The Effect of Fixed and Changing Distance Drilling Exercise Methods on Archery Accuracy

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ABSTRACT: This study aims to determine the effect of fixed distance drills and changing distances on archery accuracy. This type of research is experimental research with the design of "Two One Group Pretest Posttest Design." The population in this study was archery athletes, totaling 58 athletes. The sample was taken by random sampling, totaling 20 athletes. The instrument used in this study is the Archery Accuracy Test. The analysis of the data used a 5% significance test. Data analysis used a t-test with a significance level of 5%. The results showed (1) a significant effect of fixed distance drilling exercises on archery accuracy, with a t-count of 15,810 > t table 2,262 and a significance value of 0.000 < 0.05. The magnitude of the increase in archery accuracy after being given a fixed distance drilling exercise is 5.62%. (2) There is a significant effect of changing distance drilling exercises on archery accuracy, with t count 9.256 > t table 2.447 and a significance value of 0.000 < 0.05. The magnitude of the increase in archery accuracy after being given distance drilling exercises changed by 9.94%. (3) There is a significant difference between fixed and extensive distance drilling exercises on archery accuracy, with a t-count 5.723 > t table 2.101 and a significance value of 0.000 < 0.05. Changed distance drilling exercises are better than fixed distance drilling exercises in archery accuracy.

KEYWORDS: fixed distance drilling, changing distance drilling, archery accuracy.

INTRODUCTION

Archery is a combination of sport and art (Xue, 2022); (Li, 2018); (Lee, 2020). Archery is a sport because it uses components of the body from the hands, back, shoulders, and physical endurance. Archery is called art because it requires touch, the subtlety of soul feeling, patience, tenacity, and mental endurance (Verawati & Validanto, 2020). Archery aims to develop physical, spiritual, and social abilities and shape the character and personality of a dignified nation (Taha et al., 2018); (Artiuh et al., 2019).

Archery is a precision sport that requires consistency and stability of stable movements in order to hit the arrow accurately (Lo Presti et al., 2019); (Simsek et al., 2019); (Serrien et al., 2018); (Musa et al., 2019). Accuracy is the main thing in archery that must be mastered by athletes. If an archer does not have good shooting accuracy, athletes will find it difficult to win the competition. Athletes in archery are not required to have perfect technique. An archer is highly required to have good shot accuracy supported by archery techniques. If the technique is good and steady, it will make for a good shot (Prasetyo et al., 2022).

Achieving achievement in the sport of archery requires a special ability, both accuracy and coordination ability, as well as mental and excellent physical condition level (Suharta, 2019). In good physical condition, there must be steps that need to be taken, including training, improvement in the provision of infrastructure and facilities, problems with athletes and training, talent scouting, improving the quality of coaching, and so on. Exercise is defined as a process to systematically prepare the organism in athletes to obtain maximum performance quality by giving physical and mental loads on a regular, directed, graded, and repeated basis in time (Tryfidou et al., 2020). A good exercise is determined by a clear exercise program. The exercise program is a process of change for the better due to increased physical quality, the functional ability of the body components, and the psychological quality of the children being trained (Curran & Standage, 2017). The training method that will be applied is the fixed distance drill and changing distance.

The fixed distance drill method is a method that aims to improve technical skills (Pereira et al., 2017). In addition, the fixed distance drill method is included in closed motor learning, meaning that someone is doing something in a fixed environment, so that an athlete can control it and plan ahead. Easy to control and plan by the athlete himself. Blocked practice is a practice sequence where individuals repeatedly practice the same task (Raiola, 2017); (Nachmani et al., 2021).

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The variable distance drill method is for archery athletes with varying distances. That is, there are variations in training and setting the target distance that is not fixed. The implementation of the exercise with a random system is not sequential/regular in one training session, but rather emphasizes the variation of several target distances in the exercise. In randomized exercises, for example, the exercise sequences of a number of different tasks are mixed, or mixed, over the training period (Broadbent et al., 2019); (Beik & Fazeli, 2021). Random practice is defined as practicing tasks in a random order in such a way that each task is not practiced consecutively (Nachmani et al., 2021); (Krishnan et al., 2019); (Lelis-Torres et al., 2017); (Kim et al., 2018).

METHOD

This type of research is experimental. Experimental research is basically testing the relationship between the cause variable and the effect variable. The design used in this study is the "Two Groups Pretest-Posttest Design", which is a research design that includes a pretest before being given treatment and a posttest after being given treatment, thus it can be known more accurately, because it can be compared with what was held before being treated (Counsell & Cribbie, 2017). The population in this study was archery athletes, totaling 58 athletes. Sampling was done by random sampling, totaling 20 athletes. All samples were subjected to an archery accuracy pretest to determine the treatment group, ranked their pretest scores, then matched with the A-B-B-A pattern in two groups with ten athletes each. The sampling technique used was ordinal pairing. Ordinal pairing is dividing a group into two with the aim of having the same or equal ability (Mustofa et al., 2019). The sample was divided into two groups, Group A was given a fixed distance drilling exercise, and group B was given changing distance drilling exercise. The instrument used in this study namely the Archery Accuracy Test.
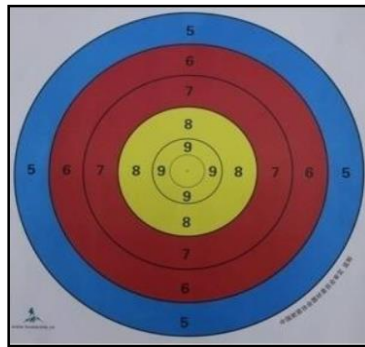
Figure 1. Archery Accuracy Test Target
(Source: Prasetyo et al., 2022**)**

