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COMPARISON OF INDEPENDENT SPIKE DRILLING TRAINING AND WITH A SETTER ON IMPROVING 3-METER SPIKES FOR VOLLEYBALL ATHLETES 17-19 YEARS OLD

Ikhsan Pascal Wicaksono[1*], Iman Sulaiman, Samsudin[2]
[12]Physical Education, Post Graduation, Universitas Negeri Jakarta
Jl. Velodrome No.2, RW.6, Rawamangun, Kec. Pulo Gadung, Kota Jakarta Timur, Daerah Khusus Ibukota Jakarta 13220
Correspondiing author. Email**:** pascaall95@gmail.com

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Abstract The purpose of this study was to determine the effect of two forms of training that is with the drilling spike method independently with gradual distance and drilling spike with setter with Spiker Specialization attribute variables on the ability to spike 3 meters. The method used in this research is an experiment with the treatment by level 2 x 2 design. This research was conducted within the scope of the DKI Jakarta Volleyball Pengprov with a population of XX PON Pelatda athletes in DKI Jakarta Province who experienced chronic ankle sprain totaling 76 athletes with a composition of 42 athletes in the position of Outside Hitter and 34 athletes in the position of Middle Block. The sample in this study amounted to 44 people with purposive proportional random sampling technique then divided into 4 groups. The instrument used to measure 3-meter spikes in this study is the Spike Skills Test instrument. Based on the results of data processing and analysis, it can be concluded that: (1) There is a difference between drilling spike training therapy independently with gradual distance and drilling spike with setter to increase 3-meter spike, (2) There is an interaction between training therapy and spiker specialization to increase 3-meter spike, (3) There is a difference between drilling spike training independently with gradual distance to increase 3-meter spike in the group of athletes who position as Outside Hitter, 3-meter spike improvement is higher if trained spike drilling independently, (4) There is a difference between independent spike drilling training with gradual distance on 3-meter spike improvement in the group of athletes positioned as Middle Blocker, 3-meter spike improvement is higher if trained spike drilling with a setter.

Keywords: Drilling Spike, 3-meter Spike, Spiker Specialization, Gradual Spacing, Paired

INTRODUCTION

In volleyball there are many ways to get points. From defending or thwarting the opponent's attack, the first hit or serve, the opponent's mistake, and even the attack itself. Attacks in volleyball are very varied, not only spike, serve can also be relied upon as an initial attack in volleyball. In volleyball games, especially in men today, quick attacks such as A-quick, B-quick, C-quick, and other quick attacks are considered very important, popular and most often trained because they are very helpful to outwit the opponent's block. Although the quick spike is often a reliable attack because it can outwit the opponent's blocker, it does not mean that other types of attacks cannot outwit the opponent's blocker during the match. Spike back attack or 3-meter spike for example, this attack is one of the effective attacks to outwit the opponent's blocker.

Spike back attack or 3 meter spike is an attack carried out by a player who is at the back. This spike is a type of attack that is rarely played during a match. Many things make us forget to realize that we also have to be good at this. Lack of priority in training sessions causes players to lack mastery, because many people still think that back position players are only tasked with defense. In fact, if it is used, it can increase the number of attacks which are usually only 3 attack points, to 4 or 5 attack points, in numbers it is clearly very profitable considering the number of opposing blockers is only 3. So that attack is quite effective with the aim of outwitting the opposing blocker.

According to a study analyzing the effectiveness of volleyball attacks in the 2019 Proliga Final Four Kediri Series, it was concluded that "This study states that the most effective attacks used in professional level volleyball players competing in the 2019 Proliga Final Four Kediri series are open spikes in the first place, back attacks or 3-meter spikes in the second place, quick in the third place, serve in the fourth place, and semi techniques in the fifth place." (Pratama et al., 2020). Not only in teams with a professional level, but there is also a study conducted by taking samples at the ASEAN SCHOOL GAMES Student Athlete Elite match showing that, "The most effective type of spike used to attack the Thai men's volleyball team is the back position spike." (Sulistiono, 2020).

