



The Effect Of Plyometric Exercises On Ability Jump Shoot Student

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ABSTRACT

Basketball is a sport that requires a combination of technical skills and physical abilities to achieve optimal performance. One of the most important offensive techniques is the jump shot, which is strongly influenced by lower-limb explosive power. However, the jump-shooting ability of students at the Faculty of Sports and Health Sciences (FIKK), Universitas Negeri Makassar (UNM), remains relatively low due to suboptimal leg muscle power. Therefore, an effective training method is needed to improve students' jump-shoot performance. This study aimed to determine the effect of plyometric training on the jump-shooting ability of FIKK UNM students. This study employed an experimental method using a One-Group Pretest-Posttest Design. The sample consisted of 20 FIKK UNM students selected through purposive sampling. Data were collected using a jump-shooting ability test. The treatment involved a structured plyometric training program conducted for six weeks with a frequency of three sessions per week. Data were analyzed using descriptive statistics and a paired-sample t-test. The results revealed that the mean pre-test score of students' jump-shoot ability was 7.85, which increased to 11.95 in the post-test, resulting in an average improvement of 4.10 points. Hypothesis testing showed a significance value of 0.000 ($p < 0.05$), indicating a statistically significant effect of plyometric training on jump-shoot performance. In conclusion, plyometric training is effective in improving the jump-shooting ability of FIKK UNM students. The training program enhances lower-limb explosive power and contributes positively to basketball-specific technical performance. Therefore, plyometric exercises can be recommended as an effective training strategy for improving jump-shoot skills in basketball learning and coaching programs.

ARTICLE HISTORY

Received: 2026/05/17

Accepted: 2026/05/20

Published: 2026/05/25

KEYWORDS

Plyometric Training;
Jump Shoot;
Basketball;
Explosive Power;
Students

AUTHORS' CONTRIBUTION

- Conception and design of the study;
- Acquisition of data;
- Analysis and interpretation of data;
- Manuscript preparation;
- Obtaining funding

Cites this Article : Sutriawan, A.; Syafruddin, M.A. (2026). The Effect Of Plyometric Exercises On Ability Jump Shoot Student. **Competitor: Jurnal Pendidikan Kepeleatihan Olahraga**. 18 (2), p.3785-3798

INTRODUCTION

Basketball is one of the most popular sports worldwide and requires the integration of technical, tactical, physical, and psychological components to achieve optimal performance. Among the fundamental technical skills in basketball, the jump shot is considered one of the most decisive scoring techniques because it enables players to execute shots over defenders and create scoring opportunities under competitive conditions. The effectiveness of a jump shot depends not only on shooting mechanics



but also on physical capacities such as lower-limb explosive power, balance, coordination, and neuromuscular control (Miller & Bartlett, 2016; Scanlan et al., 2021). Consequently, improving jump-shoot performance has become a major concern in basketball training and physical education programs.

In modern basketball, the increasing intensity and speed of the game require players to perform jump shots with greater elevation and accuracy. Previous studies have demonstrated that successful jump shooting is influenced by vertical jump performance, lower-body strength, movement coordination, and postural stability (Stojanović et al., 2018; Mancha-Triguero et al., 2019). Athletes with superior explosive power are generally able to achieve higher release points and generate better shooting opportunities while minimizing defensive interference (Schelling & Torres-Ronda, 2016). Therefore, physical conditioning programs designed to enhance explosive leg power are essential for improving basketball-specific skills.

Students enrolled in the Physical Education Study Program at the Faculty of Sports and Health Sciences, Universitas Negeri Makassar (FIKK UNM), are expected to master fundamental basketball techniques as prospective educators, coaches, and sports practitioners. However, preliminary observations revealed that many students still experience difficulties in performing effective jump shots. Common problems include insufficient jump height, poor shooting accuracy, inadequate lower-limb power, and difficulties maintaining body control during airborne shooting movements. Similar findings have been reported among university-level basketball learners, where inadequate physical conditioning contributes to suboptimal technical execution (Liu et al., 2020; Arede et al., 2021).

The observed limitations indicate the need for an evidence-based training intervention capable of simultaneously enhancing physical capacities and basketball-specific performance. Among various conditioning methods, plyometric training has been widely recognized as one of the most effective approaches for developing explosive power and sport-specific movement performance (Ramirez-Campillo et al., 2020). Therefore, investigating the effectiveness of plyometric exercises in improving jump-shoot ability among FIKK UNM students is both scientifically and practically relevant.

