



The Effect Of Moving Ball Exercise On Shooting Accuracy Towards The Goal In State High School Students Specifically For Sports Of South Sulawesi Province

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ABSTRACT

Shooting accuracy is one of the decisive technical abilities in football because it directly determines the success of attacking play and goal scoring. In school-based football coaching, students often experience difficulty directing the ball accurately toward the goal, especially when shooting from a moving ball situation. This study aimed to determine the effect of moving-ball training on shooting accuracy toward the goal among students of SMA Negeri Khusus Keberbakatan Olahraga Provinsi Sulawesi Selatan. This research used a quantitative experimental method with a one-group pretest-posttest design. The sample consisted of 20 students who participated in the football training program. The research procedure included an initial test, a moving-ball training treatment, and a final test. The instrument used was a shooting accuracy test toward the goal, while the data were analyzed using descriptive statistics, normality testing, homogeneity testing, and paired-sample t-test. The descriptive results showed that the pretest mean score was 9.900, with a standard deviation of 2.19809, a minimum score of 7.00, and a maximum score of 13.00. After the treatment, the posttest mean score increased to 15.700, with a standard deviation of 2.07998, a minimum score of 13.00, and a maximum score of 19.00. The mean improvement was 5.800 points. The paired-sample t-test obtained a t-count value of 42.136, which was higher than the t-table value of 1.729, with a significance value of $0.000 < 0.05$. Therefore, moving-ball training had a significant effect on improving students' shooting accuracy toward the goal.

ARTICLE HISTORY

Received: 2025/12/28

Accepted: 2026/01/15

Published: 2026/01/21

KEYWORDS

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AUTHORS' CONTRIBUTION

- A. Conception and design of the study;
- B. Acquisition of data;
- C. Analysis and interpretation of data;
- D. Manuscript preparation;
- E. Obtaining funding

Cites this Article : Samsul Muarif. (2026). The Effect Of Moving Ball Exercise On Shooting Accuracy Towards The Goal In State High School Students Specifically For Sports Of South Sulawesi Province. **Journal of Physical Sport Therapy and Rehabilitation**. 1(1), P.26-36

INTRODUCTION

Sport is a systematic human activity that contributes not only to health, fitness, and recreation, but also to the development of achievement, discipline, competitiveness, and national pride. In the Indonesian context, sports development is no longer positioned merely as extracurricular activity, but as a strategic field that requires planned coaching, scientific training, adequate facilities, and sustainable talent development. Law of the Republic of Indonesia Number 11 of 2022 concerning Sports emphasizes that sports must be developed through structured coaching, science-based training, and continuous performance-oriented programs. Therefore, achievement in sport cannot be reached instantly; it demands a progressive training process involving physical, technical, tactical, psychological, and evaluative components (Republic of Indonesia, 2022; Putra, 2020).



Football is one of the most popular team sports and requires cooperation among players, tactical discipline, physical readiness, and mastery of basic techniques. Among the essential technical skills in football, shooting is a decisive component because the final outcome of attacking play is determined by the ability to direct the ball accurately toward the goal. A team may dominate possession and build attacks effectively, but without accurate shooting, attacking dominance will not produce goals. In school-based talent development, especially at SMA Negeri Khusus Keberbakatan Olahraga Provinsi Sulawesi Selatan, shooting accuracy becomes a critical indicator of technical readiness because students are prepared not only for physical education participation but also for competitive sport achievement.

However, in practice, many student-athletes still experience difficulty in shooting accurately toward the goal, particularly when the ball is moving. Conventional shooting practice often uses a stationary ball, predictable target, and repeated isolated execution. This pattern may improve basic kicking mechanics, but it does not fully represent real match situations, where players must shoot after receiving a pass, controlling a rolling ball, adjusting body position, reading the goalkeeper, and making quick decisions under time pressure. Previous studies have shown that shooting accuracy is influenced by ball position, target variation, foot-eye coordination, dynamic stability, leg power, and task constraints (Ashidiqie et al., 2024; Deniz et al., 2025; Sintoko & Suharjana, 2019). Therefore, training that uses a moving ball is pedagogically and practically relevant because it places students in a more realistic technical-tactical environment.