It should be noted that the Thai men's team won the event. The results of quantitative research at the FIVB World Cup Finals in 2019 also stated that the back attack was the second most effective attack after the open spike attack. The study explained that open spikes produced 44 aces, 26 rallies, 18 failed. While the back attack itself produces 27 aces, 12 rallies, 6 failed. Then in third place there is a quick attack 23 Ace, 13 Rally, 2 Failed (Eko, 2021). This proves that the back attack spike or 3-meter spike is an effective attack for student athletes, seniors, and elite world athletes.

Why is this attack considered effective? Because in addition to being able to increase the number of attacks when attacking, the spike back attack is one of the attacks that is difficult for opponents to block. The difficulty of blocking this attack is because, in addition to aiming to attack directly, the spike3 meter is also useful for outwitting the opponent's blocker. The opposing blocker will be fooled because they are outnumbered by our team's attackers or the attack points are far more than the number of opposing blockers. That way the setter will be free to choose which attacker escapes the opponent's blocker, so that the hitter can more freely launch an attack. Another advantage is the position of the hitting point away from the net, this also makes it difficult for the opponent's blocker to block it.

So, the author thinks it is important for a team to take advantage of the spike back attack during the match. If all players can do spike back attacks, a person who is positioned as an opposite hitter, middle blocker, and outside hitter and often used to be an advantage of the team itself because every team attacks, the opponent will be overwhelmed to stem the attack because besides being difficult to stem, it is also difficult for the opponent to predict which spiker will attack because of the number of spikers who will attack and blockers who will stem the attack.

METHOD

Sugiyono (2012) stated that methodology is a scientific way to obtain data with objectives and provisions (Sugiyono, 2012).

This research is an experimental study that aims to compare two different treatments on research subjects.

The factorial design experiment method involves two or more independent variables, there is one or more manipulated variables (Emzir,

2015), which is a factorial experiment involving two factors. Each factor consists of two levels, using a pre-test and a post-test.

Sudjana (2002) Factorial experiment is an experiment in which almost or all levels of a factor are combined or crossed with all levels of each other factor in the experiment. The design in this research is pretest - posttest design. This research data is organized in a research design framework with a 2x2 factorial design.

Table 1. Research Design Framework

Variabel *Manipulatif* / Variabel *Atributif*	Metode Latihan *Drilling spike* mandiri dengan metode jarak bertahap (A_1)	Metode Latihan *Drilling spike* dengan *setter* (A2)
Outside Hitter (B_1)	A_1B_1	A_2B_1
Middle Blocker (B_2)	A_1B_2	A_2B_2

Description:

A1B1: Group of outside hitter athletes trained with independent spike drilling method with gradual distance method.

A2B1: Group of outside hitter athletes trained with spike drilling method with setter.

A1B2: The group of athletes in the middle blocker position is trained with the independent spike drilling method with the gradual distance method.

A2B2: The group of athletes in the middle blocker position is trained with the spike drilling method with a setter.

The division of experimental groups is based on the characteristics of spiker specialization in volleyball.

The population in this study amounted to 113 male volleyball athletes listed in the selection of the 2022 Junior National Championship in DKI Jakarta consisting of several clubs under PP. PBVSI DKI Jakarta.

The sample selection in this study used purposive proportional random sampling technique. Purposive sampling according to Sugiyono is a sampling technique with certain considerations (Sugiyono, 2012), namely the researcher has certain considerations to be sampled. The considerations are men who position as Outside Hitter and Middle Blocker, aged 17-19 years, and are willing to take part in treatment from start to finish so as

to get 76 athletes with a composition of 42 athletes positioned Outside Hitter and 34 athletes positioned Middle Block. To obtain the sample size, first take the sample size using the formula from Slovin (Sujarweni, 2014). The minimum sample size used with α = 0.1 and 10% confidence is 44. Of the 44 total samples used, they were divided into 2 groups of Outside Hitter and Middle Blocker based on the specialization of the attributive variables.

RESULT AND DISCUSSION

In this section there are several results that will be explained based on the research conducted in the form of: a. Research results data which includes pretest data and posttest data, b. Testing the normality of data and data homogeneity and, c. Testing the hypothesis in the study. Presentation of hypothesis testing as follows: (a) differences in the increase in 3-meter spikes between drilling spike training independently and drilling spikes with a setter; (b) The effect of interaction between drilling spike training and spiker specialization on increasing 3-meter spikes; (c) There are differences in increasing 3-meter spikes between drilling spike training independently and drilling spikes with a setter on athletes in the position of outside hitter spiker; and (d) Differences in increasing 3-meter spikes between drilling spike training independently and drilling spikes with a setter on middle blocker.

