an average of 60.00 to 74.62. An increase of 14.62 points in both groups. Data analysis involved the Shapiro-Wilk normality test and Levene's homogeneity test, confirming that the data were normally distributed and homogeneous ($p > 0.05$). The Paired Samples t-test showed a significant difference between the pretest and posttest values in both groups ($p = 0.000$), indicating that the training given was effective in improving the accuracy of shots on goal. However, based on the Independent Samples Test, there was no significant difference between the two groups ($p = 0.454$), although the average posttest score of the stationary ball group was slightly higher. **Conclusion:** Thus, stationary ball and moving ball shooting exercises are equally effective in improving shooting accuracy. These results support the implementation of both training methods in basic soccer coaching programs to enhance players' shooting precision. Future research should investigate the long-term effects of both training types across various age groups and skill levels to enhance generalizability and provide a broader understanding of optimal training strategies. **Keywords:** shooting accuracy; shooting a stationary ball; shooting a moving ball.

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INTRODUCTION

Sport is an extraordinary, rule-based, competitive, skill-based physical activity or practice, which involves cooperation to meet the initial goal of competition (Borge, 2021). Soccer is one of the popular achievement sports in Indonesia. In English, the game of soccer is known as “football”, while in the United States it is more commonly referred to as “soccer”. The word “soccer” itself comes from two basic words, namely “soccer” and “ball”.

“Soccer” means a kicking motion performed with the feet, while “ball” refers to a round-shaped game object generally made of leather or rubber. Soccer has grown to become one of the most popular sports in the world, played at various levels, from amateur to professional, with rules that continue to evolve over time. Multivariate assessment showed that the combination of accuracy and speed of each shot on target explained more than 57% of the variation in soccer playing skills in young players (Engler et al., 2023). In addition, (Zhang et al., 2023) revealed that plyometric training had a large positive impact on kicking performance in soccer ($g = 0.979$, $p < 0.001$), indicating its importance in the development of players' technical aspects, while (Sahinler et al., 2023) emphasized that impact speed and shot angle are the main determining factors in shot accuracy when doing basic training.

Soccer is a sport played using a ball, which is usually made of leather or other synthetic materials. The game involves two teams of 11 players each. Talent in sports is the ability of individuals with skills that can be perfected through consistent practice (Araújo et al., 2023). which emphasizes the importance of structured and repeated training efforts in developing soccer-related abilities.

Despite the wide variety of soccer training approaches, few studies have directly compared the effectiveness of shooting exercises with stationary versus moving balls among adolescent players. Belete (2023) stated that eight weeks of specialized training significantly improved shooting accuracy on both stationary and moving balls, with greater improvement seen in stationary ball shooting ($p < 0.05$), indicating that this exercise is more suitable for skill development at an early stage. Firdaus et al. (2021) through a 2×2 factorial experiment found that U-17 players showed higher shooting accuracy when kicking a stationary ball (average = 14.40) compared to a moving ball (12.40), with a very significant difference ($p = 0.000$). Meanwhile, (Sintoko & Suharjana, 2018) talent must also be balanced with effort because without these two things it will not run optimally. Soccer academy is one of the places to foster the talent of soccer players at an early age. In addition, several studies have shown that training with fixed targets has a

greater effect on shooting accuracy in soccer than training with changing targets.

Although several studies have explored training methods, limited research directly compares the effectiveness of stationary versus moving ball shooting among 14–15-year-old athletes. This study seeks to fill that gap and contribute to evidence-based youth training programs. This divergence in findings highlights a research gap regarding the relative effectiveness of stationary versus moving ball shooting training, particularly among younger age groups. While prior research has addressed these methods individually, there remains a lack of consensus and contextual validation within specific training environments, such as soccer academies.

Based on observations made by researchers at soccer academy Pandanaran Boyolali group age 14-15 because players have poor shooting accuracy during training or during matches, there are still many shortcomings in shooting accuracy towards the goal which causes players to have difficulty scoring goals. There are several factors that influence the shooting accuracy of players, namely the level of difficulty, player skills, anticipation of movement, experience and feelings ([Mustafa & Adnan, 2019](#)). The reform, identifying the more effective training method stationary or moving ball shooting is critical for improving player development in this age group.

