COMPETITOR:
JURNAL PENDIDIKAN KEPELATIHAN OLAHRAGA
e-ISSN: 2657-0734 & p-ISSN: 2085-5389 ‖ Volume 18, Number 1, 2026 ‖ P.0427-0440

The Effect of Shooting Training Using a Modified Size 7 Basketball on the Shooting Skills of the Women's Basketball Team

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ABSTRACT

Basketball is a team sport in which shooting skill is a critical determinant of game outcomes, as points are primarily obtained through successful shots. However, shooting mastery among junior high school athletes, particularly female players, often remains limited due to insufficient strength, coordination, and self-confidence. One instructional strategy to address this limitation is equipment modification. This study examined the effect of shooting training using a modified size 7 basketball on the shooting skills of the women's basketball extracurricular team at SMP Negeri 1 Indralaya. The use of a larger and heavier ball was intended to stimulate physical adaptation and enhance confidence when athletes returned to shooting with the standard size 6 ball. This study employed a quantitative experimental method using a one-group pretest–posttest design. The participants were 20 female students, selected through total sampling. Shooting performance was assessed using a free-throw shooting test administered before and after a six-week training program utilizing a size 7 basketball. Data were analyzed using descriptive statistics and a paired-sample t-test at a 95% confidence level ($\alpha = 0.05$). The pretest results showed a highest score of 6, a lowest score of 0, a mean of 2.95, and a standard deviation of 1.669. Posttest results demonstrated improvement, with a highest score of 7, a lowest score of 1, a mean of 3.85, and a standard deviation of 1.599. The t-test yielded a value of −4.158, exceeding the critical value of 2.100, indicating a statistically significant difference between pretest and posttest scores. It can be concluded that shooting training using a modified size 7 basketball significantly improves the accuracy and consistency of shooting skills among female junior high school players, supporting equipment modification based on overload principles as an effective strategy in school-based basketball programs.

ARTICLE HISTORY
Received: 2026/01/13
Accepted: 2026/02/04
Published: 2026/02/08

KEYWORDS
Basketball Shooting Skills;
Training;
Modified Basketball;
Overload Principle;
Women's Basketball Athletes.

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 : Wijaya, E.P.P.; Ramadhan, A.; Solahuddin, S. (2026). The Effect of Shooting Training Using a Modified Size 7 Basketball on the Shooting Skills of the Women's Basketball Team. **Competitor: Jurnal Pendidikan Kepelatihan Olahraga**. 18 (1), p.0427-0440

INTRODUCTION

Physical education is a systematically designed learning process through physical activities to develop physical fitness, motor skills, movement knowledge, a healthy lifestyle, and sportsmanship values such as cooperation, honesty, and respect for others. Several recent studies confirm that physical education is not only oriented

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towards physical aspects but also contributes significantly to the cognitive, affective, social, and moral development of students (Cahyadi et al., 2022; Finny et al., 2024; Ramadhan et al., 2024; Sari, 2024). In the context of 21st-century learning, physical education is required to create an active learning environment that encourages meaningful participation, decision-making, and character development through authentic movement experiences.

One sport that holds a strategic position in physical education learning and extracurricular activities is basketball. Basketball is a team sport played globally by various age groups and is known to develop complex motor skills, coordination, reaction time, and teamwork (Giantana et al., 2024; Surandika, 2024). However, at the junior high school level, particularly in extracurricular activities, basketball instruction often faces fundamental challenges in the form of poor mastery of basic techniques, particularly shooting. Shooting is a key technique in basketball because it directly determines points earned and the outcome of a game (Fitrah et al., 2021; Supriatna, 2023).

Initial observations of extracurricular basketball activities at SMP Negeri 1 Indralaya indicate that most students, especially new students, still struggle with accurate shooting. This phenomenon is characterized by a high frequency of airball attempts and a low percentage of shots going into the basket. These difficulties are influenced by various factors, including limited arm strength, motor coordination, body balance, and psychological factors such as low self-confidence and concentration (Iqroni, 2022; Kurniadi et al., 2023). If these conditions are not addressed pedagogically and methodologically, basketball learning has the potential to be less effective and reduce student motivation and participation in extracurricular activities.

