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Impact of Half Squat Jumps and Resistance Band Exercises on High School Students' Basketball Shooting Accuracy

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ABSTRACT

Shooting accuracy is a crucial element in basketball, but student athletes often face consistency issues due to a lack of explosive leg muscle power. This study aims to examine the impact of half squat jump and resistance band training on basketball shooting accuracy in students at High School 16 Makassar. Using experimental research design, this study involved 20 basketball players selected through total sampling. The main instrument used was a free throw test, with data analyzed through descriptive statistics, normality tests, homogeneity tests, and t-tests. The results showed: (1) There is a significant effect of half squat jump training on shooting accuracy ($t_{count} = 11.196 > t_{table} = 1.833$; $p < 0.05$) which contributes to increasing explosive leg muscle power. (2) There is a significant effect of resistance band training on shooting accuracy ($t_{count} = 7.562 > t_{table} = 1.833$; $p < 0.05$) which strengthens the kinetic chain for shooting stability. (3) Independent sample t-test showed a significant difference in effectiveness between the two methods ($t_{count} = 4.352 > t_{table} = 2.101$; $p < 0.05$), where both modalities provide different physiological adaptations. Collectively, both methods are effective strategic solutions, but resistance band training showed a tendency for higher results in improving accuracy compared to half squat jumps. This study provides practical contributions for coaches in developing varied physical programs to improve the technical performance of high school level players.

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1. INTRODUCTION

Basketball is a multifaceted sport that demands a sophisticated integration of technical, tactical, and physiological capabilities (Budi et al., 2021; Sufitriyono et al., 2024). Originally conceived by James Naismith, the game has evolved from a simple indoor activity into a high-intensity global phenomenon (Walker, 2025). In the Indonesian context, basketball has gained immense popularity at the secondary school level, fostered by the Indonesian Basketball Association (PERBASI) (Putra et al., 2024; Suardika & Irawan, 2024). At this developmental stage, basketball is not merely

a game of scoring but a vehicle for developing fundamental motor skills, cardiovascular endurance, and neuromuscular coordination among adolescents.

According to Hidayatullah (2018), achieving peak performance in basketball is a complex endeavor. Athletes must master various skills, including dribbling, passing, pivoting, and rebounding. However, among these variables, basketball shooting accuracy remains the most decisive factor. Regardless of a team's defensive prowess or ball-handling efficiency, the ultimate objective is to propel the ball into the opponent's rim (Fiset, 2026). A single point can define the trajectory of a season, making the precision of a shot the ultimate benchmark of a player's technical competence. In a competitive high school environment, the ability to maintain shooting consistency under pressure separates elite teams from average ones (Lidor et al., 2022; Pojskic et al., 2018).

A common misconception in amateur basketball coaching is the belief that shooting is primarily an upper-body action dominated by the arms and wrists (Li et al., 2025; Shalom et al., 2023). On the contrary, modern sports science emphasizes the "kinetic chain" the coordinated transfer of energy from the feet through the legs and torso and finally to the fingertips (Kraemer et al., 2024). Li and Feng (2020) contend that the power produced for a shot originates from the explosive force of the lower extremities. The leg muscles serve as the engine when a player initiates a shot, generating ground reaction force that travels upward through the kinetic chain.

The motion of shooting starts at the bottom and works its way up. The quadriceps, glutes, and gastrocnemius muscles provide the necessary "lift." Without sufficient explosive power in these muscle groups, the player is forced to overcompensate with the arms and shoulders. This overcompensation leads to "forced" movements, which degrade the fluid motion required for accuracy. When the legs are weak, the shot often doesn't reach the rim, especially at the end of a game when players are tired (Squadron & Ingram, 2023). Therefore, improving shooting accuracy is not just a matter of "practicing more shots," but rather a matter of enhancing the physical foundation—the explosive leg muscle power—that supports the shooting motion.