This study is urgent because improving shooting accuracy at an early developmental stage is essential for long-term technical growth. Moreover, soccer academies serve as the foundation for nurturing talent through structured, ongoing coaching. Age-group coaching training is beneficial to players in the learning process; in this case, it helps improve technique mastery and consolidation of motor skills, which are crucial for taking accurate shots in stressful situations ([Pratama, 2017](#)). The benefit for soccer academy that have spread throughout Indonesia is to create quality player seeds through coaching at soccer academy.

The novelty of this study lies in its direct comparison of stationary and moving ball shooting exercises in the context of an Indonesian soccer academy for players aged 14–15, a group underrepresented in existing

literature. This approach provides new empirical data to inform evidence-based training strategies.

Therefore, the objective of this study is to determine whether stationary or moving ball shooting exercises are more effective in enhancing the shooting accuracy of players aged 14–15 at Pandanaran Boyolali Soccer Academy. The findings are expected to contribute not only to the body of knowledge in sports science but also provide practical insights for coaches in designing targeted and effective training programs based on the specific developmental needs of adolescent players.

METHOD

Design Research

This study employed an experimental approach using a Two-Group Pretest-Posttest Design. [Sakerebau \(2018\)](#) explaining the purpose of experimentation is to investigate the possibility between relationships and effects through the process of applying one or more treatment conditions to one or more experimental groups and comparing the results with one or more groups. The experimental method was chosen because it allows researchers to administer treatment and objectively measure its effect.

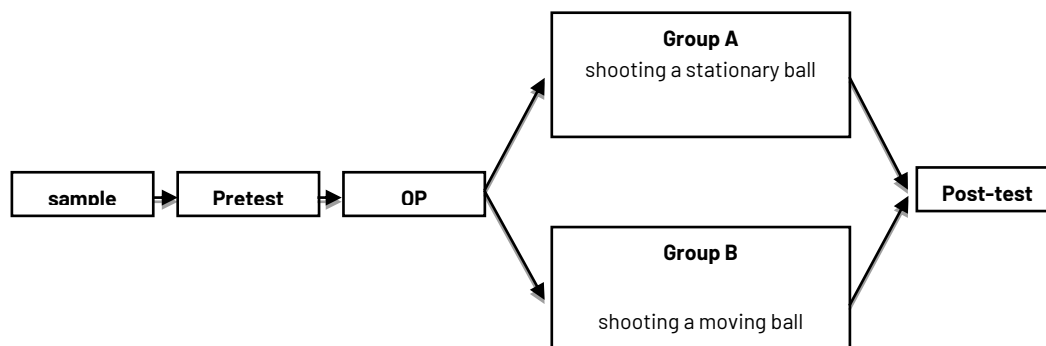


Figure 1. Research design “Two Group Pretest-Posttest Design”

Description:

Sample: Research Population

Pre-test: Initial Test

OP: Ordinal Pairing

1: Experiment Group A

2: Experiment Group B

A: Practice program of shooting a stationary ball

B: Practice Program of shooting a moving ball

Post-test: Final Test

Participant

This research was conducted at the Bangsalan Village field, which is in Teras District, Boyolali Regency. The training program was implemented over 12 sessions as part of the regular Pandanaran Soccer Academy schedule.

Sampling is the process of selecting samples from a population of individuals or large groups for certain types of research purposes ([Chudasama, 2023](#)). The sample is part of the population used as a data source in research. The population of this study consisted of soccer players aged 14–15 years enrolled in the Pandanaran Soccer Academy Boyolali. A total of 26 players were selected using total sampling. Each group consisted of 13 participants.

Research Instrument

This study employed a research instrument in the form of a shooting accuracy test to collect quantitative data in a structured and systematic manner. Research instruments are an important part of research because research instruments are tools used to collect, examine and investigate a problem that you want to examine. This test aims to measure the player's ability to shoot towards the goal with pinpoint accuracy. Accuracy is an effort made to achieve goals without making mistakes. The effort in question is an attempt to shoot into the goal within a certain distance and according to the direction desired by the kicker or according to the target ([Candra, 2016](#)).

