



The Effect of Plyometric Training Methods: Hurdle Hops Jump and Box Jump on Leg Muscle Explosive Power and Blocking Skills of Male Volleyball Extracurricular Students at SMK Negeri 4 Bandar Lampung

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Abstract

This study aims to determine the effect of plyometric training methods hurdle hops jump and box jump on lower limb explosive power and blocking skills among male students participating in volleyball extracurricular activities at SMK Negeri 4 Bandar Lampung. The research employed a comparative experimental method. The sample consisted of 30 students, divided into two groups using the ordinal pairing technique. Data analysis included pre-requisite tests and t-tests. The results of the study indicate that: (1) There is a significant effect of the hurdle hops jump training on lower limb explosive power, with a calculated t-value of 11.514 > t-table 2.145, and on blocking skills, with a calculated t-value of 17.004 > t-table 2.145. (2) There is a significant effect of the box jump training on lower limb explosive power, with a calculated t-value of 18.563 > t-table 2.145, and on blocking skills, with a t-value of 20.916 > t-table 2.145. (3) There is no significant difference between the hurdle hops jump and box jump training methods in terms of their effect on lower limb explosive power ($t = 0.490 < t\text{-table} = 2.048$), but there is a significant difference in their effect on blocking skills, with a t-value of 3.720 > t-table = 2.048, in favor of the box jump method.

Keywords: *plyometric, hurdle hops jump, box jump, lower limb explosive power, blocking skills.*

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INTRODUCTION

Sports is a physical activity aimed at improving mental health, physical fitness, and the development of motor skills (Rimasyanthi, 2013). Sports play a significant role in fulfilling the needs of the body throughout human life, not only as a means to maintain health but also as a medium to develop social, competitive, achievement, and discipline skills (Pate, 1993). That in learning that is classical in nature will face the problem of heterogeneity of students' abilities, it

cannot be denied anymore. Hanief and Sugito in (Mashuri, Hanief & Subekti, 2018: 162) says that, Physical Education, Sports and Health (PJOK) has a complex role in the process character formation because it relates to affective, cognitive, and psychomotor.

Sports have an important role in education, not only to improve physical fitness but also in shaping character, cooperation, and students' social skills (Winarno, 2006). In the Merdeka Curriculum, sports are integrated as they have been proven to have a positive impact on students' physical, mental, and emotional development (Selye, 2013) and support the achievement of the Pancasila Student Profile. Sports activities are not only held formally through the intramural program but also in extracurricular activities tailored to students' interests and talents, offering them opportunities to develop to national or international levels. This aligns with Law No. 11 of 2022, Article 18 on Educational Sport (Jaenudin, 2015), which emphasizes the importance of sports governance through both formal and non-formal educational channels. This law also supports the development of athletes and sports management by providing infrastructure, budgets, scholarships, and post-sports career transition programs (Supriyadi, 2018:66). As a concrete form, the government can organize volleyball competitions at the school and regional levels as an effort to nurture talented young athletes.

Volleyball is one of the most popular sports among students, making it widely embraced in educational environments. The game involves various essential techniques, one of the most important being blocking. Blocking serves as a critical defensive skill used to prevent or deflect the opponent's attacks at the net. This technique is especially significant as it can disrupt the opponent's offensive strategy and potentially prevent a point from being scored. Mastering blocking requires not only physical strength and agility but also timing, precision, and an understanding of the opponent's movements (Salman, 2018:22). Consequently, it plays an essential role in the overall strategy of the game and is a crucial element for players to learn and perfect, particularly in the competitive context of school volleyball teams (Ahmadi, 2007). According to Irwanto (2021:53), his technique is considered difficult to master as it requires a tall body posture, good jumping ability, and precise timing when intercepting the ball in the air. The success of executing a block heavily depends on the strength and explosive power of the player's leg muscles (Bafirman & Wahyuri, 2019). Therefore, the development of physical abilities, particularly the leg muscles, becomes an important aspect that needs to be emphasized in training. One training