Plyometric training refers to a training method that utilizes rapid eccentric-concentric muscle actions through the stretch-shortening cycle (SSC) to maximize force production and movement efficiency (Chu & Myer, 2013). During plyometric activities, elastic energy stored in muscles and tendons during the eccentric phase is immediately released during the concentric phase, resulting in explosive movements such as jumping, hopping, and bounding (Markovic & Mikulic, 2010). Recent literature consistently demonstrates the effectiveness of plyometric training in improving athletic performance across various sports. A systematic review by Ramirez-Campillo et al. (2020) concluded that plyometric interventions significantly enhance vertical jump performance, sprint speed, agility, and muscular power among youth athletes. Similarly,

Slimani et al. (2016) reported that plyometric exercises produce meaningful improvements in explosive power and sport-specific performance in team sports.

Within basketball contexts, plyometric training has become a standard component of strength and conditioning programs because basketball performance relies heavily on repeated jumping, sprinting, and rapid directional changes (Schelling & Torres-Ronda, 2016). Research conducted by Asadi et al. (2016) demonstrated significant improvements in vertical jump height, agility, and overall athletic performance following structured plyometric training programs in basketball players. Likewise, Arıkan et al. (2020) found that an eight-week plyometric intervention significantly increased lower-body power and jumping ability among competitive basketball athletes. The effectiveness of plyometric training can be explained through neuromuscular adaptations. Repeated exposure to explosive movements improves motor-unit recruitment, firing frequency, intermuscular coordination, and musculotendinous stiffness, thereby enhancing the ability to generate force rapidly (Cormie et al., 2011; Suchomel et al., 2018). These physiological adaptations directly contribute to improved jumping performance and athletic movements commonly observed in basketball.

Several studies have also linked lower-body explosive power with basketball shooting performance. Research by Stojanović et al. (2018) indicated that players with superior vertical jump abilities tend to demonstrate more effective jump-shot execution due to increased release height and improved body control. Furthermore, Mancha-Triguero et al. (2019) highlighted that physical fitness components, particularly lower-limb power, significantly influence technical basketball skills. These findings collectively suggest that plyometric training possesses strong theoretical and empirical foundations for improving jump-shoot performance. Nevertheless, evidence regarding its application among university students within physical education programs remains relatively limited.

Despite extensive research investigating plyometric training and athletic performance, several gaps remain in the existing literature. First, most previous studies have focused on elite athletes, youth basketball players, or competitive sports participants (Ramirez-Campillo et al., 2020; Arede et al., 2021). Consequently, the applicability of these findings to physical education students, who possess different physical characteristics and training backgrounds, remains uncertain. Second, previous investigations predominantly examined the effects of plyometric training on physical performance indicators such as vertical jump height, sprint speed, agility, and muscular power (Asadi et al., 2016; Slimani et al., 2016). Comparatively fewer studies have specifically explored the relationship between plyometric training and basketball technical skills, particularly jump-shoot performance. While improvements in explosive power have been well documented, the direct transfer of these gains into shooting effectiveness requires further empirical verification. Third, limited research has been conducted within the Indonesian higher education context, especially among students of physical education and sports science programs. Differences in anthropometric characteristics, training experiences, educational environments, and cultural contexts

may influence the effectiveness of training interventions (Prieske et al., 2019). Therefore, findings derived from international athlete populations cannot be generalized without local empirical evidence. Finally, there remains insufficient evidence regarding the effectiveness of plyometric training programs specifically designed to improve jump-shoot ability among FIKK UNM students. Addressing this gap is important because university students represent future physical education teachers and coaches who require both practical competence and evidence-based training knowledge.

Based on the identified problems and research gaps, this study aims to determine the effect of plyometric exercises on the jump-shoot ability of students in the Faculty of Sports and Health Sciences, Universitas Negeri Makassar. Specifically, the study seeks to evaluate whether a structured plyometric training program can significantly improve jump-shoot performance through enhancements in lower-limb explosive power and basketball-specific movement execution. The novelty of this research lies in several aspects. First, unlike many previous studies focusing on competitive athletes, this study examines the effectiveness of plyometric training among physical education students, a population that has received limited scholarly attention. Second, the study emphasizes a basketball-specific technical outcome—jump-shoot ability—rather than solely assessing physical performance variables. Third, the research contributes local empirical evidence from an Indonesian university setting, thereby enriching the existing literature on sports training interventions in higher education environments. Finally, the findings are expected to provide practical recommendations for lecturers, coaches, and curriculum developers in designing evidence-based basketball training programs.