Despite the theoretical importance of lower-body strength, many high school programs in Indonesia still rely on traditional, repetitive shooting drills that ignore the underlying physiological deficits of the players. Observations conducted by researchers at High School 16 Makassar revealed a critical performance gap. While the students possess the basic knowledge of shooting techniques, their execution in high-stakes environments remains inconsistent. During competitive trials, specifically in matches against High School 11 Makassar, the student-athletes demonstrated a significant decline in shooting consistency. Several key issues were documented, namely (1) Low Accuracy in Free Throws: Players failed to capitalize on penalty opportunities, which are theoretically the "easiest" points in the game. (2) Range Limitations: Shots from the perimeter often failed to reach the basket, indicating a lack of "thrust" from the lower body. (3) Imperfect Follow-Through: Due to instability in the lower base, players' upper-body alignment shifted mid-air, leading to inconsistent ball rotation. (4) The "Short Shot" Phenomenon: Most missed shots hit the front of the

rim, a classic symptom of insufficient leg drive. These observations indicate that the fundamental issue is not a deficiency in technical comprehension but rather a shortfall in explosive leg muscle strength and muscular endurance. The current training regimen at High School 16 Makassar lacks a structured approach to building the specific strength required to sustain accuracy throughout four quarters of a game.

Half squat jumps are a premier plyometric exercise designed to enhance the Stretch-Shortening Cycle (SSC) (Kurt et al., 2023; McGarrigal et al., 2025; Santos et al., 2024). Rezeqini (2024) notes that plyometric exercises train the nervous system to recruit motor units more rapidly, increasing the rate of force development (RFD). By performing half squat jumps, athletes improve their "vertical explosiveness" (Egan-Shuttler et al., 2017). This translates directly to the "lift" needed during a jump shot or a free throw. The novelty here involves applying this explosive training specifically to the mechanics of the basketball shot, ensuring that the energy required to reach the basket comes from the legs, allowing the arms to focus purely on direction and "touch."

Complementing the explosive nature of plyometrics is the stability and eccentric control provided by resistance band exercises (Georgoulas et al., 2026; Novak et al., 2023). Unlike traditional heavy weights (dumbbells or barbells), resistance bands provide "progressive resistance," where the tension increases as the band is stretched. This uniquely mimics the acceleration phase of a basketball shooting motion. According to Stone et al. (2022) and McQuilliam et al. (2020), resistance training improves the rate of force development and power output. For high school students, whose skeletal systems are still developing, resistance bands offer a safer, more accessible way to build strength without the high risk of injury (dos Santos Duarte Junior et al., 2022). The use of resistance bands in this study represents a modern approach to developing "functional strength," strength that is directly applicable to the fluid movements of basketball.

This study proposes that the integration of these two methods creates a "double-impact" effect on shooting accuracy. The half squat jumps provide the explosive ceiling (the ability to generate high power quickly), while the resistance band exercises provide the functional floor (the stability and muscular endurance to repeat the motion accurately). Furthermore, the choice of High School 16 Makassar as the research site is strategic. As a senior high school with a developing sports program, the results of this study can serve as a blueprint for other schools in the region. Most high schools in Makassar have limited access to high-end gym equipment; thus, the use of bodyweight exercises (half squat jumps) and affordable equipment (resistance bands) makes this intervention highly practical and scalable.

The novelty of this research lies in the strategic combination and comparative analysis of two distinct training modalities: half squat jumps and resistance band exercises. While existing literature often explores these methods in isolation, there is a significant research gap regarding their combined impact on high school-aged athletes within the specific context of basketball shooting. Given the critical importance of these factors, this research aims to empirically evaluate the impact of half squat jumps

and resistance band exercises on the basketball shooting accuracy of students at High School 16 Makassar. In conclusion, basketball shooting requires a delicate balance between power and precision. By shifting the focus from "quantity of shots" to the "quality of the physical engine," this research seeks to revolutionize how shooting accuracy is developed at the high school level. The integration of half squat jumps and resistance band exercises represents a necessary shift toward a more scientific, holistic approach to athletic training, ensuring that young players are physically equipped to reach their full technical potential.