method that has proven effective in increasing the explosive strength of the leg muscles is plyometric training. Saharullah (2022) Plyometric training is a form of exercise that relies on explosive movements, such as jumping, to enhance the stretch reflex of the muscles, with or without the use of equipment. Two common plyometric exercises used to improve blocking ability are hurdle hops jump and box jump. The hurdle hops jump trains horizontal jumping through a series of obstacles placed in sequence, while the box jump focuses on vertical jumping onto a box-shaped platform. Both exercises are designed to maximize the development of leg muscle strength, enabling players to perform blocking effectively, particularly in extracurricular volleyball activities within school environments.

Based on the observations at SMK Negeri 4 Bandar Lampung, the implementation of extracurricular volleyball training is still limited to warm-ups, paired passing, and smash drills, without physical exercises focused on improving vertical jump ability for blocking skills. As a result, many students remain uncertain when performing blocks, with their jump height not yet optimal, and they often commit violations such as touching the net or having their feet cross into the opponent's area. This issue highlights the lack of training methods that support the improvement of leg muscle explosiveness, which affects the effectiveness of students' blocking technique. Therefore, the author is interested in studying the impact of plyometric hurdle hops jump and box jump training methods on improving leg muscle explosiveness in the blocking skills of extracurricular volleyball students at SMK Negeri 4 Bandar Lampung.

METHOD

The method used in this research is a comparative experimental method, which involves calculating data variables to determine the differences between two or more groups of data variables. The aim is to examine the effect of an independent variable (treatment) on a dependent variable by manipulating the independent variable and observing its impact on the dependent variable. The sampling technique used in this study is census or total sampling. The instrument used in this research involves data collection through testing. The data collected in this study is obtained from pretests and posttests, measured through vertical jumps. From these measurements, improvements in the explosiveness of the leg muscles related to blocking technique skills can be assessed, allowing the researcher to draw conclusions based on the results obtained from both hurdle hops jump and box jump training methods.

This study uses quantitative data analysis. The data obtained in this study includes independent variables, namely the plyometric hurdle hops jump training method (X1) and the plyometric box jump training method (X2), and dependent variables, which are leg muscle explosiveness (Y1) and blocking technique skills (Y2) in volleyball. To analyze the data between these variables, the t-test formula is used, following normality and homogeneity tests that are conducted beforehand.

RESULTS AND DISCUSSION

Result

The sample in this study consisted of 30 students from the volleyball extracurricular at SMK Negeri 4 Bandar Lampung. The results of the pretest and posttest on the vertical jump test and blocking skills showed changes after the application of the plyometric hurdle hops jump and box jump training methods. Based on Table 1, the box jump training method yielded better post-test results overall compared to the hurdle hops jump, in terms of the average score, minimum and maximum values, as well as the stability of the results (SD).

Table 1. Results of the Study Lower Limb Explosive Power

RESULT	<i>Hurdle hops jump</i>		<i>Box jump</i>	
	Pre-test	Post-test	Pre-test	Post-test
Average	51.33	59.4	50.46	61.13
SD	12.69	10.70	9.38	8.41
Min	25	37	33	47
Max	70	75	62	73

Table 2. Results of the Study Blocking Skills

RESULT	<i>Hurdle hops jump</i>		<i>Box jump</i>	
	Pre-test	Post-test	Pre-test	Post-test
Average	37.96	71.42	38.71	82.72
SD	7.89	8.09	8.71	8.83
Min	25	58.3	27.7	66.6
Max	58.3	86	55.5	97.2

