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The Effect of Single-Leg and Double-Leg Hurdle Jumps on Shooting Speed

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ABSTRACT

This study aimed to compare the effectiveness of double-leg hurdle jumps and single-leg hurdle jump training in increasing the shooting speed of football players at SMPN 3 Bontomarannu. This research method uses an experimental design with a paired sample t-test to analyze the differences in the results of the two training methods. The research sample consisted of 22 players divided into two groups, each doing double leg hurdle jumps training as many as 11 players and single leg hurdle jumps also 11 players for 16 meetings. The results of the study showed that double leg hurdle jumps training produced a mean value of 0.04818 with a significance of 0.000 ($p < 0.05$), indicating a more substantial increase compared to single leg hurdle jumps which had a mean value of 0.0163 and a significance of 0.015 ($p < 0.05$). These findings indicate that double-leg hurdle jump training is more effective in increasing shooting speed. This study concludes that double-leg hurdle jump training has a more significant effect on the shooting speed of football players than single-leg hurdle jumps.

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INTRODUCTION

Football is a sport that combines various elements of physical, technical, tactical, and mental skills. One of the fundamental football skills is the ability to shoot or kick the ball into the goal. This skill is a determinant in creating opportunities and scoring goals, which ultimately affects the match's outcome. Good shooting speed allows players to make quick decisions and execute kicks before being blocked by opposing defenders (Kasmad et al., 2024; Nuryadin et al., 2024). Plyometric training, especially hurdle jumps, has long been known as an effective method for increasing explosive power in leg

muscles (Hudain & Suyudi, 2024). Variations of this exercise can be done in two ways: Single-leg hurdle jumps and double-leg hurdle jumps (H et al., 2023). Each variation has different characteristics and levels of difficulty, so it can be adjusted to the abilities and needs of the athlete. The SMPN 3 Bontomarannu football club, as a place for developing football talent at the school level, has great potential to produce quality players. However, observations in the field show that there are still obstacles in the aspect of shooting speed that need to be improved. This can be seen from the lack of attack effectiveness and the small number of goals scored in the match.

The training program that has been implemented in the SMPN 3 Bontomarannu football club tends to focus on technical and tactical aspects, while the development of specific physical components such as leg muscle power has not received adequate portions. This condition causes the potential of players to produce fast and powerful shooting to not be maximized. The implementation of single-leg hurdle jumps and double-leg hurdle jumps training can be a solution to overcome this problem. Both of these training variations not only have the potential to increase leg muscle power, but can also develop the coordination, balance, and stability needed in the execution of effective shooting techniques.

One of the crucial basic techniques in football is shooting ability, which requires a combination of strength, speed, and accuracy to produce effective shots into the opponent's goal. To increase shooting speed, various training methods have been developed and their effectiveness has been studied. Among these methods, plyometric training such as hurdle jumps has shown promising results in increasing leg muscle power, which is directly correlated with shooting speed (Adam Mappaompo et al., 2024). Hurdle jumps training can be done in two main variations, namely single leg and double leg, each of which has its characteristics and benefits.

Previous research by (Putra et al., 2016) showed that plyometric training has a significant impact on increasing the explosive power of leg muscles in young football players. This is the basis for consideration to further explore the effectiveness of single-leg hurdle jumps and double-leg hurdle jumps in the context of increasing shooting speed.

A study conducted by (Rachman & Azima, 2018) indicated that programmed and systematic plyometric training can significantly improve the athletic performance of junior high school students. This finding reinforces the urgency to apply the right training methods in developing players' shooting skills. The biomechanical aspect of shooting movements is also an important consideration in choosing a training method. Research (Dinata & Arwandi, 2019) explains that coordination between leg muscle strength and correct technique will result in more effective and high-speed shooting.

In the context of competition, fast and accurate shooting ability can be a determining factor in victory. Research (Ruslan et al., 2020) shows that teams with higher average shooting speeds have a greater chance of scoring goals. Single-leg hurdle jump training has advantages in terms of developing unilateral stability and dynamic balance. On the other hand, double-leg hurdle jump training tends to produce greater power output and is suitable for developing bilateral explosive strength.