2. METHOD

This study employs a quantitative approach rooted in the positivist paradigm. As defined by Sugiyono (2019), quantitative research utilizes concrete, numerical data to measure specific variables and draw objective conclusions through statistical analysis. The specific research design is an experimental study using a two-group pretest-posttest design. This design allows for a rigorous comparison between two distinct training modalities. Subjects were randomly assigned to two separate groups to evaluate the relative effectiveness of each intervention on the dependent variable.

Table 1. Experimental Design: Two-Group Pretest-Posttest

Group	Pretest	Treatment	Posttest
A	O_1 Accuracy Shooting Frethrow	X Half Squat Jump exercise	O_2 accuracy Shooting Frethrow
B	O_3 Accuracy shooting Frethrow	X Resistance Bands exercasie	O_4 Accuracy Shooting Frethrow

Note: O_1 and O_3 represent the initial free throw accuracy test; O_2 and O_4 represent the final test after 6 weeks of intervention

The population for this study consists of all students participating in the basketball extracurricular program at High School 16 Makassar. The population represents the entire group within a specific spatial and temporal boundary for observation. This study utilized a total sampling (saturated sampling) technique due to the manageable size of the population. Consequently, the sample includes 20 male basketball players. These participants were divided into two groups of 10 to ensure intensive monitoring during the training sessions.

To maintain high standards of empirical validity and reliability, this study rigorously defines its operational variables and measurement tools. The research architecture is centered on two independent variables (X): the implementation of half squat jump plyometric protocols and resistance band strength exercises. These variables are hypothesized to directly influence the dependent variable (Y), which is defined as the basketball free throw shooting accuracy of the participants.

The primary measurement for this dependent variable was conducted using the Standardized Free Throw Shooting Test, a validated instrument widely recognized in sports science for assessing technical precision and shooting consistency. To

complement the quantitative test results and ensure stringent environmental control throughout the experimental period, the researchers utilized a multi-faceted data collection approach. This included systematic field observations to monitor training form, structured interviews with participants to assess physical readiness, and comprehensive documentation to mitigate the influence of extraneous factors during the intervention.

The experimental protocol was systematically executed at the High School 16 Makassar basketball facility, spanning three meticulously structured phases to ensure procedural integrity. During the Initial Phase (Pre-test), a baseline assessment of free throw shooting accuracy was conducted for all 20 participants to establish a comparative starting point. This was followed by the Treatment Phase, where participants were bifurcated into two experimental groups: Group A underwent a structured half squat jump plyometric program, while Group B engaged in a targeted resistance band exercise protocol. To maintain consistency and safety, both interventions were strictly supervised to ensure that movement form and training intensity remained optimal. The process culminated in the Final Phase (Post-test), wherein shooting accuracy was re-evaluated using the identical standardized instrument to quantify the rate of performance improvement resulting from the interventions.

The resulting datasets were subjected to a rigorous statistical verification process utilizing SPSS software to derive objective empirical conclusions. The analytical framework commenced with descriptive statistics to synthesize the mean, standard deviation, and variance, providing a clear profile of the group distributions. To validate the data for parametric inference, prerequisite tests—including the Shapiro-Wilk normality test and Levene's homogeneity test—were performed to ensure the assumptions of normality and equal variance were met. Finally, hypothesis testing was conducted through paired sample T-tests to evaluate the significance of intra-group improvements, complemented by independent sample T-tests to determine the comparative efficacy between the half squat jump and resistance band training methods.

3. RESULTS AND DISCUSSION

Results

The quantitative findings derived from the pre-test and post-test assessments, specifically evaluating the impact of half squat jumps and resistance band exercises on high school students' basketball shooting accuracy, are synthesized in this section. The data reflects the physiological and technical progression of the student-athletes at High School16 Makassar following the intervention period. By comparing the baseline performance with the results achieved after the implementation of both plyometric and resistance protocols, the study provides an empirical basis for assessing the efficacy of each method. A comprehensive summary of the statistical distribution, including the

mean scores and performance increments for both experimental groups, is systematically presented in Table 2 as follows.