The shooting accuracy test was adopted from ([Mielke, 2007](#)) and has been previously validated to ensure consistency and reliability in measurement. This test aims to determine the accuracy of a player's kick toward the goal using equipment such as a goalpost, ball, rope, meter, and marker. The implementation involves the player taking position behind a marker placed 17 meters from the goal. Upon receiving a signal from the researcher, the player is instructed to shoot the ball toward the target of their choice. Each player is given five kicking opportunities. A shot is considered invalid if the ball goes outside the goal area or if the shot is taken from a position other than behind the 17-meter marker.

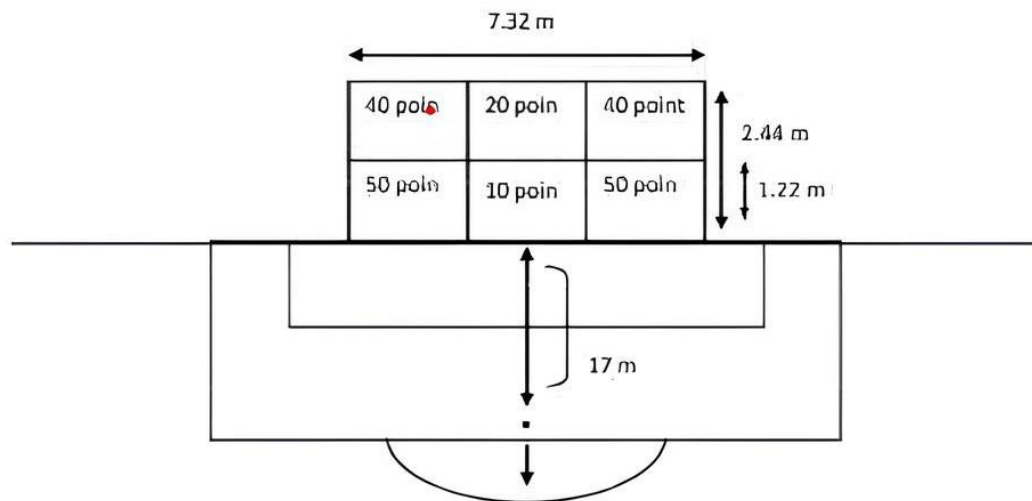


Figure 2. Distribution of points

Data Analyses

The data obtained from the shooting accuracy test during the pretest and posttest were analyzed using IBM SPSS Statistics version 25. The analysis was carried out in several stages. First, the Shapiro-Wilk normality test was conducted to ensure that the data were normally distributed. Second, the Levene's Test was conducted to determine the homogeneity of variance between groups.

Next, to determine the effectiveness of the exercises in each group, a Paired Samples t-test was used to compare the pretest and posttest results. Finally, an Independent Samples t-test was used to determine the difference in effectiveness between stationary ball shooting and moving ball shooting exercises based on the posttest results. All statistical tests were conducted with a significant level of $\alpha = 0.05$.

RESULT

The results of this study will be presented in tabular form regarding the results of the study and their interpretation with the following data calculations:

Table 1. Data Description

No.	stationary ball shooting practice		moving ball shooting practice	
	pretest	posttest	pretest	posttest
1	90	100	80	90

No.	stationary ball shooting practice		moving ball shooting practice	
	pretest	posttest	pretest	posttest
2	80	90	70	70
3	80	90	70	90
4	70	70	70	80
5	60	80	70	80
6	60	70	70	70
7	60	80	60	80
8	60	70	60	70
9	60	80	50	80
10	60	60	50	60
11	50	70	50	70
12	50	80	40	70
13	40	70	40	60
Average	63.076	77.692	60	74.615

In the stationary ball shooting exercise with a sample size of 13, the initial value of the participants before being given the treatment showed an average of 63.08, with the highest value of 90 and the lowest value of 40. After the implementation of the training program, there was an increase in the average value to 77.69, with the highest value remaining at 100, and the lowest value increasing to 60. Thus, there was an average increase of 14.62 points from the pretest to the posttest, which reflected the development of the ability to shoot a stationary ball after participating in the training. Meanwhile, in the moving ball shooting exercise with a sample size of 13, the initial average score of the participants at the time of the pretest was 60.00, with the highest score of 80 and the lowest score of 40. After being given the exercise, the average score increased to 74.62, where the highest score reached 90 and the lowest score rose to 60. The average increase that occurred in the moving ball shooting exercise was also 14.62 points, indicating that the improvement in the performance of the participants was equivalent to the results obtained in the stationary ball shooting exercise.