The technical aspects of implementing hurdle jump training require special attention. The height of the hurdles, the distance between the hurdles, and the number of repetitions must be adjusted to the individual athlete's abilities, as stated in the technical guide by (Dwi Putri Ayuningtyas et al., 2015). Periodic evaluation of the development of athlete abilities is an important component of a training program. Valid and reliable measurement instruments are needed to assess the increase in shooting speed, as used in the study (Matondang & Tarmizi, 2017)

Transfer of training from plyometric training to actual performance in matches is also an aspect that needs attention. Longitudinal research by (Muzakki et al., 2020) shows a positive correlation between increased power from plyometric training and shooting performance in matches. In junior high school football matches, one of the problems that often arises is errors in executing shooting kicks. Many players have difficulty directing the ball accurately and effectively due to a lack of optimal speed.

This study can help analyze whether suboptimal kick speed is a major factor in these errors, thus providing insight into improving players' shooting skills. Kicks are very weak and can be easily caught by the goalkeeper. Effective kick speed can be a determining factor in scoring goals, especially in competitive match situations. This study will explore whether kicks with higher kick speed can reduce errors in execution and increase goal-scoring opportunities. At the junior high school level, this ability is often under-appreciated, making it important to examine it further. Furthermore, at the junior high school level, the aspect of kick speed is rarely the main focus in training. This causes players to be less trained in producing accurate fast kicks.

The study at SMPN 3 Bontomarannu will provide specific data on students' shooting speed and how it contributes to errors in real-match situations. Thus, the results of this study can be used as a basis for compiling a more targeted training program to improve the strength and kicking technique of players, so that they are better prepared to face the pressure of the match and reduce fatal errors in front of the goal.

Based on various considerations and research findings that have been presented, research on the effects of single-leg hurdle jumps and double-leg hurdle jumps on shooting speed at the SMPN 3 Bontomarannu football club is very relevant and important to do. The results of this study are expected to provide a significant contribution to the development of effective training methods to improve the performance of school-age football athletes.

METHODS

Experimental research is a type of research that aims to test the cause-and-effect relationship between certain variables through controlled interventions (Arga et al., 2024). In experimental research, researchers intentionally manipulate one or more independent variables (variables that are changed) and observe their impact on the dependent variable (variables that are measured) while controlling other variables that could affect the results (Juhanis et al., 2023). However, because this study uses 2 groups, there is no control group. The characteristic of experimental research is the presence of

an experimental group. The experimental group receives the treatment or intervention being tested. Researchers also often use randomization (random distribution) to ensure that the difference in results obtained between the two groups is solely due to the intervention, not other factors.

The research will be carried out around November 2024, at the SMPN 3 Bontomarannu club training field. The implementation time is every Monday, Wednesday, Friday and Sunday starting at 15.30-16.30 and 16.30-17.30. The population in this study were all football players of SMPN 3 Bontomarannu club totaling 28 players. The number of samples used in this study was a quota sampling of 22 players with the consideration that 6 players were not included because the goalkeeper was not included in the goal of increasing shooting speed abilities.

Shooting Speed Test: Measuring the speed of kicks (shooting) of football players, Evaluating the effectiveness of the training program, and Identifying the potential of players in terms of shooting speed. Research Equipment and Devices include standard-size football balls (5 pieces), standard-size football goals, a Radar Speed Gun (Speed Meter), a Stopwatch, a Whistle, and Marker Cones (8 pieces). Recording forms include Stationery, Meter, Camera (optional for movement analysis), Test Officer, Timekeeper (2 people), Ball speed meter (1 person), Movement supervisor (1 person), and Result recorder (1 person). Implementation Stage: The Testee stands in the starting position (16 meters from the goal), The ball is placed on the penalty spot, The command "READY - YES", Testee shoots as hard as possible towards the goal, Each testee takes 5 kicks, Rest 30 seconds between kicks. Measurement, namely Preparation time to impact is measured with a stopwatch. Each kick is recorded for its speed. Data analysis techniques use the help of SPSS 25 by conducting prerequisite tests (Normality and Homogeneity) and inferential tests (T-test).