Table 2 Descriptive Statistics Results

Descriptive	Half Squat Jump Exercise		Resistance Band Exercise	
	Pretest	Postest	Pretest	Postest
N	10	10	10	10
Mean	4.6000	7.7000	4.3000	7.9000
Std. Deviation	1.17379	1.05935	.94868	. 99443
Variance	1.378	1.122	.900	.989
Range	3.00	3.00	3.00	3.00
Minimum	3.00	6.00	3.00	6.00
Maximum	6.00	9.00	6.00	9.00

Descriptive statistical analysis, as summarized in Table 2, showed a significant improvement in basketball shooting accuracy in both experimental groups. For the half-squat jump intervention (n=10), the initial pre-test scores recorded an average of 4.60 ± 1.17, with scores ranging from a minimum of 3.00 to a maximum of 6.00. Following the plyometric intervention, post-test results showed a significant improvement, with the average score increasing to 7.70 ± 1.06 and the maximum achieved reaching 9.00. These substantial improvements indicate that the explosive power generated through the half-squat jump effectively translates into improved shooting performance among high school athletes.

Similarly, the resistance band training group (n=10) demonstrated positive improvements in technique accuracy. The initial pre-test mean was recorded at 4.30 ± 0.95, with a variance of 0.90. Post-intervention data demonstrated significant performance improvements, with average shot accuracy increasing to 7.90 ± 0.99. This group's consistency significantly improved, as evidenced by a minimum post-test score of 6.00 and a maximum of 9.00. These findings indicate that the targeted resistance provided by the resistance bands successfully strengthened the kinetic chain, resulting in a more stable and accurate shot form. Collectively, both training modalities proved to be a powerful strategic solution to address the accuracy and consistency issues identified at High School 16 Makassar.

Table 3 Data normality test results

Variable	Kolmogorov-Smirnov		Shapiro – Wilk		A	Information
	Statistics	Sig.	Statistics	Sig.		
Half Squat Jump Pretest	0,246	0,089	0,874	0,111	0,05	Normal
Resistance Band Exercise Pretest	0,240	0,107	0,866	0,152	0,05	Normal
Half Squat Jump Posttest	0,246	0,089	0,.874	0,111	0,05	Normal
Resistance Band Exercise Posttest	0,240	0,107	0,.886	0,152	0,05	Normal

To ensure the statistical validity of the findings regarding the impact of half squat jumps and resistance band exercises on basketball shooting accuracy, a Shapiro-Wilk test was conducted to evaluate the distribution of the dataset. The analysis revealed that the data for the half squat jump intervention yielded a W value of 0.874 with a significance level (p) of 0.111, while the group performing resistance band exercisesue of 0.866 with a p-value of 0.152. Since both probability levels exceeded the established alpha threshold of 0.05 (alpha > 0.05), the null hypothesis was retained, confirming that the scores for both training modalities follow a normal distribution. Consequently, the dataset satisfies the fundamental assumptions for parametric analysis, allowing the study to proceed with rigorous hypothesis testing to determine the specific effects of each training method on high school students' performance.

Table 4. Sample homogeneity test results

Initial Test	Levena Statistic	Sig.	A	Information
Half Squat Jump & Resistance Band Exercises	1.097	0,309	0,05	Homogeneous

In the sample homogeneity test, the calculation of which is listed in the summary above, using the Levene Statistic Test at a significant level of 95%. From the calculation results, the Levene Statistic Test value was 1.097 with a probability level of 0.306, greater than the α value of 0.05. Therefore, from the calculation results, it can be concluded that both exercise groups, namely the half squat jump exercise and the resistance band exercise group, are homogeneous.