Table 2. Tests of Normality Shapiro-wilk

Results		Shapiro-Wilk		
		Statistic	df	Sig.
group	pretest shooting a stationary ball	0.917	13	0.231
	posttest shooting a moving ball	0.919	13	0.240
	pretest shooting a stationary ball	0.898	13	0.127
	posttest shooting a moving ball	0.901	13	0.139

Based on the results of the Shapiro-Wilk normality test, it was found that the pretest data of silent ball shooting had a statistical value of 0.917 with a significance of 0.231. Meanwhile, the stationary ball shooting posttest data has a statistical value of 0.919 with a significance value of 0.240. For pretest shooting the moving ball, the statistical value is 0.898 and significance 0.127, while the posttest shooting the moving ball shows a statistical value of 0.901 with a significance of 0.139. Because all significance values (Sig.) are greater than 0.05, it can be concluded that all data in the four groups are normally distributed.

Table 3. Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Results	Based on Mean	0.074	1	24	0.788
	Based on Median	0.077	1	24	0.784
	Based on Median and with adjusted df	0.077	1	23.937	0.784
	Based on trimmed mean	0.080	1	24	0.780

Based on the results of the variance homogeneity test using Levene's Test, it was found that based on the mean, the Levene Statistic value was 0.074 with degrees of freedom (df) 1 and 24, and a significance value of 0.788. Based on the median, the Levene Statistic value is 0.077 with a significance of 0.784. Based on the median with adjusted df, the Levene Statistic value remains 0.077 with df of 1 and 23.937, and a significance of 0.784. Based on the trimmed mean, the Levene Statistic value is 0.080 with a significance of 0.780. Since all significance values are greater than 0.05, it can be concluded that the data has a homogeneous variance.

Table 4. Paired Samples Test Shooting a stationary ball against shooting accuracy

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
pretest - post-test	-14.615	9.674	2.683	-20.461	-8.769	-5.447	12	0.000

The results of the Paired Samples t-test on silent ball shooting training show that there is an average difference between pretest and posttest values of -

14.615, with a standard deviation of 9.674 and a standard error of the mean of 2.683. The 95% confidence interval for the mean difference ranges from -20.461 to -8.769. The calculated t value is -5.447 with a degree of freedom (df) of 12, and a significance value (2-tailed) of 0.000. Because the significance value is smaller than 0.05 ($p < 0.05$), it can be concluded that there is a significant difference between the pretest and posttest values. That is, silent ball shooting training has a significant effect on improving the shooting accuracy of participants.

Table 5. Paired Samples Test Shooting a moving ball against shooting accuracy

	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
pretest - posttest	-14.615	9.674	2.683	-20.461	-8.769	-5.447	12	0.000

Based on the results of the Paired Samples t-test on moving ball shooting training, the average difference between pretest and posttest values is -14.615, with a standard deviation of 9.674 and a standard error of the mean of 2.683. The 95% confidence interval range for the mean difference is between -20.461 to -8.769. The calculated t value is -5.447 with a degree of freedom (df) of 12, and a significance value (Sig. 2-tailed) of 0.000. Because the significance value is smaller than 0.05 ($p < 0.05$), it can be concluded that there is a significant difference between the pretest and posttest results. Thus, moving ball shooting training has a significant effect on improving the shooting accuracy of participants.