The method of calculating archery accuracy is using an archer shooting 36 arrows from a distance of 30 meters. The total result is the sum of each arrow, called the total score, and the process is called the scoring (Yachsie, 2019). Validity uses content validity, and reliability with a retest test is 0.825.

RESULT

Table 1. Pretest and Posttest Data Archery Accuracy Drilling Fixed Distance

No Subject	Pretest Score	Posttest Score	The Number Difference
1	291	304	13
2	285	300	15
3	283	299	16
4	279	290	11
5	275	290	15
6	275	287	12
7	271	291	20
8	269	284	15
9	265	285	20
10	264	282	18

The statistical descriptions of the pretest and posttest of archery accuracy in fixed distance drilling exercises are presented in Table 2 as follows:

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Table 2. Descriptive Statistics of Pretest and Posttest Archery Accuracy Drilling Exercise Fixed Distance

Statistik	Pretest	Posttest
N	10	10
Mean	275,70	291,20
Median	275,00	290,00
Mode	275,00	290,00
Std. Deviation	8,84	7,44
Minimum	264,00	282,00
Maximum	291,00	304,00

Based on Table 2 above, it shows that the pretest accuracy of archery drills at a fixed distance on average is 275.70 and increases at the posttest by 291.20.

Table 3. Pretest and Posttest Data Archery Accuracy Drilling Practice Changed Distance

No Subject	Pretest Score	Posttest Score	The Number Difference
1	288	311	23
2	288	312	24
3	282	306	24
4	279	307	28
5	272	310	38
6	272	302	30
7	272	305	33
8	268	299	31
9	265	288	23
10	261	280	19

Descriptive statistics of pretest and posttest The accuracy of archery drills in distance drilling exercises changes completely is presented in Table 4 as follows:

Table 4. Descriptive Statistics Pretest and Posttest Archery Accuracy Drilling Practice Changed Distance

Statistik	Pretest	Posttest
N	10	10
Mean	274,70	302,00
Median	272,00	305,50
Mode	272,00	280,00a
Std. Deviation	9,27	10,46
Minimum	261,00	280,00
Maximum	288,00	312,00

Berdasarkan Tabel 4 di atas, menunjukkan bahwa pretest Akurasi memanah latihan drilling jarak berubah rata-rata sebesar 274,70 dan meningkat saat posttest sebesar 302,00.

Table 5. Normality Test Results

Group		p	Sig.	Description
Accuracy Fixed Distance Drilling Practice Group	Pretest	0,830	0,05	Normal
	Posttest	0,344	0,05	Normal
Accuracy Drilling Practice Group Changed Distance	Pretest	0,509	0,05	Normal
	Posttest	0,060	0,05	Normal

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Based on Table 4 above, it shows that the pretest accuracy of archery distance drilling exercises changed on average by 274.70, and increased during the posttest by 302.00.

Table 6. Homogeneity Test Results

Group	Sig.	Description
Pretest-Posttest Archery Accuracy Fixed Distance Drilling Practice Group	0,779	Homogeneous
Pretest-Posttest Archery Accuracy Drilling Practice Group Changed Distance	0,438	Homogeneous

Based on Table 6 above, it can be seen that the pretest-posttest data archery accuracy scores sig. p > 0.05, so the data is homogeneous.

Table 7. T-Test Pretest and Posttest Results of Archery Accuracy in Fixed Distance Drilling Practice Group

Archery accuracy	Average	t-count	t-table	sig	Precentage
Pretest	275,70	15,810	2,262	0,000	5,62%
Posttest	291,20				

Based on the results of the analysis in Table 7 above, can be seen that the t count is 15.810 and the t table (df 9) is 2.262 with a p significance value of 0.000. Because t count 15,810 > t table 2,262, and a significance value of 0.000 < 0.05, this result shows that there is a significant difference.

Table 8. T-Test Pretest and Posttest Results of Archery Accuracy in the Drilling Practice Group Changed Distance

Archery accuracy	Mean	t-count	t-table	sig	Precentage
Pretest	274,70	15,051	2,262	0,000	9,94%
Posttest	302,00				

Based on the results of the analysis in Table 8 above, can be seen that the t count is 15,051 and the t table (df 9) is 2,262 with a p significance value of 0.000. Because t count 15,051 > t table 2,262, and a significance value of 0.000 < 0.05, this result shows that there is a significant difference.