Recent literature in football coaching emphasizes that skill improvement is more effective when training tasks are designed to resemble game demands. Small-sided games, constraints-led training, and target-based shooting models have been widely discussed as methods that improve technical execution, decision-making, and tactical adaptation in youth football. Clemente et al. (2021) reported that small-sided game interventions provide significant benefits for technical execution among young and youth players. Similarly, Clemente et al. (2020) and Ferreira-Ruiz et al. (2021) explained that manipulating playing format, space, player number, and task constraints can influence technical-tactical behavior in football. These findings indicate that football skills should not be trained only through repetitive mechanical drills, but also through contextual practice that requires perception, movement adjustment, and decision-making.

Studies on shooting accuracy also support the importance of specific and varied training. Sintoko and Suharjana (2019) found that target practice models influence football shooting accuracy among school athletes. Daulay et al. (2025) developed a goal-targeted shooting training model to improve shot accuracy in youth football players, while Paisal et al. (2024) produced a shooting training model for players aged 14–17 years. Pangestu (2025) further validated a multi-station shooting model that integrated speed, accuracy, strength, core stability, leg strength, and power. These studies confirm that effective shooting training should include variation, progressive difficulty, target orientation, and realistic execution patterns rather than monotonous repetition.

Biomechanical and motor-learning perspectives also strengthen the rationale for moving-ball shooting practice. Accurate shooting depends on the interaction between approach angle, support-foot placement, kicking-foot velocity, ball contact quality, balance, and visual control. Deniz et al. (2025) showed that kicking effectiveness is determined by both ball velocity and accuracy, while Vieira et al. (2024) highlighted the need for valid measurement of soccer kicking features under field conditions. Dynamic stability is also important because shooting during movement requires body control before, during, and after ball contact (Al-Baitar et al., 2025). From a skill acquisition perspective, D'Isanto et al. (2021) and Ramos et al. (2020) argued that constraints-led practice helps players adapt technical actions to changing performance environments. Thus, moving-ball shooting training is aligned with contemporary football coaching because it develops technical accuracy in conditions closer to match reality.

Although many previous studies have examined shooting accuracy, target shooting, small-sided games, plyometric training, and technical skill development, several gaps remain. First, many shooting studies still focus on stationary-ball execution, fixed targets, or general shooting drills, whereas real football situations frequently require players to shoot a moving ball. Second, studies on moving-ball

shooting remain limited, especially in Indonesian school-based talent development settings. The available research on stationary versus moving-ball shooting indicates that ball condition affects shooting accuracy, but more contextual evidence is needed in different athlete populations and educational environments (Isnandar et al., 2025). Third, most studies examine football academies, clubs, or general school students, while research involving students of a special sports talent senior high school in South Sulawesi is still rarely reported.

This gap is important because students at SMA Negeri Khusus Keperbakatan Olahraga Provinsi Sulawesi Selatan have different characteristics from ordinary school students. They are expected to demonstrate higher technical readiness, faster motor adaptation, and stronger competitive orientation. Therefore, their training program should not only improve basic shooting mechanics, but also develop accuracy under dynamic, match-like conditions. Moving-ball training may serve as a bridge between isolated shooting drills and actual game execution because it requires coordination, timing, body positioning, concentration, and quick technical decision-making. Previous related studies by Widodo et al. (2022), Sawali (2021), Nugraha et al. (2024), Hadi et al. (2023), Erlan et al. (2025), Putri et al. (2023), and Neag et al. (2024) support the importance of valid skill testing, target-oriented practice, physical support, and contextual training in improving football or futsal technical performance.

Based on these problems and gaps, this study aims to determine the effect of moving-ball training on shooting accuracy toward the goal among students of SMA Negeri Khusus Keperbakatan Olahraga Provinsi Sulawesi Selatan. The novelty of this study lies in three aspects. First, it focuses specifically on moving-ball training as a dynamic shooting method, not merely conventional stationary shooting. Second, it is conducted in a special sports talent school, where the participants represent a strategic population for regional sport achievement development. Third, the study connects practical football coaching with contemporary concepts of contextual practice, constraints-led learning, target-based shooting, and dynamic technical execution. Therefore, this research is expected to provide empirical evidence for coaches, physical education teachers, and school sport trainers in designing more realistic and effective shooting accuracy programs.