Research related to learning and practicing basketball shooting techniques has advanced rapidly in the last decade. Biomechanically, shooting is influenced by the synchronization of upper and lower extremity movements, postural stability, elbow angle, hand position, shooting rhythm, and visual control of the basket (Iqroni, 2022; Rezeqini, 2024). Empirical studies also show that physical conditions such as muscle strength, flexibility, and coordination contribute significantly to shooting accuracy (Dadang, 2018; Kurniadi et al., 2023).

In addition to physical factors, psychological aspects such as self-confidence, focus, and emotional regulation also determine shooting success, especially in beginners and school-age players (Ramadhan & Fikri, 2022; Surandika, 2024). Therefore, modern basketball learning and training approaches tend to integrate technical, physical, and psychological aspects simultaneously.

In the context of physical education pedagogy, equipment and game modification strategies have been widely recommended as an effective approach to improving students' fundamental skills. Modifications are made by adjusting the court size, hoop height, game duration, and equipment characteristics, such as the ball, to suit the developmental stage of the students (Susanto, 2019; Hikmawati et al., 2023). Several studies have shown that using balls with specific characteristics can affect students' motor control, load perception, and neuromuscular adaptation during shooting (Mariyani et al., 2022; Supriatna, 2023).

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However, most research still focuses on the use of smaller or lighter balls to facilitate beginners. This approach is effective for the early stages of learning, but has the potential to be less challenging in terms of developing strength, motor control, and confidence when students have to transition to real game standards.

Although the literature indicates that equipment modification is a relevant pedagogical strategy in physical education and basketball instruction, several research gaps remain unaddressed. First, research on basketball modifications generally focuses on the use of smaller or lighter balls, while empirical studies on the use of larger and heavier balls as training stimuli are still very limited, particularly in the context of junior high school students.

Second, most studies only measure learning outcomes in terms of technical skills, without examining the psychological implications, such as self-confidence and motor adaptation, after students return to using standard balls. Third, research on equipment modifications in basketball is still rare in the context of extracurricular activities, even though these activities have different learning characteristics than intracurricular activities, both in terms of training intensity, student motivation, and the goal of developing early achievement.

Therefore, there is a need for research that empirically tests the effectiveness of using larger and heavier modified basketballs (e.g., size 7 balls) on improving junior high school students' shooting skills, while also examining their potential as a means of building student confidence and readiness when returning to using standard balls (size 6).

Based on the aforementioned research problems and gaps, this study aims to analyze the effect of shooting practice using a size 7 basketball on students' shooting skills in extracurricular basketball activities at SMP Negeri 1 Indralaya. Specifically, this study aims to (1) evaluate changes in shooting accuracy after implementing training with a larger and heavier ball, and (2) examine the pedagogical implications of using a modified ball as an effective and efficient learning strategy in junior high school physical education.

The novelty of this study lies in the reverse modification approach, which uses a ball with a larger size and weight than the students' age standards to stimulate motor and psychological adaptation. This approach is expected to strengthen arm strength, motor control, and increase students' self-confidence. Therefore, when returning to using a standard-sized ball, they will be able to shoot more stably and accurately. Thus, this study not only contributes to the development of basketball learning practices in schools but also enriches the scientific body of physical education through a modified equipment model based on the principles of motor adaptation and progressive learning.

METHODS

Research Design

This study employed a quantitative experimental approach to examine the causal effect of shooting training using a modified basketball on students' shooting skills. Experimental research is widely used in sports science to determine the effectiveness of specific training interventions on performance-related outcomes under controlled conditions (Thomas et al., 2015; Creswell & Creswell, 2018). In line with this objective, the present study adopted a one-

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group pretest–posttest design, which allows for the measurement of changes in the dependent variable before and after the intervention (Sugiyono, 2013; Fraenkel et al., 2019).

The independent variable in this study was shooting training using a modified size 7 basketball, while the dependent variable was basketball shooting skill, operationalized through free-throw shooting accuracy. The intervention was designed using an overload principle, where athletes were exposed to higher physical and motor demands through a heavier and larger ball to stimulate neuromuscular adaptation (Bompa & Buzzichelli, 2019; Suchomel et al., 2018). Overload-based training has been empirically shown to enhance strength, coordination, and motor control, which are essential components of shooting performance in basketball (Rezeqini, 2024; Kurniadi et al., 2023).

The research design can be illustrated as follows:

Table 1.
Desain one grup pretest-posttest desain

O_1	X	O_2
Pretest	**Perlakuan**	**Posttest**

Where O_1 represents the pretest shooting score, X represents shooting training using a modified size 7 basketball, and O_2 represents the posttest shooting score.