Before and after getting the treatment of players first pretest and posttest Spike 3 meters of volleyball presented in the table below. To clarify, it will be explained as follows:

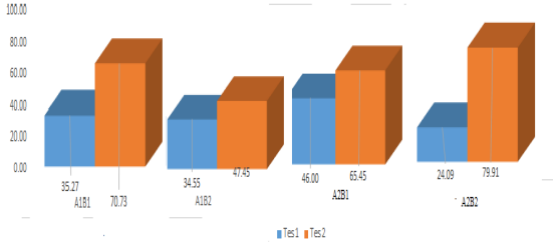

Figure 4 1: Diagram of Pretest and Posttest results of 3-meter spikes

Description:

A1B1: Group of outside hitter athletes trained with independent spike drilling method with gradual distance method.

A1B2: Group of athletes in the position of middle blocker trained with independent spike drilling method with gradual distance method.

A2B1: Group of athletes in the position of outside hitter trained with spike drilling method with setter.

A2B2: The group of athletes in the middle blocker position is trained with the spike drilling method with a setter.

Analysis of Variance Requirement Testing

Before testing the hypothesis using a two-way analysis of variance (Anava), the analysis requirements test was first carried out, namely (1) normality test; and (2) homogeneity test. The results are as follows:

1) Normality test

The normality test of the 3-meter spike score was calculated using Kolmogorov-Smirnov and SPSS 26 at a significant level α = 0.05. The summary of the research normality test results can be seen in the table below:

Table 2. Normality Test Results

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Standardized Residual for Hasil	.119	44	.127	.958	44	.108

a. Lilliefors Significance Correction

In the 2 table above, it can be seen that the normality test using Kolmogorov Smirnov obtained a statistical result of 0.119 and a sig. or p-value of 0.127> 0.05 and the results of the normality test using Shapiro-Wilk obtained a result of 0.958 and a sig. or p-value of 0.108> 0.05, so it can be concluded that all data groups in this study were taken from a normally distributed population so that they could be used for hypothesis testing.

2) Homogenity test

Another analysis requirement that needs to be done in this study is testing the homogeneity of variance. Variance homogeneity testing carried out in this study is testing the homogeneity of cell places in the research design, namely cell groups A1B1, A1B2, A2B1, A2B2.

The homogeneity test was conducted with SPSS 26. The basic decision making in the homogeneity test is as follows:

a. if the significance value or sig. <0.05, then it is said that the variants of two or more groups of population data are not the same (not homogeneous).
b. If the significance value or sig. >0.05, then it is said that the

variants of two or more groups of population data are the same (homogeneous).

Table 3. Results of Homogeneity Test of Variance of Research Design Groups

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Hasil tes spike 3 meter	Based on Mean	3.125	3	40	.036
	Based on Median	1.669	3	40	.189
	Based on Median and with adjusted df	1.669	3	30.108	.194
	Based on trimmed mean	3.003	3	40	.042

Based on table 3, the results of the homogeneity test based on the Levene's test obtained sig. or /p-value 0.194> 0.05. Thus it can be concluded that the data comes from a homogeneous variant.

1. Hypothesis Submission

Hypothesis testing using two-way Analysis of Variance (ANOVA). Furthermore, if there is an interaction between independent and paired training therapy on 3-meter spikes in volleyball athletes aged 17-19 years DKI Jakarta Province. The purpose of the two-way Analysis of Variance (ANOVA) is to determine how the influence of the independent variable on the experimental results and to determine the interaction effect of the treatment. Analysis of Variance (ANOVA) was conducted with SPSS 26. For more details, the results of hypothesis testing can be seen in the table below:

Table 4. Summary of Analysis of Variance (ANOVA) Calculation Results)

Tests of Between-Subjects Effects

Dependent Variable: Spike 3 meter

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	12059.636[a]	3	4019.879	90.031	.000
Intercept	42036.364	1	42036.364	941.464	.000
Drilling	1991.273	1	1991.273	44.597	.000
Spesialisasi	525.091	1	525.091	11.760	.001
Drilling * Spesialisasi	9543.273	1	9543.273	213.735	.000
Error	1786.000	40	44.650		
Total	55882.000	44			
Corrected Total	13845.636	43			

a. R Squared = .871 (Adjusted R Squared = .861)