In conclusion, shooting accuracy is a decisive technical skill in football and must be trained through methods that reflect actual game demands. Moving-ball training is theoretically supported by motor-learning principles, biomechanical considerations, and contemporary football coaching models because it requires students to coordinate perception, timing, body control, and kicking accuracy in a dynamic situation. Considering the limited empirical evidence in Indonesian special sports talent schools, this study is relevant, urgent, and academically valuable for strengthening football training practice and supporting the development of student-athlete achievement in South Sulawesi.

METHODS

This study employed a quantitative experimental method using a one-group pretest-posttest design to examine the effect of moving-ball training on shooting accuracy toward the goal among students of SMA Negeri Khusus Keperbakatan Olahraga Provinsi Sulawesi Selatan. Experimental research is appropriate when the researcher intends to determine whether a specific treatment produces measurable changes in the research subjects. In line with Suharsimi (2013), experimental research is designed to identify the effect of a treatment applied to selected participants, while Sukardi (2015) explains that the one-group pretest-posttest design allows researchers to compare participants' performance before and after the intervention. Although this design does not use a control group, it remains relevant for school-based sport training studies when the main objective is to measure the immediate effect of a structured training program within a limited training environment.

The population of this study consisted of students enrolled in the football training program at SMA Negeri Khusus Keperbakatan Olahraga Provinsi Sulawesi Selatan. The sample consisted of 20 students selected through purposive sampling based on active participation in football training, physical readiness, attendance commitment, and willingness to complete the full research procedure. This sample size is consistent with recent sport-training studies that applied pretest-posttest

experimental designs to evaluate technical skill improvement in football, futsal, and other sport contexts (Raihan et al., 2025; Rejeki et al., 2025; Syaputra et al., 2024). Recent football research also supports the use of targeted and contextual shooting interventions to improve accuracy, especially when training tasks resemble real match situations (Isnandar et al., 2025; Nurtajudin, 2025; Pangestu, 2025).

The research procedure consisted of three main stages: pretest, treatment, and posttest. The pretest was conducted to measure students' initial shooting accuracy toward the goal. After that, participants received moving-ball training as the experimental treatment. In this program, students performed shooting activities using a rolling or moving ball delivered through passes from different angles and distances. The training emphasized timing, body positioning, support-foot placement, visual focus, kicking mechanics, and target direction. This approach is consistent with contemporary football coaching principles, which highlight that technical skills should be trained through dynamic, representative, and game-related tasks rather than isolated mechanical repetition (Clemente et al., 2020; Clemente et al., 2021; Rahmoune et al., 2025).

The instrument used in this study was a football shooting accuracy test directed toward the goal. Students were asked to perform a predetermined number of shots, and scores were awarded based on the accuracy of the ball toward the target area. Similar target-based shooting assessment procedures have been used in previous studies to evaluate football and futsal shooting accuracy (Saputra et al., 2024; Widodo et al., 2022). Data were analyzed using descriptive statistics, including mean, standard deviation, minimum score, maximum score, and score improvement. Before hypothesis testing, normality testing was conducted to determine the distribution of the data. If the data were normally distributed, a paired-sample t-test was used to compare pretest and posttest scores. The level of significance was set at 0.05. The training was considered effective if the posttest score showed a statistically significant improvement compared with the pretest score.

RESULTS AND DISCUSSION

Result

This section presents the results of data analysis concerning the effect of moving-ball training on shooting accuracy toward the goal among students of SMA Negeri Khusus Keberbakatan Olahraga Provinsi Sulawesi Selatan. The analysis includes descriptive statistics, normality testing, homogeneity testing, and hypothesis testing using the paired-sample t-test. The data were obtained from 20 students who completed both the pretest and posttest.

Table 1.
Descriptive Statistics of Shooting Accuracy Toward the Goal

Variable	N	Range	Min.	Max.	Sum	Mean	Stdv
Pretest shooting accuracy	20	6.00	7.00	13.00	198.00	9.900	2.19809
Posttest shooting accuracy	20	6.00	13.00	19.00	314.00	15.700	2.07998

Based on Table 1, the pretest result of shooting accuracy toward the goal obtained from 20 students showed a total score of 198.00, with a mean score of 9.900 and a standard deviation of 2.19809. The minimum score was 7.00, while the maximum score was 13.00, producing a range of 6.00. These results indicate that before the treatment, students' shooting accuracy was still relatively limited and varied among participants.