In summary, jump-shoot ability is a critical basketball skill that depends on the integration of technical proficiency and physical capacities, particularly lower-limb explosive power. Although previous studies have consistently demonstrated the effectiveness of plyometric training in enhancing athletic performance, evidence regarding its influence on jump-shoot ability among physical education students remains limited. Furthermore, empirical data from Indonesian university settings are still scarce. Therefore, this study is conducted to investigate the effect of plyometric exercises on the jump-shoot ability of FIKK UNM students. The findings are expected to contribute both theoretically to sports science literature and practically to the development of effective basketball training programs in higher education.

METHODS

This study employed a quantitative approach using a pre-experimental design with a one-group pretest-posttest model to determine the effect of plyometric exercises on the jump-shoot ability of students in the Faculty of Sports and Health Sciences (FIKK), Universitas Negeri Makassar. The quantitative experimental approach was selected because it allows researchers to objectively measure changes in performance before and after the implementation of a training intervention (Creswell & Creswell, 2018). The one-group pretest-posttest design is widely used in sports science research to evaluate

the effectiveness of training programs on specific physical and technical performance variables (Thomas et al., 2022).

The population of this study consisted of students enrolled in the Physical Education Study Program at FIKK Universitas Negeri Makassar who had participated in basketball learning activities. The sample was selected using a purposive sampling technique based on several criteria, namely: (1) active students of the Physical Education Study Program, (2) having basic basketball playing experience, (3) physically healthy and able to participate in training activities, and (4) willing to follow the entire research program. Purposive sampling is considered appropriate in sports performance studies because it enables researchers to select participants who possess characteristics relevant to the research objectives (Etikan & Bala, 2017). The study involved 20–30 students who met the predetermined criteria.

Prior to the implementation of the training program, all participants underwent a pretest to measure their initial jump-shoot ability. The jump-shoot test was conducted using a standardized basketball shooting assessment procedure that evaluated shooting accuracy and shooting success within a specified duration. Basketball shooting performance tests are commonly used to assess technical skill proficiency and have demonstrated acceptable validity and reliability in sports science research (Scanlan et al., 2021). The obtained scores were recorded as baseline data before the intervention.

The treatment consisted of a structured plyometric training program conducted for eight weeks with a frequency of three sessions per week. Previous studies have shown that an eight-week plyometric intervention is sufficient to produce significant neuromuscular adaptations and improvements in explosive power performance (Ramirez-Campillo et al., 2020; Arıkan et al., 2020). Each training session lasted approximately 60–90 minutes and included warm-up activities, plyometric exercises, and cool-down phases. The plyometric exercises consisted of squat jumps, tuck jumps, bounding, lateral jumps, box jumps, and depth jumps. These exercises were selected because they effectively stimulate the stretch-shortening cycle mechanism responsible for improving explosive muscular performance (Chu & Myer, 2013).

Plyometric training emphasizes rapid eccentric and concentric muscle contractions that enhance lower-limb power production and neuromuscular efficiency (Markovic & Mikulic, 2010). The exercises were progressively increased in intensity and volume throughout the training period to ensure adequate overload and adaptation. Progressive overload is an important principle in sports training because it promotes continuous physiological improvements and prevents performance stagnation (Bompa & Buzzichelli, 2019). During the intervention period, participants were supervised directly to ensure proper exercise execution and training safety.

Following the completion of the eight-week training program, participants performed a posttest using the same jump-shoot assessment instrument administered during the pretest. The posttest was conducted under similar environmental and procedural conditions to minimize measurement bias and ensure data consistency

(Hopkins et al., 2021). The resulting scores represented the participants' jump-shoot performance after receiving the plyometric training intervention.

Data analysis was carried out using descriptive and inferential statistical techniques with the assistance of IBM SPSS software. Descriptive statistics were used to calculate the mean, standard deviation, maximum score, and minimum score of jump-shoot performance. Before hypothesis testing, the data were subjected to normality testing using the Shapiro-Wilk test because it is considered appropriate for small to moderate sample sizes (Razali & Wah, 2019). If the data were normally distributed, hypothesis testing was performed using a paired-sample t-test to determine whether there was a significant difference between pretest and posttest scores. The paired-sample t-test is widely recommended for evaluating changes within the same group following a training intervention (Field, 2018). Statistical significance was established at the 0.05 level.