Table 6. Independent Samples Test

Statistic	Equal Variances Assumed	Equal Variances Not Assumed
Levene's F	0.074	—
Levene's Sig.	0.788	—
t-value	0.760	0.760
df	24	23.657
Sig. (2-tailed)	0.454	0.454
Mean Difference	3.077	3.077
Std. Error Difference	4.046	4.046
95% CI Lower	-5.274	-5.280
95% CI Upper	11.428	11.434

Based on the results of the Independent Samples Test, it is known that Levene's Test for Equality of Variances produces an F value = 0.074 with a significance of 0.788, which means that the data has a homogeneous variance (because the sig value > 0.05). Furthermore, the results of the T-test for Equality of Means showed a value of $t = 0.760$ with a degree of freedom (df) of 24 and a significance value (Sig. 2-tailed) of 0.454. The mean difference value between the two groups is 3.077, with a standard error of 4.046, and a range of 95% confidence interval of the difference between - 5.274 to 11.428. Since the significance value ($0.454 > 0.05$), it can be concluded that there is no statistically significant difference between the two groups being compared.

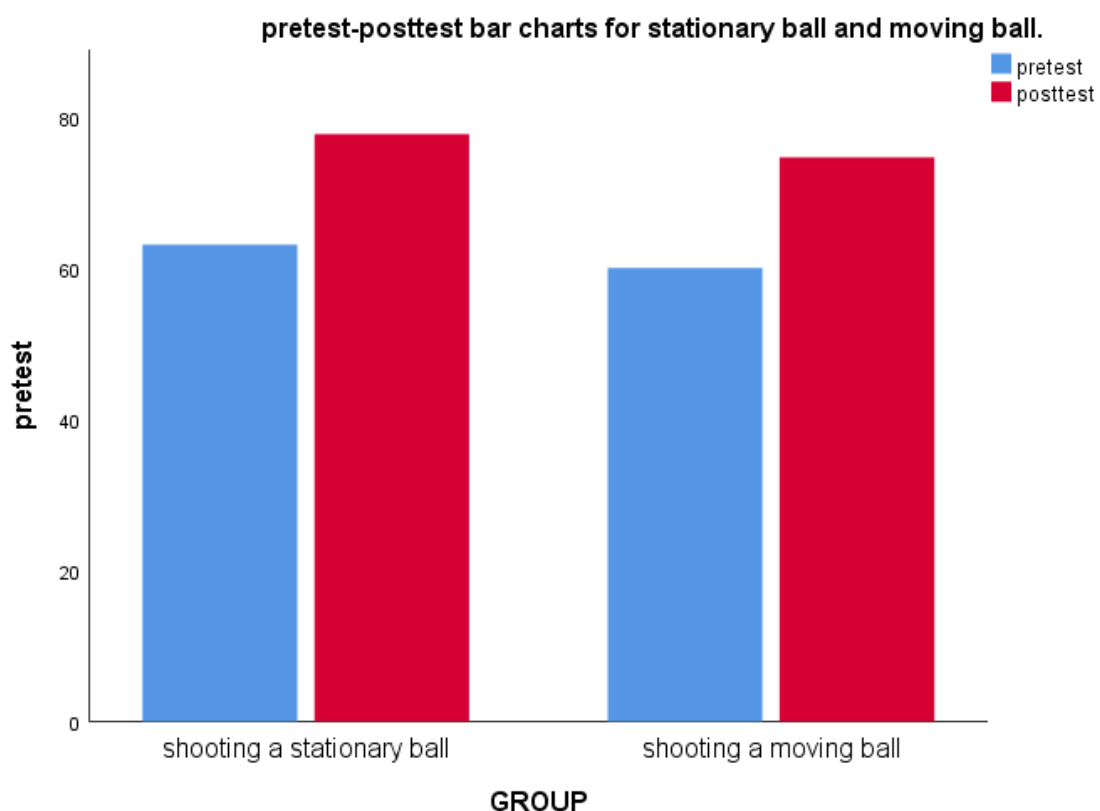


Figure 3. pretest-posttest bar charts for stationary ball and moving ball.