After the moving-ball training treatment, the posttest result showed a total score of 314.00, with a mean score of 15.700 and a standard deviation of 2.07998. The minimum score increased to 13.00, while the maximum score reached 19.00, with the same range of 6.00. The increase in the minimum and maximum scores indicates that students experienced improvement not only in average performance but also in the overall quality of shooting accuracy. The mean score increased by 5.800 points, or approximately 58.59% compared with the pretest mean. This improvement shows that moving-ball training provided a positive change in students' ability to direct the ball accurately toward the goal.

Table 2.
Normality Test Results

Variable	Kolmogorov-Smirnov		Shapiro-Wilk		α
	Statistic	Sig.	Statistic	Sig.	
Pretest experimental group	0.192	0.053	0.773	0.064	0.05
Posttest experimental group	0.184	0.074	0.781	0.058	0.05

Table 2 presents the results of the normality test using Kolmogorov-Smirnov and Shapiro-Wilk tests. For the pretest data, the Kolmogorov-Smirnov significance value was 0.053, while the Shapiro-Wilk significance value was 0.064. Both values were greater than $\alpha = 0.05$, indicating that the pretest data were normally distributed. For the posttest data, the Kolmogorov-Smirnov significance value was 0.074 and the Shapiro-Wilk significance value was 0.058. Since both values were also greater than $\alpha = 0.05$, the posttest data were normally distributed. Therefore, the data met the assumption of normality and could be analyzed using a parametric statistical test.

Table 3.
Homogeneity Test Result

Variable	Levene Statistic	Sig.	α	Interpretation
Moving-ball training	0.164	0.688	0.05	Homogeneous

Based on Table 3, the homogeneity test using Levene's Test produced a Levene Statistic value of 0.164 with a significance value of 0.688. Since the significance value was greater than $\alpha = 0.05$, the data were considered homogeneous. This means that the variance of the data was relatively equal and fulfilled the statistical assumption required for further hypothesis testing.

Table 4.
Paired-Sample t-Test Result of the Experimental Group

Variable	Pretest Mean	Posttest Mean	Mean Difference	t-count	df	Sig. (2-tailed)	t-table	Interpretation
Shooting accuracy	9.900	15.700	5.800	42.136	19	0.000	1.729	Significant

Table 4 shows the result of the paired-sample t-test used to determine whether there was a significant difference between the pretest and posttest scores. The analysis obtained a t-count value of 42.136, while the t-table value at $df = 19$ was 1.729. Since the t-count was higher than the t-table value, and the significance value was 0.000, which was lower than $\alpha = 0.05$, the null hypothesis was rejected. This result indicates that there was a statistically significant effect of moving-ball training on shooting accuracy toward the goal. The mean difference between the pretest and posttest was 5.800 points. This finding confirms that moving-ball training was effective in improving students' shooting accuracy. The improvement occurred because the training required students to shoot in a more dynamic condition, where they had to adjust their timing, balance, kicking movement, and target orientation while the ball was moving. Such training conditions are closer to real football situations, where shooting rarely occurs from a completely stationary ball. Therefore, the treatment not only improved technical execution but also strengthened students' ability to respond to game-like shooting situations.

Overall, the research findings demonstrate that moving-ball training significantly improved shooting accuracy toward the goal among students of SMA Negeri Khusus Keberbakatan Olahraga Provinsi Sulawesi Selatan. The increase in mean score, supported by normally distributed data, homogeneous variance, and significant paired-sample t-test results, provides strong empirical evidence that moving-ball training can be used as an effective training method in football coaching programs at the school sport talent level.