Table 9. T-Test Differences in Archery Accuracy Fixed Distance Drilling and Variable Distance Drilling

Group	Mean	t-count	t-table	sig
Fixed Distance Drilling Practice Group	5,62%	5,723	2,101	0,000
Accuracy Drilling Practice Group Changed Distance	9,94%			

Based on the analysis results in Table 9 above it can be seen that the t count is 5.723 and the t table (df 12) is 2.101 with a p significance value of 0.000. Because t arithmetic 5.723 > t table 2.101, and a significance value of 0.000 < 0.05, this result indicates a significant difference.

DISCUSSION

Effect of Fixed Distance Drilling on Archery Accuracy

Based on the results of the analysis showed that there was a significant effect of fixed distance drilling exercises on archery accuracy. The magnitude of the increase in archery accuracy after being given a fixed distance drilling exercise is 5.62%. The fixed distance drill method is a method that aims to improve technical skills. In addition, the fixed distance drill method is included in closed motor learning, meaning that someone is doing something in a fixed environment, so an athlete can control it and plan ahead. Easy to maintain and plan by the athlete himself (Mu'ammar, 2017). Blocked practice is a practice sequence where individuals repeatedly practice the same task (Schmidt, 2017); (Nachmani et al., 2021).

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The distance drill method remains a closed skill. Closed skills are when the supporter is either a surface, object, or other people displaying the skill in a stationary state. Closed skills are more accessible because they are influenced by individual abilities, so other factors outside motion do not affect them. So, the practice of the fixed distance drill method will be beneficial and it is hoped that the use of this method can increase the accuracy of efficient and perfect archery.

Effect of Drilling Practice Distance changes on Archery Accuracy

The analysis results show a significant effect of changing distance drilling exercises on archery accuracy. The magnitude of the increase in archery accuracy after being given distance drilling exercises changed by 9.94%. Random practice is defined as practicing tasks in a random order in such a way that each task is not practiced consecutively (Nachmani et al., 2021); (Krishnan et al., 2019); (Lelis-Torres et al., 2017); (Kim et al., 2018).

The variable distance drill method is for archery athletes with varying distances. That is, there are variations in training and setting the target distance that is not fixed. The implementation of the exercise with a random system is not sequential/regular in one training session but rather emphasizes the variation of several target distances in the exercise. In randomized exercises, for example, the exercise sequences of several different tasks are mixed, or mixed, over the training period (Broadbent et al., 2019). Paying attention to the characteristics of the varying target distance drill method also has advantages in increasing cognitive skills. In this case, the target distance drill method changes designed so that the athlete is able to carry out the tasks that have been given with the specified target. Athletes are expected to be able to measure and shoot as desired. The cognitive learning stage (cognitive stage) focuses on cognitive-oriented problems related to what to do and how to do it (Winne, 2017). This stage is known as the cognitive stage because conscious mental processes dominate the early stages of learning. In this stage, students are almost completely dependent on declarative memory, and information is consciously manipulated and trained in formulating motor commands.

The Difference between Fixed and Extensive Distance Drilling on Archery Accuracy

Based on the results of the analysis showed that there was a significant difference between fixed and extensive distance drilling exercises on archery accuracy. Changed distance drilling practice is better than fixed distance drilling exercise on archery accuracy. Several studies on the effect of the drill method were carried out by (Atmaja & Tomoliyus, 2015). This study aims to determine the difference in the effect of the constant bait drill training method and the variable bait drill training method. The results show that there is a difference in the effect of the constant bait drill method and the variable bait drill method. Furthermore, research conducted by (Mu'ammar, 2017) shows that there is a significant difference in influence between the drill method with constant target direction and variable target direction drill.

The drilling method is suitable for training, especially when practicing skills in a sport. Skills are given with the drill method because the same movement is done repeatedly, so an athlete will remember it in carrying out a movement (Mu'ammar, 2017). The advantage of the variable distance method is an opportunity to enrich the movement skills being trained. In this case, the drill's target distance changes, making a child display his best abilities and develop archery techniques to increase accuracy. In addition, the varying distance drill method requires athletes to be more skilled (Schmidt, 2017).

CONCLUSION

Based on the results of data analysis, description, testing of research results, and discussion, it can be concluded that: (1) There is a significant effect of fixed distance drilling exercises on archery accuracy, with t count 15,810 > t table 2,262, and a significance value of 0.000 < 0,05. The magnitude of the increase in archery accuracy after being given a fixed distance drilling exercise is 5.62%. (2) There is a significant effect of drill distance training on archery accuracy, with t-count 9.256 > t table 2.447, and a significance value of 0.000 < 0.05. The magnitude of the increase in archery accuracy after being given distance drilling exercises changed by 9.94%. (3) There is a significant difference between fixed and extensive distance drilling exercises on archery accuracy, with a t-count 5.723 > t table 2.101, and a significance value of 0.000 < 0.05. Changed distance drilling practice is better than fixed distance drilling exercise on archery accuracy.

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