The bar chart above shows a comparison of the pretest and posttest results in the two training groups, namely the stationary ball shooting group and the moving ball shooting group. In the stationary ball shooting group, the average pretest value was in the range of 63-64, while the posttest value increased significantly to around 78. Meanwhile, the moving ball shooting

group had an average pretest value of around 60 and increased to 75 in the posttest. The increase that occurred in both groups showed that the training program provided was effective in improving shooting accuracy. However, the group that did the stationary ball shooting exercise showed a slightly higher increase compared to the moving ball shooting group. This indicates that training using a stationary ball is more suitable for use in the early stages of mastering basic shooting techniques.

Table 7. Group Statistics

	group	N	Mean	Std. Deviation	Std. Error Mean
pretest	shooting a stationary ball	13	63.08	13.775	3.820
	shooting a moving ball	13	60.00	12.910	3.581
post-test	shooting a stationary ball	13	77.69	10.919	3.028
	shooting a moving ball	13	74.62	9.674	2.683

Based on the results of descriptive statistics, it is known that at the pretest stage, the stationary ball shooting training group has an average value of 63.08 (SD = 13.775), while the moving ball shooting group has an average value of 60.00 (SD = 12.910). This shows that before treatment, both groups have relatively balanced initial abilities. Although the average posttest value of the stationary ball group is higher, the difference is not statistically significant. After being given the training treatment, at the posttest stage, the stationary ball shooting group experienced an increase in average value to 77.69 (SD = 10.919), while the moving ball shooting group increased to 74.62 (SD = 9.674). Thus, both groups experienced an increase in shooting accuracy. So, it can be said that stationary ball shooting training is more effective in improving shooting accuracy than moving balls, based on the average value of posttest results. Although the average posttest value of the stationary ball group is higher, the difference is not statistically significant.

DISCUSSION

The results of this study as a whole show that the two training models applied, namely stationary ball shooting training and moving ball shooting training, can have a positive impact on improving the shooting accuracy of participants. In the group that received silent ball shooting training

treatment, there was an increase in the average value from 63.08 in the pretest to 77.69 in the posttest, or an increase of 14.62 points. Similarly, the group that practiced shooting a moving ball experienced an increase in average value from 60.00 to 74.62, which also showed an increase of 14.62 points. This identical increase in scores indicates that both forms of training contributed significantly to the participants' performance, especially in the context of shooting skills.

Furthermore, the results of statistical tests using Paired Samples t-Test corroborate these findings, showing that the difference between pretest and posttest scores is statistically significant. The calculated t-value obtained was -5.447 with a degree of freedom (df) of 12, and a significance value of 0.000 ($p < 0.05$), accompanied by a 95% confidence interval on the average difference in the range of -20.461 to -8.769. This indicates that the training performed can provide a strong influence on shooting ability, and that the difference in scores does not occur by chance or influence from outside factors. These findings support the results of (Nurtajudin, 2025) study, which showed that the Spinning Shooting Training Model significantly improved soccer players' shooting ability ($p = 0.000$), as measured using the Bobby Charlton Shooting Test and analyzed with the Wilcoxon Signed-Rank Test. Rifaldo et al. (2024) found that combining plyometric training with shooting variations significantly improves shooting accuracy. Similarly, La Sawali (2022) reported a significant effect of target shooting practice on accuracy, with a t-value of 10.018 and a significance level of $p = 0.000$, highlighting the effectiveness of structured technical training in improving players' shooting accuracy. Additionally, Atabaş & Yapıcı (2018) demonstrated that jump-based (plyometric-like) training yields significantly higher shooting accuracy (60%) compared to speed-based training (20%), despite the latter improving shot velocity, supporting that methods emphasizing explosive physical control can enhance precision.

However, when a comparison was made between the posttest results of the two groups using the Independent Samples Test, it was found that the difference in final scores between the stationary ball and moving ball

exercises was not statistically significant. The calculated t value of 0.760 and significance value of 0.454 ($p > 0.05$) indicate that the effectiveness of the two types of training is relatively comparable, although numerically the stationary ball group showed slightly higher posttest results. This suggests that in the context of basic shooting training, both stationary and moving drills can be equally effective depending on the needs and specific training objectives that the coach wants to achieve.