1. **There is a difference in the 3 meter (Y) spike increase between the independent *drilling spike* (A1) and *the drilling spike* with *the setter* (A2)**

Based on the results obtained by the SPSS Tests of Between- Subjects Effects output in the Drilling column, the F value is 44.597, Sig. 0.000 <0.05, meaning that there is a difference in 3-meter spike results based on the type of drilling. Thus it can be concluded that there is a significant difference in the type of gradual independent drilling with a setter on increasing the 3-meter spike of DKI Jakarta athletes aged 17-19 years.

2. **There is an interaction effect between drilling spike training (A) and spiker specialization (B) on the improvement of 3-meter spikes.**

Based on the Drilling Spesialization column table, the value of F (AB) = 213.735 with a p-value/Sig. 0.000 <0.05, meaning that there is an

interaction. This means that there is an interaction between drilling spike training and spiker specialization on increasing the 3-meter spike of DKI Jakarta athletes aged 17-19 years. Based on the results of the analysis, the effect of drilling spike training and spiker specialization on increasing 3-meter spikes for DKI Jakarta athletes aged 17-19 years is 86.1%.

3. There is a difference in the improvement of 3-meter spikes (Y) between drilling spike training independently (A1) and drilling spikes with a setter (A2) on athletes in the position of outside hitter spiker (B1).

The results of the hypothesis test calculation of the simple effect test for B1 were carried out using the tukey test. The results can be seen in the table below:

Table 5. Hypothesis 3 Test Results

Multiple Comparisons

Dependent Variable: Spike 3 Meter
Tukey HSD

(I) Post Hoc	(J) Post Hoc	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
A1B1	A1B2	22.55*	2.849	.000	14.91	30.18
	A2B1	16.00*	2.849	.000	8.36	23.64
	A2B2	-20.36*	2.849	.000	-28.00	-12.73
A1B2	A1B1	-22.55*	2.849	.000	-30.18	-14.91
	A2B1	-6.55	2.849	.116	-14.18	1.09
	A2B2	-42.91*	2.849	.000	-50.55	-35.27
A2B1	A1B1	-16.00*	2.849	.000	-23.64	-8.36
	A1B2	6.55	2.849	.116	-1.09	14.18
	A2B2	-36.36*	2.849	.000	-44.00	-28.73
A2B2	A1B1	20.36*	2.849	.000	12.73	28.00
	A1B2	42.91*	2.849	.000	35.27	50.55
	A2B1	36.36*	2.849	.000	28.73	44.00

Based on observed means.
The error term is Mean Square(Error) = 44.650.
**. The mean difference is significant at the 0.05 level.*

Based on the spss output from the Analysis of Variance (ANOVA) further test results with the Tukey Test, the results show that there is a difference in the 3-meter spike of DKI Jakarta athletes aged 17-19 years (Y) between independent spike drilling (A1) and spike drilling with a setter (A2) in the group of athletes who have athletes in the position of outside hitter spiker (B1). Simple effect testing for B1: (A1B1-A2B1) has a sig value of 0.000 <0.05 so that H0 is rejected. This means that there is a difference in the average 3-meter spike (Y) of athletes who are drilling spikes independently (A1) and drilling spikes with a setter (A2) in the group of athletes positioned outside hitter spiker (B1). The average value of athletes who are drilling spikes independently is higher than the group drilling spikes with a setter in the group of athletes in the position of outside hitter spiker, the mean difference is 16.00.

4. There is a difference in the improvement of 3-meter spike (Y) between drilling spike training independently (A1) and drilling spike with setter (A2) in athletes with middle blocker position (B2).

The results of the hypothesis test calculation of the simple effect test for B1 were carried out using the tukey test.