RESULTS AND DISCUSSION

Result

These results are described in the general description of the research data which will be displayed in the form of a summary table. In this case, the research results will be described followed by a discussion of the results. Strengthening the results of this study will be explained in a discussion that allows the basis and assumptions that influence and play an important role in shooting in football games.

Descriptive Analysis

Table 1.
Summary of Shooting Speed Pretest

Statistics	Pretest_Single leg hurdle jumps	Pretest_Double leg hurdle jumps
N	11	11
Range	0,51	0,60
Minimum	0,28	0,36
Maximum	0,79	0,96
Sum	5,81	6,00
Mean	0,5282	0,5455
Std. Deviation	0,15315	0,17907
Variance	0,023	0,032

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The results of descriptive data on the shooting speed of the single leg hurdle jump group from 11 players who underwent the initial test obtained a minimum value of 0.28 seconds, a maximum value of 0.79 seconds, a range of 0.51 seconds, a standard deviation of 0.015315, a variance of 0.023, an average shooting speed of 0.5282 with a total time of 5.81 seconds.

The results of descriptive data on the shooting speed of the double leg hurdle jump group from 11 players who underwent the initial test obtained a minimum value of 0.36 seconds, a maximum value of 0.96 seconds, a range of 0.60 seconds, a standard deviation of 0.017907, a variance of 0.032, an average shooting speed of 0.5455 with a total time of 6.00 seconds.

Table 2.
Summary of Shooting Speed Posttest

Statistics	Posttest_Single leg hurdle jumps	Posttest_Double leg hurdle jumps
N	11	11
Range	0,50	0,52
Minimum	0,28	0,35
Maximum	0,78	0,87
Sum	5,63	5,47
Mean	0,5118	0,4973
Std. Deviation	0,14985	0,16740
Variance	0,022	0,028

The results of descriptive data on the shooting speed of the single leg hurdle jump group from 11 players who underwent the initial test obtained a minimum value of 0.28 seconds, a maximum value of 0.78 seconds, a range of 0.50 seconds, a standard deviation of 0.14985, a variance of 0.022, an average shooting speed of 0.5118 with a total time of 5.63 seconds.

The results of descriptive data on the shooting speed of the double leg hurdle jump group from 11 players who underwent the initial test obtained a minimum value of 0.35 seconds, a maximum value of 0.87 seconds, a range of 0.52 seconds, a standard deviation of 0.16740, a variance of 0.028, an average shooting speed of 0.4973 with a total time of 5.47 seconds.

Table 3.
Normality Test of Pretest Posttest Data of the Single Leg and Double Leg Hurdle Jumps Groups on Shooting Speed

Variable	Kolmogorov-Smirnova		
	Statistic	df	Sig.
Pre_Single_Leg_Hurdle_Jumps	0,150	11	.200*
Pre_Double_Leg_Hurdle_Jumps	0,188	11	.200*
Post_Single_Leg_Hurdle_Jumps	0,156	11	.200*
Post_Double_Leg_Hurdle_Jumps	0,265	11	.200*

Based on the posttest normality test of the single-leg hurdle jumps and double-leg hurdle jumps groups on the shooting speed of SMPN 3 Bontomarannu players, the following results were obtained:

Pretest data for the single leg hurdle jumps group with a df value of 11. Statistical value of 0.150 and a significance value of 0.200. A value of 0.200 indicates that the value

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is greater than alpha 0.05. This indicates that the posttest data for the single-leg hurdle jumps group is normally distributed.

Posttest data for the single leg hurdle jumps group with a df value of 11. Statistical value of 0.156 and a significance value of 0.200. A value of 0.200 indicates that the value is greater than alpha 0.05. This indicates that the posttest data for the double-leg hurdle jumps group is normally distributed.

Pretest data for the double leg hurdle jumps group with a df value of 11. Statistical value of 0.188 and a significance value of 0.200. The value of 0.200 indicates that the value is greater than alpha 0.05. This indicates that the pretest data of the double-leg hurdle jumps group is normally distributed.

Posttest data of the double leg hurdle jumps group with a df value of 11. The statistical value is 0.265 and the significance value is 0.200. The value of 0.200 indicates that the value is greater than alpha 0.05. This indicates that the posttest data of the double-leg hurdle jumps group is normally distributed.

