

ANALYSIS OF THE EFFECT OF PLYOMETRIC TRAINING ON IMPROVING THREE-POINT SHOOTING ABILITY IN BASKETBALL

Raihan Auzora Putra¹, Taufiq Hidayah²

Universitas Negeri Semarang^{1,2}

raihanauzora@students.unnes.ac.id¹ taufiqhidayah@mail.unnes.ac.id²

Abstract

One of the common problems among high school basketball players is the lack of balance and consistency when performing three point shots, which negatively affects scoring performance. This research seeks to examine the influence of plyometric training specifically depth jump and box jump drills for enhancing three-point shooting skill. A semi-experimental approach employing a single-group pre-evaluation-post-evaluation was applied to a sample of 15 male students from SMA Santo Paulus, Jakarta. The training intervention lasted five weeks, with 14 sessions conducted three times per week. Shooting performance was measured from five standard angles on the three-point arc, and data were analyzed using Shapiro-Wilk, Levene's test, and paired sample t-test. The results showed a significant improvement in three-point shooting scores after the intervention ($t = -4.356$; $p = 0.000$), indicating that plyometric training enhances lower-body strength, balance, and shooting accuracy. It can be concluded that structured plyometric exercises contribute positively to three-point shooting performance in basketball athletes.

Keywords: *Plyometric Training; Three-Point Shooting; Balance; Basketball*

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Correspondence Author: Raihan Auzora Putra, Universitas Negeri Semarang, Indonesia.

E-Mail: raihanauzora@students.unnes.ac.id

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INTRODUCTION

Basketball is a globally popular sport that demands high-level physical fitness and technical skills, particularly in executing shooting techniques such as the three-point shot. One of the problems that arise among basketball players and affects their game is balance. Thomas et al. (2020) found that a combination of balance and plyometric training program effectively improved dynamic balance abilities, muscle explosiveness, and agility in young basketball players. The ability to perform successful three-point shots is vital in modern basketball, as it contributes significantly to a team's scoring potential and overall game strategy (Fernando Adam & Yenes Ronni, 2020). Effective three-point shooting is influenced by multiple factors such as strength, balance, coordination, and shooting

mechanics (Niza et al., 2021). Three-point shooting not only requires upper-body strength but also relies heavily on lower-body stability, coordination, and explosive power (Prasetia & Wismanadi, 2022).

In Indonesia, the popularity and competitiveness of basketball continue to grow, as evidenced by the increasing number of school-level tournaments and extracurricular basketball programs (Djami, 2018). However, observational data from SMA Santo Paulus reveal that student-athletes face challenges in consistently executing effective three-point shots, particularly due to balance issues and the lack of specific physical training targeting lower-body power and coordination.

To address this performance gap, plyometric training has been proposed as an effective intervention to enhance physical capacities that support shooting techniques. Plyometric exercises such as depth jumps and box jumps focus on improving the explosive strength of the lower limbs, neuromuscular control, and dynamic balance (Yanti et al., 2021). These training methods have been widely used in sports like basketball to improve jump height, movement efficiency, and stability during complex motor tasks such as shooting (Sumarandak et al., 2021). Specifically, such exercises are believed to enhance an athlete's ability to maintain balance and power during the shooting phase, thus improving shooting accuracy and consistency (Rizal et al., 2024).

Previous studies support the effectiveness of plyometric training in basketball contexts. For instance, (Putri & Wicaksono, 2023) demonstrated that box jump and depth jump exercises significantly enhanced jump shooting performance among female high school basketball players. Similarly, (Huang et al., 2024) found that plyometric interventions led to greater improvements in athletic performance compared to conventional endurance training. These findings underline the potential role of plyometric training in improving physical components essential for three-point shooting.

Despite existing research, there remains a scarcity of studies specifically examining the influence of plyometric training on three-point shooting accuracy

among high school athletes. Most prior studies have focused on general jump performance or lay-up techniques. Therefore, the present study introduces a novel focus on three-point shooting performance and balance, using a quasi-experimental design involving one group pretest-posttest conducted at SMA Santo Paulus, Central Jakarta.

This research aims to determine the impact of plyometric training specifically depth jump and box jump regarding the three-point shooting precision among secondary school basketball players. The anticipated benefit from this research is to offer functional perspectives for trainers and athletic instructors in formulating specialized exercise regimens to improve shooting performance through lower-body conditioning. The findings may also serve as a reference for further research exploring physical training methods and their influence on specific basketball skills.