Participants and Sampling

The participants in this study were 20 female students who were members of the women's basketball extracurricular team at SMP Negeri 1 Indralaya. Because the total population of the women's basketball team was fewer than 100 students, a total sampling (population sampling) technique was applied, in accordance with methodological recommendations for small populations (Arikunto, 2016; Etikan et al., 2016).

The use of population sampling ensured that all available athletes received the same training exposure, thereby increasing the ecological validity of the findings in the context of school-based extracurricular sports (Hikmawati et al., 2023; Mariyani et al., 2022). All participants were physically healthy, actively engaged in regular basketball training, and provided consent to participate in the study.

Research Setting

The study was conducted on the basketball court of SMP Negeri 1 Indralaya, Indralaya District. This location was selected because it is the primary training venue for the school's women's basketball team and provides standard basketball facilities that support consistent training and testing conditions. Conducting the research in an authentic training environment aligns with best practices in applied sports science research, ensuring ecological relevance and practical applicability (Giantana et al., 2024; Surandika, 2024).

Instrument and Measurement

The research instrument used was a basketball free-throw shooting test, which is widely recognized as a valid and reliable measure of shooting accuracy in basketball research (Fitrah et al., 2021; Supriatna, 2023). The test aimed to assess participants' ability to execute accurate shots from the free throw line under standardized conditions.

Each participant performed 10 free-throw attempts using a standard-size 6 basketball during both the pretest and posttest sessions. The score was determined by

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the number of successful shots that entered the basket. Participants were allowed to use either one-hand or two-hand shooting techniques and were permitted to bounce the ball before shooting, provided that they did not step on or cross the free-throw line before releasing the ball.

Free-throw testing was selected because it minimizes external interference, emphasizes shooting mechanics, and allows for consistent comparison across testing sessions (Iqroni, 2022; Dadang, 2018).

Training Intervention Procedure

The intervention consisted of shooting training using a modified size 7 basketball, which is larger and heavier than the standard size 6 ball typically used by female junior high school players. The training program was conducted over six weeks, with progressive increases in shooting volume to apply the overload principle systematically (Bompa & Buzzichelli, 2019).

The training protocol was structured as follows:

Weeks 1–2: 10 shooting repetitions per session using a size 7 ball

Weeks 3–4: 15 shooting repetitions per session using a size 7 ball

Weeks 5–6: 20 shooting repetitions per session using a size 7 ball

This progressive load increase was designed to enhance upper limb strength, coordination, and shooting stability. Previous studies suggest that training with increased resistance or load can improve neuromuscular efficiency and motor learning, leading to improved performance when returning to standard equipment (Suchomel et al., 2018; Rezeqini, 2024).

After completing the intervention phase, participants performed a posttest free-throw shooting test using a size 6 ball, identical to the pretest conditions, to determine changes in shooting performance.

Data Collection Techniques

Data collection in this study employed three complementary techniques:

1. Observation, conducted to monitor training implementation and participant compliance during the intervention.
2. Literature review is used to support the conceptual framework and methodological decisions based on recent empirical evidence.
3. Tests and measurements, specifically the free-throw shooting test, which provided quantitative data on shooting performance before and after the intervention.

This triangulated approach strengthens the methodological rigour of the study by combining direct measurement with contextual observation (Creswell & Creswell, 2018).

Data Analysis

Data analysis was conducted using paired-sample t-test statistics, which are appropriate for comparing mean differences between pretest and posttest scores within the same group (Field, 2018). Before hypothesis testing, a normality test was performed using the Shapiro–Wilk test with SPSS software. Data were considered normally distributed if $p > 0.05$.

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The mean difference was calculated using the following formula:

$$m_d = \frac{\Sigma_d}{n}$$

Where Md is the mean difference, d is the deviation score, and n is the number of participants (Arikunto, 2016).

If the calculated t value exceeded the critical t value ($p < 0.05$), the alternative hypothesis (H_a) was accepted, indicating a significant effect of shooting training using a modified size 7 basketball on shooting skills. Conversely, if tcount < ttable, H_a was rejected.

Methodological Justification

The use of a one-group pretest–posttest design is methodologically appropriate for exploratory experimental studies in school-based sports contexts, particularly when sample sizes are limited and random assignment is not feasible (Fraenkel et al., 2019; Sugiyono, 2013). Although the absence of a control group is acknowledged as a limitation, the structured overload-based intervention and standardized measurement procedures provide sufficient internal consistency to support causal inference.