Table 4

Homogeneity Test of Single Leg Hurdle Jumps and Double Leg Hurdle Jumps Groups Against Shooting Speed

Variable	Shooting Speed			
	Levene Statistic	df1	df2	Sig.
Single-Leg Hurdle Jumps	0.010	1	20	0.922
Double Leg Hurdle Jumps	0.002	1	20	0.967

Based on the homogeneity test above, the data obtained with a significance value of 0.922 and 0.967, the data is said to be homogeneous data. With the provision that the significance value is greater than 0.05. Between the single-leg hurdle jumps and double-leg hurdle jumps groups, the resulting values are homogeneous.

Table 5.

Paired Sample Statistical Test

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre_Single_Leg_Hurdle_Jumps	.5282	11	.15315	.04618
	Post_Single_Leg_Hurdle_Jumps	.5118	11	.14985	.04518
Pair 2	Pre_Double_Leg_Hurdle_Jumps	.5455	11	.17907	.05399
	Post_Double_Leg_Hurdle_Jumps	.4973	11	.16740	.05047

Based on the paired sample statistical test, the parameters of the shooting speed values between the single-leg hurdle jumps group and the double-leg hurdle jumps group were obtained as follows:

The pretest of the single leg hurdle jumps group with 11 players with a standard deviation of 0.15315 with an average error value tolerance of 0.04618 and an average value of 0.5282 while the Posttest of the single leg hurdle jumps group with 11 players with a standard deviation of 0.14985 with an average error value tolerance of 0.4518 and an average value of 0.5118

The pretest of the double leg hurdle jumps group with 11 players with a standard deviation of 0.17907 an average error value tolerance of 0.5399 and an average value of 0.5455 while in the posttest of the double leg hurdle jumps group with the same number

of players, 11 players with a standard deviation of 0.16740 with an average error tolerance of 0.05047 and an average value of 0.4973.

This proves that there is an increase in the average shooting of SMPN 3 Bontomarannu players in each group that have been given treatment during the study with the treatment given being single-leg hurdle jumps and double-leg hurdle jumps training. This study was attended by 22 players who were divided into 2 groups and were able to be followed from the beginning of the study to the end with the final results of the development of shooting speed as attached in the T-Test in the appendix of this study.

Furthermore, in the sample test, a comparison will be made of the effects produced between the single-leg hurdle jumps and double-leg hurdle jumps groups by looking at the results of the inferential test produced in SPSS 25.0. This paired sample test will provide evidence in the quantitative form in the form of data presentation in the form of numbers about the average increase, results of the increase and strength of influence from the initial test to the final test of players in shooting at SMPN 3 Bontomarannu, with details of the results of the sample t-test as follows.

Table 6.
Paired Sample Test

Paired Samples Test					
Kelompok	**Mean**	**Std. Deviation**	**T**	**df**	**Sig. (2-tailed)**
Pre_Single_Leg_Hurdle_Jumps - Post_Single_Leg_Hurdle_Jumps	0.01636	.01859	2.920	10	.015
Pre_Double_Leg_Hurdle_Jumps - Post_Double_Leg_Hurdle_Jumps	0.04818	.02857	5.593	10	.000

Based on the sample test, statistical data was obtained on the shooting speed by two groups between the single-leg hurdle jumps group and the double-leg hurdle jumps group with each detail:

Pretest and posttest of the single leg hurdle jumps group with a t table of 2.920 with an increase of 0.01636 from 11 samples with sig. (2-tailed) of 0.015.

Pretest and posttest of the double leg hurdle jumps group with a t table of 5.593 with an increase of 0.04818 from 11 samples with sig. (2-tailed) of 0.000.

With the results of the T-Test sample test above from the sig. Data. (tailed 2) then the data obtained that the significance level of 0.015 showed that there is a significant influence between single leg hurdle jump training and the significance level of 0.000 double leg hurdle jump training but the mean data shows that double leg hurdle jumps training has a greater increase of 0.048180 seconds compared to single leg hurdle jumps has a greater increase of 0.01636 seconds. Therefore, it can be ascertained that from the two forms of treatment given, double-leg hurdle jump training is better than single-leg hurdle jumps.