METHOD

The current investigation employed a numerical methodology featuring a semi-experimental single-cohort initial-final testing model, which is suitable for observing changes in a single group before and after a specific intervention (Susanti et al., 2021). The study was conducted at SMA Santo Paulus, Central Jakarta, involving 15 male basketball players aged 16–18 years who were active participants in the school's extracurricular basketball program. Intentional sampling was applied to choose individuals who satisfied the acceptance conditions (Yanti et al., 2021).

The intervention took place over five weeks, comprising 14 plyometric training sessions and 2 evaluation sessions (pretest and posttest). The plyometric training involved depth jumps and box jumps, carried out three times per week, with 4 sets of 12 repetitions per session and a one-minute rest between sets (Putri & Wicaksono, 2023).

To assess three-point shooting ability, players performed a standardized test from five angles on the three-point arc (0°, 45°, 90°, 135°, and 180°), attempting

five shots from each position in both the pretest and posttest phases (Sartika & Indra Bayu, 2023). This test was designed to evaluate both shooting consistency and improvements after the intervention.

Statistical examination comprised the Shapiro-Wilk test for normal distribution and Levene's test for uniformity. The Paired Sample t-Test was utilized to ascertain if there were numerically meaningful variations between initial and concluding results with a meaningfulness threshold of $p < 0.05$ (Argian Rizki Taufik, 2020). The complete information was managed through SPSS version 25 for Windows, and the protocols adhered to moral principles for inquiry concerning human participants.

RESULT AND DISCUSSION

The study was conducted with 15 male basketball players from SMA Santo Paulus using a one-group pretest-posttest design. Each participant performed a three-point shooting test from five different angles (0° , 45° , 90° , 135° , and 180°) before and after undergoing 14 sessions of plyometric training involving depth jumps and box jumps.

The basic characteristics of the participants are presented in Table 1. These encompass age, stature, mass, body mass index (BMI), and three-point shooting results prior to and following the exercise program. The mean age among the individuals stood at 17.3 years ($SD = 0.7$), indicating a relatively homogenous age group. The mean height was 171.0 cm, and the average body weight was 61.2 kg. The average BMI was 21.0 kg/m^2 , which falls within the normal range according to WHO adolescent classifications.

Regarding performance, the average three-point shooting score improved from 8.4 in the pretest to 11.4 in the posttest. This initial data suggests that the plyometric training contributed to performance improvement.

Table 1. Characteristics of research subject data

Variable	N	Mean \pm SD
Age (Year)	15	17.3 \pm 0.7
Height (Cm)	15	171.0 \pm 7.0

Weight (Kg)	15	61.2±11.4
BMI (kg/m ²)	15	21.0±4.5
Shooting 3 point Pre (Skor)	15	8.4±2.7
Shooting 3 point post (skor)	15	11.4 ± 3.2

The statistical analysis began with a normality test via the Shapiro-Wilk technique, which revealed that the information followed a standard distribution for both pretest (Sig = 0.492) and posttest (Sig = 0.863) scores.

Table 2. Nomality Test

Variabel	N	Sig.
Pretest	15	0.492
Posttest	15	0.863

The statistical analysis began with a homogeneity test using A Levene's test for homogeneity also confirmed that the data were homogeneous (Sig = 0.353).

Table 3. Homogeneity Test

Levene statistic	Df1	Df2	Sig.
0.893	1	28	0.353

To evaluate the proposition, a Paired Sample t-Test was performed. The findings demonstrated an average improvement in marksmanship results from the initial evaluation to the concluding one, exhibiting a t-value of -4.356 and a meaningfulness marker of $p = 0.000$. Because the p-value fell below 0.05, it was concluded that the plyometric training had a statistically significant effect on improving three-point shooting performance.

Table 4. Paired sampel t test

Variable	Pre mean± sd	Post mean±sd	t-table	P value	SE Cohen's d
Shooting 3 point	8.4±2.7	11.4 ± 3.2	-4.743	< 0.001	0.281

Figure 1 visually illustrates the score improvements between pretest and posttest. A consistent increase in shooting performance was observed across the majority of participants.