Through this methodological procedure, the study aimed to obtain empirical evidence regarding the effectiveness of plyometric exercises in improving the jump-shoot ability of FIKK Universitas Negeri Makassar students. The findings are expected to contribute to the development of evidence-based basketball training programs and provide practical implications for physical education learning and sports coaching environments.

RESULTS AND DISCUSSION

Result

Descriptive Analysis of Jump-Shoot Ability

The descriptive analysis was conducted to examine the changes in students' jump-shoot ability before and after participating in the plyometric training program. The results of the descriptive statistics are presented in Table 1.

Table 1.
Descriptive Statistics of Students' Jump-Shoot Ability

Variables	Pre-Test	Post-Test
Mean	7.85	11.95
Median	8.00	12.00
Standard Deviation	1.226	1.605
Minimum	6	9
Maximum	10	15

Based on Table 1, the mean score of students' jump-shoot ability increased from 7.85 in the pre-test to 11.95 in the post-test. This increase indicates that the plyometric training program contributed positively to the improvement of jump-shoot performance among FIKK UNM students. The average improvement of 4.10 points demonstrates a substantial enhancement in shooting performance following the intervention.

The median score also increased from 8.00 in the pre-test to 12.00 in the post-test. This finding suggests that the majority of participants experienced improvements in jump-shoot ability after completing the plyometric training program. Furthermore, the

standard deviation increased slightly from 1.226 to 1.605, indicating a wider distribution of scores in the post-test. However, the overall trend still showed consistent performance improvement among participants.

The minimum score improved from 6 to 9, while the maximum score increased from 10 to 15. These findings indicate that the training intervention benefited students across different performance levels, including both lower-performing and higher-performing participants. Overall, the descriptive results suggest that plyometric exercises effectively enhanced the jump-shoot ability of FIKK UNM students.

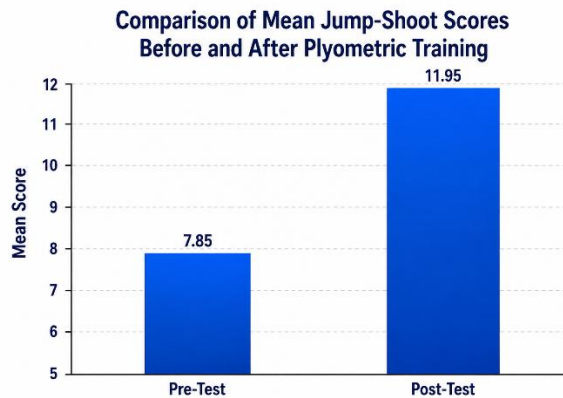


Figure 1.

Comparison of Mean Jump-Shoot Scores Before and After Plyometric Training

Figure 1 illustrates a clear increase in the mean jump-shoot score following the plyometric training intervention. The graphical representation confirms the effectiveness of the training program in improving students' basketball shooting performance.

Hypothesis Testing

To determine whether the observed improvement was statistically significant, a paired-sample t-test was conducted comparing pre-test and post-test jump-shoot scores. The results are presented in Table 2.

Table 2.
 Results of Hypothesis Testing

Variable	N	Mean	Mean Difference	Sig. (p)
Pre-Test Jump Shoot	20	7.85	4.10	0.000
Post-Test Jump Shoot	20	11.95		

The results of the hypothesis test revealed that the mean score increased from 7.85 during the pre-test to 11.95 during the post-test, resulting in a mean difference of 4.10 points. This improvement demonstrates a substantial enhancement in jump-shoot ability after the implementation of the plyometric training program.

The statistical analysis produced a significance value ($p = 0.000$), which was lower than the predetermined alpha level of 0.05 ($p < 0.05$). Therefore, the null hypothesis (H_0) was rejected, while the alternative hypothesis (H_1) was accepted. These findings indicate that plyometric exercises had a statistically significant effect on the jump-shoot ability of FIKK UNM students.

The significant improvement observed after the intervention suggests that plyometric exercises effectively enhance the physical capacities required for jump-shoot performance, particularly lower-limb explosive power, neuromuscular coordination, and movement efficiency. As a result, students were able to generate greater jumping force and execute jump shots with improved control and accuracy.

Overall, the findings provide empirical evidence that plyometric training can be used as an effective conditioning strategy to improve basketball-specific technical performance among university students. The improvement in jump-shoot ability observed in this study supports the application of plyometric exercises within basketball learning and training programs in higher education settings.