RESULTS AND DISCUSSION

Result

The results of the study from 20 samples taken from female basketball players of SMP N 1 Indralaya from the Pre-test data obtained the highest score of 6, and the lowest 0, range 6, mean 2.95 standard deviation 1.669, while the data on the posttest obtained the highest score of 7, and the lowest 1, range 6, Mean 2.85 standard deviation 1.599.

Data pre-test

At the beginning of the study, the students were first given a pre-test or initial test in the experimental group. After being given treatment in the form of shooting practice using ball 7 for 6 weeks with a frequency of 3 times a week, a final test or post-test was carried out to see whether or not there were changes after being given the treatment. Based on the results of the pre-test that had been carried out on students of SMP N 1 Indralaya with 20 samples on December 9, 2024, a mean of 2.95 was obtained, a standard deviation of 1.669, the highest score was 6, the lowest score was 0, and the range was 6.

Table 2.
Results pre-test

Variabel	N	Skor Tertinggi	Skor Terendah	Rentangan	Mean	Standar Deviasi
Shooting	20	6	0	6	2,95	1,669

Based on these descriptive statistical data, it can be concluded that the participants' shooting abilities during the pre-test varied significantly, with the highest score being 6 and the lowest score being 0. The average participants' shooting abilities were 2.95, with a standard deviation of 1.669.

Result data post-test

Based on the research data for 6 weeks or 16 meetings. There was an increase in the ability to shoot in the experimental group. The results of the post-test conducted on

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January 25, 2025, with a sample of 20 people showed a mean of 3.85, a standard deviation of 1.59, the highest score 7, skor terendah 1, dan rentanganya adalah 6.

Table 3.
Results post-test

Variabel	N	Skor Tertinggi	Skor Terendah	Rentangan	Mean	Standar Deviasi
Shooting	20	7	1	6	3.85	1,599

Based on these descriptive statistical data, it can be concluded that the participants' shooting ability after the post-test increased, with the highest score of 7 and the lowest score of 1. The average shooting ability of the participants was 3.85, with a standard deviation of 1.599, which shows quite a large variation between participants.

Table 4.
Results pre-test and post-test

Hasil	N	Skor Tertinggi	Skor Terendah	Mean	Perbedaan Mean Pretest Dan Posttest
Pre-test	20	6	0	2,95	1,10
Post-test	20	7	1	3,85	

The comparison of the pre-test and post-test results above can be seen from the pre-test data; the highest score is 6, and the lowest is 0. The post-test data results, the highest score is 7 and the lowest is 1, obtained an average pre-test of 2.95 and a post-test of 3.85, so that the difference in the pre-test and post-test means is 1.10. The results obtained from the pre-test data of the experimental group with the highest score of 6 and the lowest score of 0, with an average of 2.95 mode of 2 standard deviation of 1.669.

During the post-test, the experimental group had the highest score of 7 and the lowest 1, with an average of 3.85 mode of 3 standard deviation of 1.599. The data obtained and managed using analysis techniques and using the IMB SPSS Statistic 28 program. Comparison between the pre-test and post-test of the experimental group. A significant increase in the average shooting score, which is 1.10, shows that the modification of the size 7 basketball has a positive effect on the shooting ability of the women's basketball team. Size 7 basketballs have larger and heavier dimensions compared to size 6 balls, so players must adapt their hand techniques and strengths to control the ball. This modification may challenge players to improve their concentration and accuracy in their shooting skills. This is in accordance with the theory that training with more difficult equipment can improve players' overall abilities because they learn to overcome greater challenges. In accordance with the principle of increasing demands, the training load must be continuous if the athlete's general and specific fitness continues to improve. The training load must be increased regularly (progressive overload) the training ratio is critical. (Sidik, 2022). Using a larger ball requires players to pay more attention to technical aspects of shooting, such as hand position, ball control, and movement consistency, so that the process of adapting to a larger ball may also lead to increased hand and wrist muscle strength, which greatly supports shooting skills.