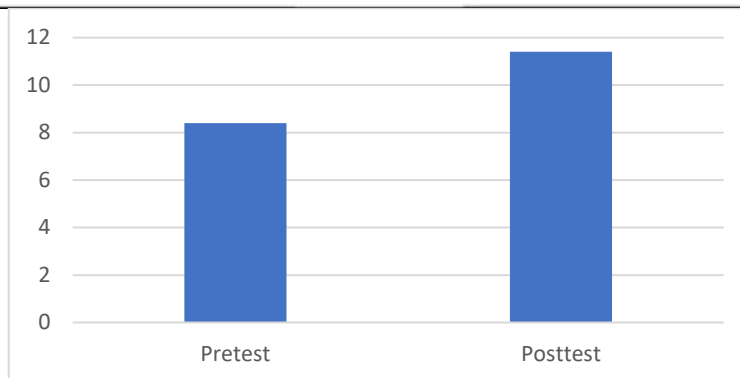


Figure 1. Comparison of Pretest and Posttest 3-Point Shooting Scores

These results indicate that plyometric training, specifically depth and box jumps, effectively enhanced the three-point shooting ability of basketball athletes by improving balance, lower-limb strength, and shooting stability.

Discussion

The outcomes from the present inquiry illustrate that plyometric training significantly improves three-point shooting performance in high school basketball players. These improvements align with previous studies which suggest that explosive leg power, balance, and coordination are critical components of effective three-point shooting (Rizal et al., 2024; Taufik, 2020). The plyometric training treatment given in this study were plyometric box jumps and depth jumps. Plyometric exercises that jump onto a box or chair and utilize body balance while on the box or chair. (Triandini et al., 2023) stated that plyometric box jump exercises have an effect on increasing vertical jump if the analysis of the results obtains a significant comparison. Depth jump is an advanced plyometric exercise that is done by jumping from a height and then doing a vertical jump when landing. In research (Ferdiana et al., 2020) Depth Jump exercises have an impact and influence on the power of the height muscles.

According to Yanti et al. (2021), plyometric exercises such as depth jumps and box jumps target the muscles responsible for explosive movements, which are essential in creating lift and stability during shooting. Plyometric movements help

improve neuromuscular efficiency, shorten ground contact time, and increase vertical jump capability—all of which are directly related to shooting mechanics in basketball. Depth Jump and Box Jump, specific types of plyometric exercises, are particularly effective in improving vertical power and neuromuscular coordination essential for shooting performance (Koefoed et al., 2022).

The observed increase in posttest scores is consistent with the B.E.E.F. principle (Balance, Eyes, Elbow, Follow-through), especially the balance component, which plays a crucial role in the execution of successful three-point shots. Plyometric exercises reinforce this principle by enabling athletes to maintain a strong and stable base while generating upward force during the shooting motion (Prasetia & Wismanadi, 2022).

The determinations from this investigation align with Ramos et al. (2020) who emphasized that balance-focused exercises such as jump-to-box significantly improve shooting accuracy. Improved posture and controlled center of gravity allow athletes to execute consistent three-point shots with less error. Similar outcomes were reported by Jebus et al. (2021) who noted improvements in shooting accuracy following jump-based plyometric interventions. Moreover, the research supports findings by Putri & Wicaksono (2023), who reported a significant improvement in jump shooting performance after implementing plyometric training.

The novelty of this study lies in its specific focus on three-point shooting accuracy, rather than general jumping ability or lay-up performance. By isolating three-point shooting as the outcome variable, this research contributes new insights into how lower-body training can be optimized to improve a key technical skill in basketball. In addition, Isnanto (2019) noted that early introduction of plyometric routines in school-level training programs accelerates skill acquisition and strengthens motor memory. This supports the findings in our study where participants, though relatively new to structured strength training, showed notable improvements. The study confirms that a structured plyometric training program

can effectively increase the shooting accuracy of high school basketball players, especially for long-range shots that demand both physical strength and technical precision.

CONCLUSION

Derived from the outcomes of the research and the numerical review, the deduction is that plyometric training, particularly the application of depth jumps and box jumps, possesses a meaningful beneficial influence in enhancing the three-point shooting execution of secondary school basketball athletes at SMA Santo Paulus. The intervention led to measurable improvements in shooting accuracy, which were statistically supported by a Paired Sample t-Test ($t = -4.356$; $p = 0.000 < 0.05$), indicating that the athletes' shooting scores increased significantly after undergoing the training program. This improvement is attributed to the enhancement of lower-limb explosive power, balance, and postural stability, which are critical in executing effective and consistent three-point shots.

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