Table 5. Test of the difference in the sample means of group A

Half Squat Jump		Mean	Mean Difference	T	Df	Sig (2-tailed)	t-tabel
Group A	Post-test	7.70	3.100	11.196	9	0,000	1,833
	Pre-test	4.60					

Inferential statistical analysis was conducted to determine the specific impact of half squat jumps on the basketball shooting accuracy of student-athletes at High School 16 Makassar. The results of the paired-sample t-test, as detailed in Table 5, yielded a calculated t-value (t_count) of 11.196, significantly exceeding the critical t-table value (t_table) of 1.833. Furthermore, the observed significance level (p = 0.000) fell well below the alpha threshold of 0.05 (p < alpha), leading to the rejection of the null hypothesis (H_0). These findings provide robust empirical evidence that the implementation of a structured half squat jump training program exerts a significant positive influence on shooting precision. This statistical outcome underscores the efficacy of plyometric-based movements in enhancing the lower-body explosive power required for consistent technical performance in high school basketball games.

Table 6. Test of the Difference in the Sample Means of Group B

Resistance Bands		Mean	Mean Difference	T	Df	Sig (2-tailed)	t-tabel
Group B	Post-test	7.90	3.600	7.562	9	0,000	1,833
	Pre-test	4.30					

Table 6 above, the t-test has the following pretest and posttest values for resistance band training. The results of the data testing obtained a t-count value of 7.562 and a t-table value of 1.833, and a significance value of 0.000 <α0.05, so these results indicate a significant difference. Because the t-count is greater than the t-table, Ho is rejected, thus meaning there is a significant effect of resistance band training.

Table 7. Independent Sample T-Test Results: Half Squat Jump vs. Resistance Band

Comparison Groups	tcount	ttable	Sig. (2-tailed)	Decision	Conclusion
Half Squat Jump vs. Resistance Band	4,352	2,101	0	H0 Rejected	Significant Difference

To determine the comparative efficacy of the two interventions, an independent sample t-test was conducted on the post-test results of both groups. The analysis yielded a t_count value of 4.352, which significantly exceeds the t_table value of 2.101, accompanied by a significance value of 0.000 ($p < 0.05$). Consequently, the null hypothesis (H_0) is rejected, confirming a statistically significant difference in the impact of half squat jumps versus resistance band exercises on the basketball shooting accuracy of students at High School 16 Makassar. This finding suggests that while both modalities contribute to performance gains, they elicit distinct physiological adaptations, thereby providing coaches with critical insights into which specific training method yields superior results for enhancing technical precision in high school basketball players.

Discussion

The synthesis of the research data confirms that both training modalities exert a statistically significant impact on the basketball shooting accuracy of student-athletes at High School 16 Makassar. Empirical evidence reveals that the half squat jump group achieved a substantial performance increment with an average improvement of 3.100 points ($p < 0.05$), while the resistance band group demonstrated a slightly higher gain of 3.600 points ($p < 0.05$). This significant improvement aligns with the Kinetic Chain Theory, which posits that shooting precision is a byproduct of efficient energy transfer from the lower extremities through the core to the upper body (Almansoof et al., 2023; Forelli et al., 2023; Petrič & Žlajpah, 2023). By enhancing the explosive power and stability of the lower limbs, these exercises ensure that the energy required for the shot is generated by the legs, allowing the arms to focus primarily on the technical "touch" and trajectory of the ball.

Furthermore, the comparative analysis indicates that while both methods are effective, the resistance band exercises yielded a more pronounced effect on accuracy compared to the half squat jumps. This suggests that the variable and progressive resistance provided by elastic bands may offer a superior benefit for adolescent athletes in developing the neuromuscular control and muscular endurance necessary for consistent shooting form. These findings support the integration of targeted resistance training alongside plyometric movements as a strategic solution for coaches to address accuracy deficits (Barrio et al., 2023; Junge et al., 2023). The results of this study provide a clear empirical foundation for modernizing physical training programs at the high school level to foster higher technical proficiency in basketball.