Discussion

The findings of this study demonstrated that plyometric training had a significant effect on the jump-shoot ability of students in the Faculty of Sports and Health Sciences (FIKK), Universitas Negeri Makassar. The descriptive analysis revealed that the mean jump-shoot score increased from 7.85 during the pre-test to 11.95 during the post-test, representing an average improvement of 4.10 points. Furthermore, the hypothesis testing showed a significance value of 0.000 ($p < 0.05$), indicating that the improvement was statistically significant. These findings confirm that plyometric exercises effectively enhance basketball jump-shoot performance among university students. The results are consistent with previous literature emphasizing the role of plyometric training in improving explosive power, neuromuscular efficiency, and sport-specific technical performance.

One of the primary reasons for the observed improvement is the enhancement of lower-limb explosive power resulting from plyometric training. Explosive power is a critical physical component in basketball because players frequently perform actions such as jumping, rebounding, sprinting, and shooting under dynamic game conditions. According to Bompa and Buzzichelli (2019), explosive power represents the ability to generate maximum force within the shortest possible time and serves as a key determinant of athletic performance. Plyometric exercises stimulate rapid eccentric-concentric muscle actions through the stretch-shortening cycle (SSC), which improves the ability of muscles and tendons to store and release elastic energy efficiently (Ramirez-Campillo et al., 2020; Markovic & Mikulic, 2010). Consequently, students become capable of producing stronger take-off forces during jump shots, resulting in higher jump heights and improved shooting opportunities.

The improvement in jump-shoot ability observed in this study is also consistent with the biomechanical demands of basketball shooting. During a jump shot, the player must generate sufficient vertical displacement to release the ball from an optimal height while maintaining body control and shooting mechanics. Research by Stojanović et al. (2018) demonstrated that vertical jump performance significantly influences shooting effectiveness because a higher release point reduces defensive pressure and improves shooting angles. Similarly, Scanlan et al. (2021) reported that basketball players with greater lower-body power tend to exhibit superior technical performance during offensive actions.

Therefore, the increase in jump-shoot scores recorded in this study can be attributed to the enhanced jumping capacity developed through plyometric training.

The exercises included in the intervention program, such as squat jumps, box jumps, tuck jumps, and depth jumps, are widely recognized as effective methods for improving muscular power and vertical jump performance. Chu and Myer (2013) explained that these exercises challenge the neuromuscular system to produce force rapidly, leading to improvements in muscle recruitment patterns and movement efficiency. Recent studies conducted by Arikan et al. (2020), Asadi et al. (2016), and Arede et al. (2021) similarly found that structured plyometric programs significantly increased vertical jump height among basketball athletes. The current findings extend these results by demonstrating that improvements in explosive power can also transfer to basketball-specific technical skills such as jump shooting.

Beyond physical adaptations, plyometric training contributes to enhanced neuromuscular coordination. Effective jump shooting requires the integration of multiple movement components, including lower-body propulsion, trunk stabilization, upper-limb coordination, and precise ball release timing. According to Suchomel et al. (2018), plyometric exercises improve neural drive, motor-unit recruitment, firing frequency, and intermuscular coordination, thereby facilitating more efficient movement execution. Improvements in neuromuscular function enable athletes to synchronize complex movement patterns more effectively, which is essential for successful jump-shot performance.

The present findings support the theory proposed by Rimmer and Sleivert (2000), who suggested that plyometric training enhances movement efficiency by improving communication between the nervous and muscular systems. Through repeated exposure to explosive jumping activities, students develop better proprioceptive awareness and movement control. This adaptation allows them to maintain body balance while airborne and execute shooting movements with greater precision. Similar findings were reported by Prieske et al. (2019), who observed that plyometric training positively affects balance, coordination, and sport-specific motor skills.

An important observation from the present study is that performance improvements occurred across almost all participants. This is evident from the increase in minimum scores from 6 to 9 and maximum scores from 10 to 15. These results indicate that plyometric training benefits students with varying levels of initial ability. Students with lower baseline performance experienced meaningful gains, while those with higher initial performance also continued to improve. Such findings suggest that plyometric exercises possess broad applicability in educational and training settings.

This pattern aligns with the findings of Meylan and Malatesta (2009), who reported that short-term plyometric interventions produced significant improvements across athletes with different performance backgrounds. Likewise, Moran et al. (2018) concluded that plyometric training is effective for enhancing physical performance regardless of participants' initial fitness levels. The current findings reinforce the notion that plyometric training can be successfully implemented within university basketball programs to support both skill development and physical conditioning.