Discussion

The results of this study demonstrate that moving-ball training had a significant effect on students' shooting accuracy toward the goal at SMA Negeri Khusus Keberbakatan Olahraga Provinsi

Sulawesi Selatan. The descriptive data showed a clear improvement from the pretest mean score of 9.900 to the posttest mean score of 15.700, with a mean difference of 5.800 points. This improvement was supported by the paired-sample t-test result, where the t-count value was 42.136, higher than the t-table value of 1.729, with a significance value of $0.000 < 0.05$. Therefore, the null hypothesis was rejected, and the alternative hypothesis was accepted. In practical terms, these findings indicate that moving-ball training was not only statistically significant but also meaningful in improving the technical quality of shooting performance among student-athletes.

Before hypothesis testing, the data fulfilled the statistical assumptions. The normality test showed that both pretest and posttest data were normally distributed, as indicated by significance values greater than 0.05 in the Kolmogorov-Smirnov and Shapiro-Wilk tests. The homogeneity test also showed a significance value of 0.688, which was greater than 0.05, indicating that the data variance was homogeneous. These results provide a strong basis for using a parametric paired-sample t-test. However, because this study used a one-group pretest-posttest design, the most appropriate inferential analysis was the paired t-test, not an independent or unpaired t-test. This strengthens the internal logic of the analysis because the same 20 students were measured before and after the moving-ball training intervention.

The increase of 5.800 points reflects a substantial technical development. The posttest minimum score was 13.00, equal to the pretest maximum score, which means that after the treatment, even the lowest posttest performance reached the highest level achieved before the intervention. This pattern suggests that the improvement was not limited to a few students with high ability, but occurred more evenly across the sample. In football coaching, this is an important finding because effective training should not only improve average performance but also reduce technical inconsistency among players. Similar findings were reported by Saputra et al. (2024), who found that target-based and interpass shooting exercises improved football shooting accuracy among young players, and Pangestu (2025), who developed a multi-station shooting model integrating accuracy, speed, strength, core stability, and leg power to enhance shooting performance.

The positive effect of moving-ball training can be explained through the principle of training specificity. Shooting in real football matches rarely occurs from a completely stationary ball. Players often shoot after receiving a pass, controlling a rolling ball, responding to defender pressure, adjusting body position, and quickly selecting the target area. Therefore, a moving-ball training model provides a more representative task environment than conventional stationary-ball shooting. Isnandar et al. (2025) showed that shooting with stationary and moving balls influences soccer shooting accuracy, while Al-Baitar et al. (2025) emphasized that shooting accuracy in stationary and moving positions is closely related to dynamic stability. These findings support the argument that shooting accuracy is not merely a product of kicking power, but also depends on balance, timing, perceptual adjustment, and body control.

From the perspective of motor learning, moving-ball training improves the perception-action relationship. Students are required to read the speed and direction of the ball, adjust their approach steps, position the support foot, control the swing of the kicking leg, and direct the ball toward the target. This process trains the coordination between visual perception, neuromuscular response, and technical execution. Caballero et al. (2024) explained that practice variability can support motor learning by helping performers adapt to different task demands, while Chua et al. (2019) stated that variable practice may strengthen learning by encouraging more flexible movement solutions. In this study, the moving ball functioned as a practical source of variability, forcing students to adapt their shooting mechanics in conditions closer to the demands of competition.

The findings are also consistent with representative learning design and constraints-led approaches in sport coaching. Representative learning design argues that training tasks should reflect the perceptual, technical, and tactical demands of competition. Dann et al. (2024) emphasized that representative practice should align learning environments with sport-specific demands, while Newcombe et al. (2019), Renshaw and Moy (2018), and D'Isanto et al. (2021) highlighted that constraints-led practice allows players to develop adaptable technical actions through manipulation of task, environmental, and individual constraints. In this research, the moving ball acted as a task constraint that required students to coordinate timing, approach angle, and kicking accuracy. This condition

helped students learn not only how to kick, but also when and how to strike the ball accurately under dynamic conditions.

Biomechanically, the improvement can be understood through better support-foot placement, body alignment, kicking-leg coordination, and postural control. Ou et al. (2023) found that support-foot placement affects ball speed and accuracy in football instep kicking. Ramadani et al. (2025) also emphasized that shooting accuracy using the instep and inside foot is fundamental for creating scoring opportunities and improving game performance. In moving-ball shooting, students cannot rely only on memorized kicking movements. They must stabilize the body while approaching the ball, place the support foot at the correct distance and angle, and produce controlled contact between the foot and the ball. This repeated adjustment likely contributed to the significant increase in shooting accuracy found in this study.