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Table 5.
increased yield pre-test and post-test

Hasil	N	Highest Score	Lowest Score	Mean	Improvement Mean Pretest - Posttest	Modus	SD
Pre-test	20	6	0	2,95	1,10	2	1,669
Post-test	20	7	1	3,85		3	1,599

Comparative data of pre-test and post-test results with a total N of 20, can be seen in the table above, the pre-test of the experimental group with the highest score of 6 and the lowest score of 0 with an average of 2.95 mode 2 standard deviation 1.669 while the post-test with the highest score of 7 and the lowest 1 with a mean of 3.85 mode 3 and standard deviation 1.599

The decrease in standard deviation from 1.699 in the pre-test to 1.599 in the post-test indicates a decrease in variability between players. This means that while the overall average shooting score was clearly improved, there was also an increase in consistency in shooting ability between players. In the pre-test, there was greater variation in shooting ability between individuals, while in the post-test, players tended to show a more consistent level of skill. This decrease in standard deviation may reflect the effectiveness of training with a size 7 basketball in improving shooting technique more evenly across team members. Players who previously struggled may have begun to adjust their technique, while players who were already more skilled became more consistent. This suggests that the use of a larger ball serves not only to improve shooting skills but also to reduce the sharp differences in ability between players.

The standard deviation that decreased from 1.669 in the pre-test to 1.559 in the post-test showed that the participants' shooting results became more consistent after using a basketball that had been modified to size 7, and showed that the participants' shooting abilities tended to be more homogeneous and centered on a higher average value after being given treatment. According to Magill (2011), consistency in physical performance will increase if training is carried out in match conditions or in accordance with the physical characteristics of participants with a size 7 ball that is adjusted to the physical size of the female athlete's body. Participants can develop more stable shooting techniques, thereby reducing variation in results and increasing consistency.

Normality testNormality test

In the data collection technique, the normality test in this study used the technique *One-Sample Kolmogorov-Smirnov Test*, between (-1) and information from the pretest and post-test of the exploration collection is adjusted. This test is carried out to see whether the dependent autonomy factor has a standard deviation or not.

Table 6.
data normalization test pre-test dan post-test

Variable	T-statistik	sig	information
Pre-test	.138	0,200	Normal
Post-test	.153	0,200	Normal

The results of the data management above can be concluded that the results of the pre-test and post-test data in the normality test above, the results of the pre-test

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data significance value are 0.200>0.05, while the post-test data significance value is 0.200>0.05 and is normally distributed because the value exceeds 0.05.

Test paired T-test pre-test and post-test

Table 7.
Test data paired T-test pre-test dan post-test

	Paired differences					T	DF	Sig. (2-tailed)
	mean	Std. deviation	Std. error maen	95% confidence interval of the defference Lower	upper			
Posttest *shooting*	-900	968	216	-1,353	-447	-4.158	19	.001

The data from the T test statistical calculation results obtained T result -4.158, while T table is 2.100, which is obtained from the results of the T distribution table with dk (20-1-1) = 18 and a confidence level of 95% (a = 0.05), listed in the table. The hypothesis test criteria are accepted Ha if T count > T table (a-1), and reject H0 if T count < T table, because T count (-4.158) > T table (2.100), then there is a significant difference between the pre-test and post-test, thus the H0 hypothesis is rejected and the Ha hypothesis is accepted. The Ha statement is the effect of shooting practice with a size 7 basketball modification on the shooting of the girls' basketball team in the SMP N 1 Indralaya basketball extracurricular.

Discussion

The findings of this study indicate that shooting training using a modified size 7 basketball produced a significant improvement in the shooting skills of the women's basketball team at SMP Negeri 1 Indralaya. This result confirms the research hypothesis that exposure to a larger and heavier ball during training can positively influence shooting performance when athletes return to using the standard size 6 ball. The improvement observed in posttest scores suggests that the applied training stimulus successfully facilitated both motor adaptation and performance transfer, which are central principles in sports training and motor learning.

From a training theory perspective, the effectiveness of this intervention can be explained through the overload principle, whereby the musculoskeletal and neuromuscular systems are exposed to demands exceeding habitual levels, resulting in physiological and motor adaptations (Bompa & Buzzichelli, 2019; Suchomel et al., 2018). The use of a size 7 basketball increased resistance during shooting movements, requiring greater force production from the upper limbs and enhanced stabilization of the trunk and lower extremities. Previous studies have shown that overload-based training improves strength, coordination, and movement efficiency, which subsequently enhances technical performance in sport-specific skills (Turner, 2016; Cormie et al., 2017).