Discussion

In this discussion, the researcher will discuss and describe the results of the research on double-leg hurdle jumps group training and single-leg hurdle jumps group training. In addition, this chapter will also discuss the limitations of the research by

comparing the research process that has been passed with the ideal conditions that should be achieved. Based on the results of the paired sample t-test analysis conducted, there are significant differences in the two training methods applied. For single-leg hurdle jumps, a mean value of 0.0163 was obtained with a standard deviation of 0.01859 and a significance value (2-tailed) of 0.015 ($p < 0.05$), while for double-leg hurdle jumps, the mean value was 0.04818 with a standard deviation of 0.02857 and a significance value of 0.000 ($p < 0.05$). These results indicate that double-leg hurdle jumps training provides a more substantial increase than single-leg hurdle jumps in increasing the shooting speed of SMPN 3 Bontomarannu football players. This can be seen from the higher mean value in the double-leg hurdle jumps group (0.04818) compared to single-leg hurdle jumps (0.0163).

This finding is in line with research conducted by (Pangesty et al., 2025) which showed that double-leg hurdle hopping plyometric training significantly increased the leg muscle power of football players. This increase in leg muscle power contributes directly to increased shooting speed because kicking power is highly dependent on leg muscle strength. From a biomechanical perspective, double-leg hurdle jumps involve more complex and comprehensive muscle contractions in both legs simultaneously. This results in better inter-muscular coordination, as explained in the study (Putera Rustaman et al., 2024) which states that bilateral plyometric training is more effective in developing explosive power.

Meanwhile, although single-leg hurdle jumps also showed a significant increase ($p = 0.015$), their effectiveness was not as good as double-leg hurdle jumps. This can be explained through research (Ferdiansyah et al., 2024) which revealed that unilateral training is indeed effective in improving balance and individual leg strength, but is not optimal in developing the explosive power needed in shooting. The neural adaptation aspect that occurs during double-leg hurdle jump training also plays an important role in improving shooting performance. Research (Gozali et al., 2024) explains that bilateral training such as double leg hurdle jumps optimizes motor unit recruitment and better firing rate synchronization compared to unilateral training.

In terms of muscle metabolism, double-leg hurdle jumps activate a more intensive stretch-shortening cycle (SSC) mechanism. This study found that bilateral plyometric training resulted in more optimal metabolic adaptation in fast-twitch muscle fibres, which are very crucial in explosive movements such as shooting. The coordination factor is also an important consideration in the effectiveness of these two training methods and also revealed that double leg hurdle jumps training provides a better stimulus for the development of intermuscular and intramuscular coordination, which plays a vital role in shooting accuracy and speed.

Reviewed from the bioenergetics aspect, double-leg hurdle jumps optimize the ATP-PC system which is responsible for energy production for explosive movements. This shows that bilateral plyometric training is more effective in increasing the capacity of the phosphagen system than unilateral training. It also supports the superiority of double leg hurdle jumps training in terms of transfer of training to shooting movements. This bilateral training provides a specific adaptation that is more relevant to the biomechanical

characteristics of shooting in football. The aspects of core stability and body posture during shooting execution are also more facilitated through double leg hurdle jump training.

In terms of training periodization, double-leg hurdle jumps show a faster adaptation curve. Research confirms that athletes who undergo bilateral plyometric training programs reach peak performance faster than groups undergoing unilateral training. A comprehensive analysis of the research results supported by various previous studies leads to the conclusion that double leg hurdle jumps training has a more significant effect on increasing the shooting speed of SMPN 3 Bontomarannu football players. This is evidenced by the higher mean value and stronger significance value in the double leg hurdle jumps group, and is supported by various physiological, biomechanical, and methodological aspects that have been discussed comprehensively.

CONCLUSION

1. There is an effect of single-leg hurdle jump training on shooting speed
2. There is an effect of double leg hurdle jumps training on shooting speed
3. The difference in the effect of single leg hurdle jumps training is 0.01636 seconds and double leg hurdle jumps is 0.04818 seconds in increasing shooting speed

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