The results also support contemporary football training literature that promotes contextual, game-related, and decision-based practice. Clemente et al. (2020) reported that small-sided soccer games influence technical actions and technical performance, while Clemente et al. (2021) found that small-sided game interventions have beneficial effects on technical execution in young and youth players. Rahmoune et al. (2025) further demonstrated that small-sided games provide a more comprehensive and enjoyable method for developing technical and physical qualities in young soccer players. Although the present study did not use small-sided games directly, moving-ball shooting shares a similar principle: technical skills are trained in a dynamic environment rather than through isolated repetition. This makes the learning process more relevant to actual match situations.

Furthermore, the improvement in shooting accuracy may also be influenced by increased concentration, confidence, and decision-making readiness. Machado et al. (2024) reported that tactical principles and small-sided games can develop cognitive and motor decision-making in youth soccer. Chow et al. (2023) and Bromilow et al. (2025) also showed that nonlinear pedagogy can support technical and tactical development in invasion games because it encourages players to search for effective movement solutions. In the context of this study, students had to decide quickly when to shoot, how to adjust their body, and where to direct the ball. This repeated decision-making process likely strengthened their shooting confidence and reduced hesitation during execution.

These findings are also relevant to school-based sports talent development. SMA Negeri Khusus Keberbakatan Olahraga Provinsi Sulawesi Selatan is expected to produce students with stronger technical readiness and competitive potential. Therefore, training programs must move beyond basic repetition and include more match-like situations. Widodo et al. (2022) emphasized the importance of valid football shooting skill tests for school-aged players, while Sawali (2021), Anam et al. (2021), and Hariansyah et al. (2026) showed that target-oriented training can improve accuracy-related football skills. The present study contributes to this line of evidence by showing that moving-ball training can be an effective alternative for improving shooting accuracy in a special sports talent school context.

Overall, the findings confirm that moving-ball training significantly improves shooting accuracy toward the goal. The increase in mean score, the normal and homogeneous data distribution, and the highly significant t-test result provide empirical support for the effectiveness of this training model. Conceptually, the improvement can be explained by training specificity, representative practice, motor learning variability, dynamic stability, and biomechanical adjustment. Practically, coaches and physical education teachers should integrate moving-ball shooting drills into football training programs because they help students develop more realistic shooting ability. Nevertheless, future studies are recommended to use a control group, larger sample size, longer intervention period, and additional performance indicators such as shooting speed, target zone distribution, decision-making quality, and game-performance outcomes. With these improvements, future research can provide stronger evidence regarding the long-term contribution of moving-ball training to football performance development.

CONCLUSION

Based on the results of the study, it can be concluded that moving-ball training has a significant effect on shooting accuracy toward the goal among students of SMA Negeri Khusus Keberbakatan Olahraga Provinsi Sulawesi Selatan. This conclusion is supported by the increase in students' shooting

accuracy scores from the pretest to the posttest. The pretest data showed a mean score of 9.900, with a standard deviation of 2.19809, a minimum score of 7.00, and a maximum score of 13.00. After the students participated in moving-ball training, the posttest mean score increased to 15.700, with a standard deviation of 2.07998, a minimum score of 13.00, and a maximum score of 19.00. The mean improvement of 5.800 points indicates a meaningful development in students' ability to direct the ball accurately toward the goal.

The statistical analysis also strengthened this finding. The normality test showed that both pretest and posttest data were normally distributed, while the homogeneity test indicated that the data were homogeneous. Furthermore, the paired-sample t-test produced a t-count value of 42.136, which was higher than the t-table value of 1.729, with a significance value of $0.000 < 0.05$. Therefore, the null hypothesis was rejected, and the alternative hypothesis was accepted.

These results confirm that moving-ball training is an effective method for improving football shooting accuracy. The training helps students adjust timing, body position, balance, kicking coordination, and target orientation in dynamic situations. Therefore, this training model is recommended for football coaches and physical education teachers as a practical strategy to develop more realistic and match-related shooting skills.

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