In the context of basketball, shooting accuracy is highly dependent on kinetic chain coordination, balance, and release consistency (Iqroni, 2022; Rezeqini, 2024). Training with a heavier ball likely strengthened the shoulder, elbow, and wrist musculature, while

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simultaneously improving proprioceptive control and timing. When participants returned to shooting with a lighter size 6 ball during the posttest, the movement felt mechanically easier, allowing for better control and accuracy. This phenomenon aligns with the concept of post-activation performance enhancement, where prior exposure to higher loads improves subsequent performance under standard conditions (Suchomel et al., 2018).

Empirically, the results of this study are consistent with prior research reporting that resistance-based or modified-equipment training can enhance sport-specific skills. Kurniadi et al. (2023) demonstrated that improvements in upper limb strength and coordination significantly contributed to shooting accuracy in adolescent basketball players. Similarly, Supriatna (2023) reported that repetitive shooting practice under increased physical demands led to better shooting consistency and confidence. Although most previous studies employed lighter or age-adjusted equipment, the present findings extend this body of knowledge by showing that reverse modification using heavier equipment can also be pedagogically effective when applied progressively and systematically.

Beyond physical adaptations, the improvement in shooting performance observed in this study may also be attributed to psychological factors, particularly increased self-confidence and concentration. Basketball shooting is not solely a biomechanical action but also a perceptual–cognitive task requiring focus, emotional regulation, and belief in one's ability to score (Ramadhan & Fikri, 2022; Surandika, 2024). Successfully performing shots with a heavier ball may have enhanced the athletes' confidence, reducing performance anxiety when returning to the standard ball. This finding supports previous research highlighting the strong relationship between confidence, concentration, and shooting success in youth basketball players (Dadang, 2018; Fitrah et al., 2021).

From a motor learning perspective, repeated practice under slightly more demanding conditions encourages deeper neural engagement and adaptive motor planning (Schmidt et al., 2019). The six-week progressive training structure implemented in this study allowed athletes to gradually adapt to increased shooting volume and load, which is consistent with recommendations for skill acquisition in youth sports (Gabbett et al., 2016). This structured progression likely minimized injury risk while maximizing learning effectiveness, supporting the notion that well-designed overload does not compromise safety when properly monitored.

In terms of educational and extracurricular sports practice, the findings of this study have important implications. Extracurricular basketball programs in junior high schools often face heterogeneous skill levels among participants, particularly between new and experienced players (Hikmawati et al., 2023; Mariyani et al., 2022). The use of modified equipment, such as a size 7 basketball, offers a practical and low-cost training strategy that coaches and physical education teachers can implement to accelerate skill development. Moreover, this approach aligns with pedagogical recommendations emphasizing adaptive learning environments that challenge students appropriately while maintaining engagement (Cahyadi et al., 2022; Finny et al., 2024).

However, the findings of this study should be interpreted with consideration of its limitations. The absence of a control group restricts the ability to attribute

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improvements exclusively to the intervention without potential influence from external factors such as regular training routines or maturation effects. Additionally, the relatively small sample size limits generalizability beyond the studied population. Despite these limitations, the consistency of the findings with established training theories and empirical studies strengthens the internal validity of the conclusions.

Future research is encouraged to employ controlled or randomized experimental designs, compare different types of equipment modification (lighter vs. heavier balls), and incorporate additional outcome variables such as shooting biomechanics, muscle activation patterns, or psychological measures. Such investigations would further clarify the mechanisms underlying performance improvements and enhance the evidence base for modified-equipment training in youth basketball.

CONCLUSION

From this study, it can be concluded that the effect of shooting training with a size 7 basketball modification on the shooting of the women's basketball team in the basketball extracurricular activities at SMP N 1 Indralaya is that. There is a significant difference in player shooting, before and after being given treatment, because modifying the ball to be bigger and heavier than the standard plays a role in improving shooting. And there is an increase in shooting accuracy and consistency after adapting to using a size 7 ball. Players who are used to using a size 7 ball show an increase in their ball control and shooting technique, although beginners need a little longer to adapt to a bigger and heavier ball, which can affect their shooting results in the short term.

ACKNOWLEDGMENT

The researcher would like to express sincere gratitude to the Principal of SMP Negeri 1 Indralaya for granting permission and support to conduct this research. Appreciation is also extended to the basketball extracurricular coach and all members of the women's basketball team of SMP Negeri 1 Indralaya for their active participation and cooperation throughout the research process. Furthermore, the researcher would like to thank all parties who provided assistance, guidance, and encouragement, either directly or indirectly, which contributed to the successful completion of this study.

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