Based on Table 2, the results of the initial test on blocking skills for male students in the volleyball extracurricular at SMK Negeri 4 Bandar Lampung using the plyometric hurdle hops jump training method showed an average of 37.96, a standard deviation of 7.89, a minimum value

of 25, and a maximum value of 58.3. Meanwhile, in the final test on blocking skills for the hurdle hops jump training group, the average score significantly improved to 71.42, with 8 male students scoring above the class average, 7 students below the class average, a standard deviation of 8.09, a minimum value of 58.3, and a maximum value of 86. The comparison between the initial and final tests of the explosive strength of the muscles can be illustrated in the following diagram below:

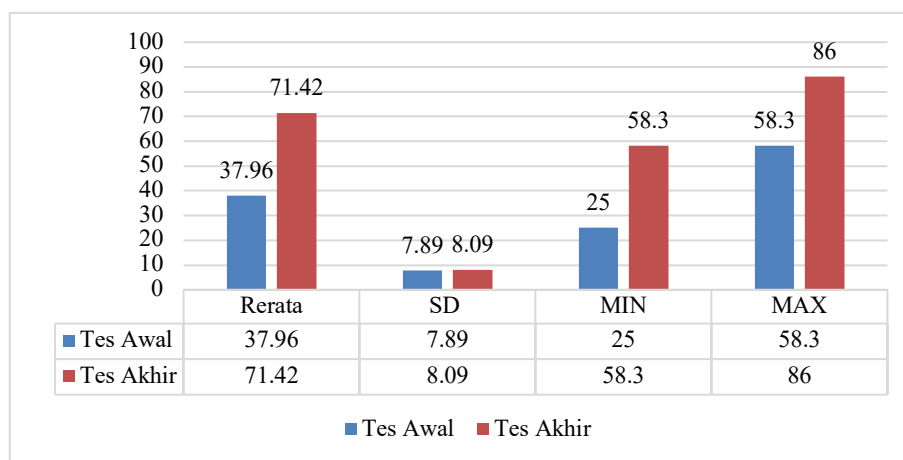


Figure 1. Initial Test and Final Test of the Hurdle Hops Jump Training Group on Blocking Skills

The results of the initial test on leg power in male students of the extracurricular volleyball program at SMK Negeri 4 Bandar Lampung with the plyometric box jump training treatment showed an average of 50.46, standard deviation of 9.38, minimum value of 33, and maximum value of 62. Meanwhile, in the final test, the leg power of male students in the extracurricular volleyball program at SMK Negeri 4 Bandar Lampung in the hurdle hops jump treatment group showed a significant improvement, with an average of 61.13. The number of male students above the average was 13 students, while 2 students were below the class average, with a standard deviation of 8.14, a minimum value of 47, and a maximum value of 73. The comparison between the initial and final tests of leg power ability is illustrated in the diagram below:

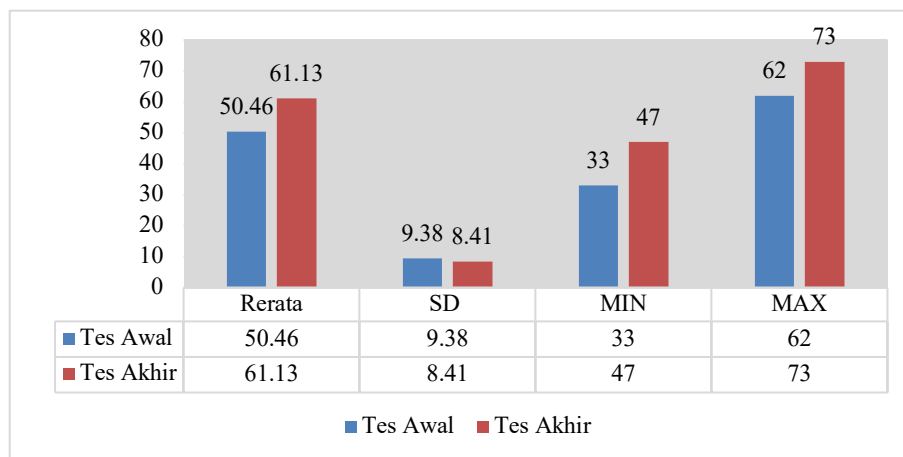


Figure 2. Initial Test and Final Test of the Box Jump Training Group on Leg Power