From a physiological perspective, the effectiveness of plyometric training is associated with adaptations in the musculotendinous system. Research has shown that repeated SSC activities increase tendon stiffness, muscle fascicle efficiency, and force transmission capabilities (Krzyszowski & Lahti, 2021). These adaptations enable athletes to utilize elastic energy more effectively during explosive actions. In basketball, efficient force transmission is crucial for generating higher jumps and maintaining shooting mechanics under competitive conditions (Cormie et al., 2011). Consequently, the physiological adaptations induced by plyometric training contribute directly to improved jump-shoot performance.

The findings of this study are also consistent with contemporary sports training theories emphasizing specificity of training. The principle of specificity states that training adaptations are greatest when exercises closely resemble the movement patterns and physiological demands of the target activity (Behm & Sale, 2020). Since plyometric exercises involve explosive jumping movements similar to those required during jump shooting, the transfer of training effects is likely to be substantial. This explains why participants experienced significant improvements in basketball-specific performance following the intervention.

Furthermore, the training frequency implemented in this study—three sessions per week over six weeks—appears sufficient to induce meaningful neuromuscular adaptations. Previous meta-analyses have demonstrated that plyometric programs performed two to three times weekly for six to eight weeks consistently improve lower-body power and athletic performance (Ramirez-Campillo et al., 2020; Moran et al., 2018). The current results support these recommendations and suggest that similar training protocols may be effectively applied in higher education sports programs.

The practical implications of this study are particularly relevant for physical education lecturers, basketball coaches, and university sports practitioners. Integrating plyometric exercises into basketball training curricula may enhance students' technical performance while simultaneously developing important physical capacities. In addition, improved jump-shoot ability can contribute to greater confidence and effectiveness during gameplay, ultimately supporting overall basketball competence (Schelling & Torres-Ronda, 2016). For prospective physical education teachers, understanding the relationship between conditioning exercises and technical skill development is essential for implementing evidence-based teaching practices.

Although the findings are promising, several limitations should be acknowledged. The study employed a one-group pretest–posttest design without a control group, limiting the ability to establish causal relationships with complete certainty. Future studies should consider randomized controlled trials involving larger sample sizes and additional performance variables such as shooting accuracy percentage, vertical jump height, agility, and game performance indicators. Furthermore, investigating the long-term effects of plyometric training may provide a deeper understanding of its role in basketball skill development.

Overall, the findings provide strong empirical evidence that plyometric training is an effective intervention for improving jump-shoot ability among FIKK UNM students. The significant increase in mean scores, supported by statistical testing, demonstrates that plyometric exercises successfully enhance lower-limb explosive power, neuromuscular coordination, movement efficiency, and basketball-specific technical performance. These results strengthen previous findings from international studies and contribute new evidence within the context of Indonesian higher education sports programs. Consequently, plyometric training can be recommended as an effective and practical training method for improving basketball jump-shoot performance among university students.

CONCLUSION

Based on the results of the study, plyometric exercises were proven to have a significant influence on improving the jump shooting ability of FIKK UNM students, which was shown by an increase in the average score from 7.85 in the pre-test to 11.95 in the post-test. With a significance value of $0.000 < 0.05$, it can be concluded that plyometric exercises are effectively used to improve students' jump shooting skills in basketball games.

In addition, this research contributes to the development of sports science, especially in the field of sports coaching and physical condition, that plyometric exercises are able to increase the explosiveness of leg muscles which plays an important role in the implementation of jump shooting techniques. This finding strengthens the theory that the element of explosive power is one of the main components in supporting the technical skills of the game of basketball.

The implication of this research for sports science is that it can be used as a scientific reference in the preparation of a more effective, structured, and evidence-based training program to improve the performance of basketball athletes. In addition, the results of this research can also be a reference for coaches, lecturers, and sports practitioners in integrating plyometric training methods into athlete coaching programs, especially to improve shooting skills and game performance.

ACKNOWLEDGMENTS

The author would like to thank all parties who have supported the implementation of this research. Thank you to the Dean of the Faculty of Sports and Health Sciences (FIKK) State University of Makassar for the permits and facilities provided. Thank you are also expressed to the supervisor for his direction and guidance, as well as to all FIKK UNM students who have been willing to be research subjects and participate in the plyometric training program with full dedication from *the pre-test to post-test* stages. Not to forget, thank you to your family and colleagues for the support and motivation given during the research process. Hopefully it can make a real contribution to the development of sports science, especially in improving basketball achievements in the academic environment.

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