The results can be seen in the table below:

Table 6. Hypothesis 4 Test Results

Multiple Comparisons

Dependent Variable: Spike 3 Meter
Tukey HSD

(I) Post Hoc	(J) Post Hoc	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
A1B1	A1B2	22.55*	2.849	.000	14.91	30.18
	A2B1	16.00*	2.849	.000	8.36	23.64
	A2B2	-20.36*	2.849	.000	-28.00	-12.73
A1B2	A1B1	-22.55*	2.849	.000	-30.18	-14.91
	A2B1	-6.55	2.849	.116	-14.18	1.09
	A2B2	-42.91*	2.849	.000	-50.55	-35.27
A2B1	A1B1	-16.00*	2.849	.000	-23.64	-8.36
	A1B2	6.55	2.849	.116	-1.09	14.18
	A2B2	-36.36*	2.849	.000	-44.00	-28.73
A2B2	A1B1	20.36*	2.849	.000	12.73	28.00
	A1B2	42.91*	2.849	.000	35.27	50.55
	A2B1	36.36*	2.849	.000	28.73	44.00

Based on observed means.
The error term is Mean Square(Error) = 44.650.
**. The mean difference is significant at the 0.05 level.*

Based on the spss output from the Analysis of Variance (ANOVA) further test results with the Tukey Test, the results show that there is a difference in the 3-meter spike of DKI Jakarta athletes aged 17-19 years (Y) between independent spike drilling (A1) and spike drilling with a setter (A2) in the group of athletes who have athletes in the position of middle blocker spiker (B2). Simple effect testing for B1: (A1B2-A2B2) has a sig value of 0.000 <0.05 so that H0 is rejected. This means that there is a difference in the average 3-meter spike (Y) of athletes who are drilling spikes independently (A1) and drilling spikes with a setter (A2) in the group of athletes in the position of middle blocker spiker (B2). The average value of athletes who are drilling spikes with a setter is higher than the group that is drilling spikes independently in the group of athletes in the middle blocker position, the mean difference is 43.00.

DISCUSSION

This study was designed to determine the increase in 3-meter Spike of DKI Jakarta Province Athletes aged 17-19 years using drilling training therapy independently, drilling with setter and spiker specialization as a moderator variable. After analyzing the data using a two-way ANOVA approach and continued with the Tukey Test using SPSS.26 there are four research hypotheses proposed.

The research findings as found in the previous section of this chapter are the results of statistical data analysis that need to be further examined to explain why the research hypothesis can be accepted, why there can be some significant interactions between Exercise therapy and spiker specialization, and so on.

1. **There is a difference in the improvement of 3-meter spikes (Y) between drilling spikes independently (A1) and drilling spikes with a setter (A2).**

Obtained the value of F = 44.597, Sig. 0.000 <0.05, meaning that the hypothesis is accepted. Thus it can be concluded that there is a significant difference in the type of gradual independent drilling with a setter on increasing the 3-meter spike of DKI Jakarta athletes aged 17-19 years. The results of testing the first hypothesis show that the overall average score of Spike 3 meters in the independent training therapy group is smaller than the training group with a setter of 24.18 < 37.63. In other words, the proposed research hypothesis is rejected. From the results of these observations, it can be stated that the form of independent training therapy is not more effective than the form of training therapy with a setter. This can be seen from the results of statistical analysis with a mean difference of 13.45. Thus it means that the 3-meter Spike using training with a setter provides a better effect than training independently.

Training is a way to improve the skills of a spiker in supporting his maximum performance. The importance of preparing a training program with the right volume, intensity and phase systematically supports the development of athletes towards peak performance. Basically, any type of exercise will have an impact on athletes, it's just that the coach needs to know what is essential for each athlete, because specialization makes the needs of each athlete different. Even so, these two types of training still provide an increase in the increase in 3-meter spikes.

2. There is an interaction effect between drilling spike training (A) and spiker specialization (B) on the improvement of 3-meter spikes

Based on the results of hypothesis testing between training independently and training with a setter, the value of F (AB) = 213.735 with a p-value / Sig. 0.000 <0.05, meaning that the hypothesis is accepted, which means that there is an interaction between training independently and training with a setter on increasing 3-meter spikes for DKI Jakarta athletes aged 17-19 years.

From the results of testing the second hypothesis, it proves that there is an interaction between training independently and training with a setter with spiker specialization in increasing the 3-meter spike of DKI Jakarta athletes aged 17-19 years or in other words, the research hypothesis proposed is proven correct.

Based on the explanation above, it can be concluded that by using the form of independent or paired training in each specialization to increase 3-meter spikes, it will still be able to improve 3-meter spike skills in DKI Jakarta volleyball athletes aged 17-19 years.