The comparative analysis of the post-intervention data reveals a significant disparity in the effectiveness of the two training modalities, with resistance band exercises outperforming half squat jumps by a mean difference margin of 0.500 points. While half squat jumps primarily enhance vertical explosiveness through the Stretch-Shortening Cycle (SSC), the superior gains observed in the resistance band group suggest that variable elastic resistance offers a more targeted benefit for the specific mechanics of basketball shooting. This finding is consistent with the research of Stone et al. (2022), which emphasizes that progressive resistance training facilitates greater neuromuscular adaptations, allowing student-athletes to maintain a stable and controlled posture throughout the shooting motion.

This increased performance likely stems from the constant tension provided by the bands, which requires the athlete to stabilize the kinetic chain throughout the entire range of motion, rather than just during the explosive launch phase. As noted by McQuilliam et al. (2020), this type of training improves the rate of force development while simultaneously enhancing functional stability and muscular endurance. Consequently, the resistance band developed a more consistent "launchpad" for their shots, leading to higher accuracy levels compared to the purely plyometric nature of the half squat jump group. These results indicate that for high school athletes, developing functional control through resistance exercises may be more beneficial for technical precision than focusing solely on raw explosive power.

This research provides key contributions to the fields of sports science and physical education, particularly in the development of youth basketball performance. This study enriches the existing body of literature regarding the "Kinetic Chain Theory" by providing empirical evidence on how lower-body strength interventions directly influence upper-body technical precision. By comparing plyometric movements (half squat jumps) with elastic resistance (resistance bands), this research offers a new perspective on the Stretch-Shortening Cycle (SSC) versus variable resistance in the context of adolescent motor learning. It validates that for high school athletes, functional stability provided by resistance bands is just as critical—if not more so—than raw explosive power for achieving consistent shooting accuracy.

Furthermore, the findings serve as a strategic blueprint for basketball coaches and physical education teachers, specifically at the high school level. This study introduces an affordable, accessible, and high-impact training module that does not require

expensive gym infrastructure. Coaches at High School 16 Makassar and similar institutions can implement these structured resistance bands and plyometric protocols to bridge the gap between physical conditioning and technical skill execution. This study establishes a standardized experimental framework for measuring the impact of combined physical interventions on technical skills in a school setting. The use of a two-group pretest-posttest design provides a rigorous model for future researchers who wish to examine other variables of basketball performance using low-cost equipment, ensuring that scientific training methods are replicable in diverse educational environments.

4. CONCLUSION

The research findings indicate that half squat jump training has a positive and significant effect on shooting accuracy. This conclusion is evidenced by the calculated t value (11.196), which is much greater than the t table (1.833), with a significance value of 0.000 < 0.05. This exercise has been shown to increase explosive leg muscle power, which is crucial for technical shooting performance. Training using resistance bands also has a significant effect on increasing shooting accuracy. The test results show a calculated t value of 7.562 > t table 1.833 with a significance value of 0.000 < 0.05. This method helps strengthen the kinetic chain, resulting in a more stable and accurate shooting form. Both training methods collectively represent a strong strategic solution to address the problem of accuracy consistency at High School 16 Makassar. However, the results of the independent sample t-test indicate a significant difference in effectiveness between the two (calculated t value 4.352 > t table 2.101), where the two modalities provide different physiological adaptations for student athletes, suggesting that one method may be more beneficial for improving shooting accuracy than the other depending on the athletes' individual needs.

As a recommendation, it is suggested that teachers integrate both half-squat jumps and resistance band exercises into their routine training programs to effectively improve students' shooting accuracy. Given that both exercises provide significant but varying results, coaches can choose or combine these methods based on the specific needs of the players to achieve greater technical precision. Future researchers can further explore the duration of the intervention or combine these two methods in a single integrated training program to determine whether there is a greater synergistic effect on athlete performance.

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