This study was limited by its small sample size and the absence of a control group, which reduces the generalizability of the findings across broader populations. In addition, other potentially influential variables such as player motivation, concentration level during training, and baseline technical proficiency in shooting were not controlled. These uncontrolled factors may have had an indirect effect on the shooting outcomes observed, particularly in relation to the accuracy of both stationary ball and moving ball shooting. For example, a player with higher intrinsic motivation or better initial technique may show greater improvement regardless of the training method applied, thereby influencing the results. Moreover, the relatively short duration of the intervention may not have been sufficient to capture the long-term development of shooting accuracy, especially considering that shooting a moving ball often requires more advanced coordination and decision-making skills compared to stationary ball shooting. Future studies with larger samples and controlled variables are needed to better isolate the effects of each training type on shooting accuracy and provide stronger evidence for the optimal training methods in youth soccer development.

This finding is in line with the results of previous research. [Al Mubarak & Sukoco \(2019\)](#) confirmed that the systematic application of shooting training variations in adolescent age players was able to significantly improve accuracy, with a value of $p = 0.002$, indicating the success of training interventions on basic soccer technical skills. A similar study was conducted at Victory Dairi FC, which showed that a variety of shooting exercises can consistently improve the shooting accuracy of players aged 14-17 years with a t value of 12.89 and a significance of $p < 0.05$, which supports the

conclusion that a planned training program can encourage the improvement of players' technical performance (Telaumbanua & Ibrahim, 2024). Wicaksono et al. (2020) in his research on the effect of shooting training variations on kick accuracy in soccer reported that there was a statistically significant effect on improving shooting ability, with a significance value of $p = 0.000$. Furthermore, he noted that the contribution of variation training to shooting accuracy reached about 24.1%, which means that almost a quarter of the improvement in participants' performance can be explained by the application of these training methods. This shows that training designed with a variety of techniques, shot angles, and movement speeds has a real influence on the accuracy of the ball's direction when shooting at goal.

Based on all these findings, it can be concluded that shooting training, both from a stationary and moving position, both have a significant contribution to improving the shooting accuracy of participants. This is consistent with the literature which states that a combination of training techniques, intensity, and consistent repetition can maximize the development of basic skills in soccer. Therefore, the results of this study can be used as a basis for coaches or sports educators to design shooting training programs that are more systematic, directed, and varied, especially in youth coaching, to optimize the results of accurate and effective shooting technique performance in real game situations.

Practically speaking, coaches should incorporate both stationary ball shooting and moving ball shooting drills into youth development programs, as each offers measurable benefits depending on the context and training objectives. Still ball shooting is very effective in developing fundamental mechanics such as body position, foot placement, and controlled follow-through, which are crucial for improving basic shot accuracy. On the other hand, shooting a moving ball is better at simulating actual match conditions, where players must shoot on the move or after receiving a pass under time constraints and pressure. By combining these two types of drills, players are not only trained to be accurate in a controlled environment, but are also equipped to maintain precision in dynamic, game-like situations.

This balanced approach helps to improve technical consistency, spatial awareness, and decision-making, all of which are critical components in achieving high shot accuracy under a variety of conditions. Therefore, an integrated training program that includes both shooting methods can provide a more comprehensive skills foundation and support long-term performance development in youth soccer players.

CONCLUSION

The study concludes that both stationary and moving ball shooting exercises significantly improve players' shooting accuracy, as shown by an average score increase of 14.62 points in both groups and a significant p -value (0.000) from the Paired Samples t -test. Although the stationary ball group had a slightly higher post-test average (77.69 vs. 74.62), the difference was not statistically significant ($p = 0.454$), indicating both methods are similarly effective.

These findings suggest that structured training—whether with stationary or moving balls—enhances players' precision and consistency in shooting. Coaches are advised to integrate both methods in training programs, as match conditions often require players to shoot in both static and dynamic scenarios. Combining both approaches helps improve adaptability, decision-making, and technical accuracy in real game situations.

AUTHOR'S CONTRIBUTION

Habid Wipa Rayhananda: Conceptualization, Methodology, Data Curation, Formal Analysis, Investigation, Writing – original draft. **Mohamad Annas:** Supervision, Validation, Writing – review & editing, Project Administration.

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