3. **There is a difference in the improvement of 3-meter spikes (Y) between drilling spike training independently (A1) and drilling spikes with a setter (A2) on athletes in the position of outside hitter spiker (B1).**

The results of the Analysis of Variance (ANOVA) further test with the Tukey test showed that Sig. 0,000 < 0,05. This means that there is a difference in the effect on increasing 3-meter spikes given independent training and with a setter with athletes in the position of outside hitter spiker, in other words, the proposed hypothesis is accepted. The mean value in the A1B1 group is 36.45 and the mean value in the A2B1 group is 19.45 or it can be written A1B1> A2B1. Based on the average difference, it can be concluded that DKI Jakarta athletes aged 17-19 years who are outside hitter spikers will be effective if trained with a form of training independently rather than with a form of training with a setter.

The results of testing the third hypothesis show that overall, the increase in 3-meter spikes in groups given an independent training form and a form with a setter in athletes in the position of outside hitter spiker is significantly different. From the results of these findings it can be argued that the form of training independently on athletes in the position of outside hitter spiker has a greater average than the 3-meter spike in the group given the form of training with a setter on athletes in the position of outside hitter spiker.

4. **There is a difference in the improvement of 3-meter spike (Y) between drilling spike training independently (A1) and drilling spike with setter (A2) in athletes with middle blocker position (B2).**

Based on the spss output from the Analysis of Variance (ANOVA) further test results with the Tukey Test, the results show that there is a difference in the 3-meter spike of DKI Jakarta athletes aged 17-19 years (Y) between independent spike drilling (A1) and spike drilling with a setter (A2) in the group of athletes who have athletes in the position of middle blocker spiker (B2). Simple effect testing for B1: (A1B2-A2B2) has a sig value of 0.000 <0.05 so that H0 is rejected. This means that there is a difference in the average 3-meter spike (Y) of athletes who are drilling

spikes independently (A1) and drilling spikes with a setter (A2) in the group of athletes in the position of middle blocker spiker (B2). The average value of athletes who are drilling spikes with a setter is higher than the group that is drilling spikes independently in the group of athletes in the middle blocker position, the mean difference is 43.00.

The results of the Analysis of Variance (ANOVA) further test with the Tukey test showed that Sig. 0,000 < 0,05. This means that there is a difference in the increase in 3-meter spikes given independent training and with a setter with athletes in the position of middle blocker spiker, in other words, the proposed hypothesis is accepted. The mean value in the A1B2 group is 12.9 and the mean value in the A2B2 group is 55.82 or it can be written A1B2 < A2B2. Based on the average difference, it can be concluded that DKI Jakarta athletes aged 17-19 years who are middle blockers will be effective if trained with a form of training with a setter rather than with a form of training independently.

The results of testing the fourth hypothesis show that overall, the increase in 3-meter spikes in groups given an independent training form and a form with a setter in athletes in the position of middle blocker is significantly different. From these findings it can be argued that the form of training with a setter on athletes in the position of middle blocker has a greater average than the 3-meter spike in the group given the form of training independently on athletes in the position of middle blocker.

CONCLUSIONS

Based on the results and discussion in the previous chapter, the conclusions in this study are as follows:

1. There are differences in the results of increasing 3-meter spikes owned by DKI Jakarta Volleyball Athletes aged 17-19 years who are trained using independent training drilling with gradual distance and drilling spike training with a setter.
2. There is an interaction between the form of training and the specialization of the spiker studied in DKI Jakarta Volleyball Athletes aged 17-19 years on the increase in 3-meter spikes. That is, training Outside Hitter or Middle Blocker with independent training with gradual distance and drilling

spike training with a setter will be able to increase the 3-meter spike owned by DKI Jakarta Volleyball Athletes aged 17-19 years.

3. There is a difference between training given independently (A1) and training with a setter (A2) on increasing 3-meter spikes (Y) in the group of athletes who position Outside Hitter, with higher 3-meter spike results if trained with independent training (A1).
4. There is a difference between training given independently (A1) and training with a setter (A2) on increasing 3-meter spikes (Y) in the group of athletes who are positioned Middle Blocker (B2). with higher 3-meter spike results if trained with training independently (A2).

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