The results of the initial test on blocking skills in male students of the volleyball extracurricular at SMK Negeri 4 Bandar Lampung with the plyometric box jump training method showed an average score of 38.85, a standard deviation of 8.71, a minimum score of 27.7, and a maximum score of 55.5. Meanwhile, the final test results for blocking skills in the hurdle hops jump training group showed a significant improvement, with an average score of 82.72. The number of male students above the average was 8 students, while 7 students were below the class average, with a standard deviation of 8.53, a minimum score of 66.6, and a maximum score as noted. Therefore, the comparison between the initial and final tests of leg power ability can be illustrated through the diagram below:

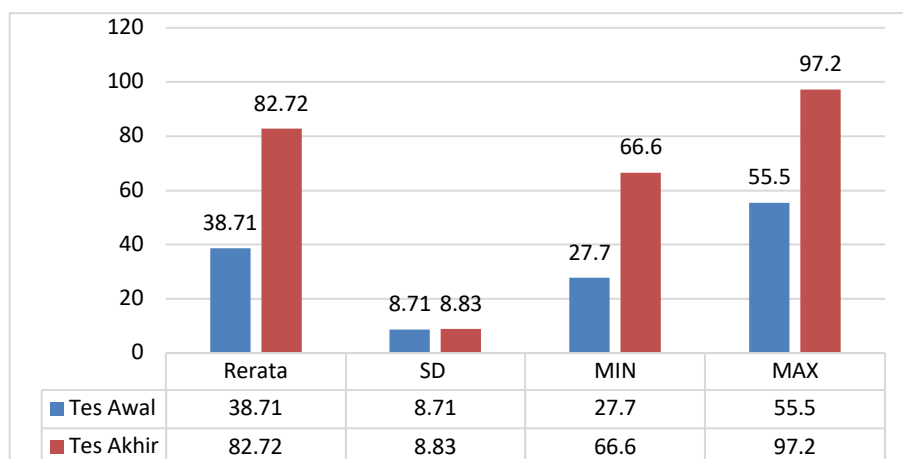


Figure 3. Initial and Final Tests for the Box Jump Training Group on Blocking Skills

After the data was collected, a normality test was conducted to determine whether the data distribution in the sample followed a normal distribution or not. Based on the results shown in Tables 3 and 4, the normality test was applied to the dependent variables of explosive power and blocking skills for both the hurdle hops jump and box jump groups. In the case of the hurdle hops jump group, the calculated L_{value} , leading to the acceptance of the null hypothesis (H_0) and the rejection of the alternative hypothesis (H_1). Similarly, for the box jump group, the calculated L_{value} was also smaller than the table value, resulting in the acceptance of H_0 and the rejection of H_1 . These findings indicate that the data for both groups followed a normal distribution, allowing for the further analysis of the impact of the plyometric training methods on explosive power and blocking skills.

Table 3. Normality Test Results of the Hurdle Hops Jump Training Group

Test	Leg Muscle Explosive Power		Conclusion	Blocking Skills		Conclusion
	L_{value}	L_{table}		L_{value}	L_{table}	
	Pre-test	0.139		0.220	Normal	
Post-test	0.168	0.220	Normal	0.128	0.220	Normal

Table 4. Normality Test Results of the Box Jump Training Group

Test	Leg Muscle Explosive Power		Conclusion	Blocking Skills		Conclusion
	L_{value}	L_{table}		L_{value}	L_{table}	
	Pre-test	0.120		0.220	Normal	
Post-test	0.127	0.220	Normal	0.083	0.220	Normal

The data from box jump training results on the variables of leg muscle explosive power and blocking skills are normally distributed, so parametric statistical tests such as the t-test can be applied.

Based on the results of the homogeneity test, it was found that the F-calculated value is less than the F-table value ($F_{hitung} < F_{tabel}$), indicating that the data from both groups namely the hurdle hops jump training method and the box jump training method have homogeneous variances with respect to the variable of leg muscle explosive power. Furthermore, the t-test results

for each group showed that hurdle hops jump training had a significant effect on increasing leg muscle explosive power ($T_{\text{value}} = 11.514 > T_{\text{table}} = 2.145$) and blocking skills ($T_{\text{value}} = 17.004 > T_{\text{table}} = 2.145$). Similarly, in the box jump training group, there was a significant effect on leg muscle explosive power ($T_{\text{value}} = 18.563 > T_{\text{table}} = 2.145$) and blocking skills ($T_{\text{value}} = 20.916 > T_{\text{table}} = 2.145$). The comparative t-test between the two groups showed no significant difference in leg muscle explosive power ($T_{\text{value}} = 0.480 < T_{\text{table}} = 2.048$), but there was a significant difference in blocking skills ($T_{\text{value}} = 3.197 > T_{\text{table}} = 2.048$). Therefore, it can be concluded that both plyometric training methods are equally effective in improving leg muscle explosive power, but box jump training yields better results in enhancing the blocking skills of male volleyball extracurricular students at SMK Negeri 4 Bandar Lampung.

Discussion

Based on the research findings on male volleyball extracurricular students at SMK Negeri 4 Bandar Lampung, it was found that both the plyometric training methods, hurdle hops jump and box jump, had a significant impact on improving leg muscle explosive power. This was demonstrated through t-tests, which showed improvements in both groups after the intervention. However, when comparing the two methods, there was no significant difference, leading to the conclusion that both training methods are equally effective and yield comparable results in enhancing leg muscle explosive power. These findings are in line with the theory of Based on the research findings on male volleyball extracurricular students at SMK Negeri 4 Bandar Lampung, it was found that both the plyometric training methods, hurdle hops jump and box jump, had a significant impact on improving leg muscle explosive power. This was demonstrated through t-tests, which showed improvements in both groups after the intervention. However, when comparing the two methods, there was no significant difference, leading to the conclusion that both training methods are equally effective and yield comparable results in enhancing leg muscle explosive power. These findings are in line with the theory of Based on the research findings on male volleyball extracurricular students at SMK Negeri 4 Bandar Lampung, it was found that both the plyometric training methods, hurdle hops jump and box jump, had a significant impact on improving leg muscle explosive power. This was demonstrated through t-tests, which showed improvements in both groups after the intervention. However, when comparing the two methods, there was no significant difference, leading to the conclusion that both training methods are equally

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Meanwhile, in blocking skills, both methods also proved to result in significant improvements. However, a significant difference was found when comparing the two methods, with the box jump method yielding better results than the hurdle hops jump method. This is believed to be because box jump emphasizes vertical movement and balance, which directly contribute to the blocking technique in volleyball. This finding is reinforced by the statement of Zainuddin (2022) and supported by the research of Septi Citra Permana (2020), which indicates that bench step-ups are more effective than other methods in enhancing blocking ability. Overall, box jump training is superior in refining blocking skills, although both methods are equally effective in improving leg muscle explosive power.

CONCLUSION

Based on the results of the research and discussion, it can be concluded that both the plyometric training methods, hurdle hops jump and box jump, have a significant impact on improving leg muscle explosive power and blocking skills in male students of the volleyball extracurricular at SMK Negeri 4 Bandar Lampung. Although both methods are effective in enhancing leg muscle explosive power, there is no significant difference between the two in this aspect. However, a significant difference was found in the improvement of blocking skills, where the box jump method showed better results compared to the hurdle hops jump method.

ACKNOWLEDGMENT

Thank you to the SMK Negeri 4, Bandar Lampung City, which has permitted us to collect data so that this research could run well.

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