

Drilling distance fixed vs changing: which exercise is better for accuracy archery? Distancia de perforación fija versus cambiante: ¿qué ejercicio es mejor para el tiro con arco de precisión?

*Betrix Teofa Perkasa Wibafied Billy Yachsie; **Doni Pranata, *Yudik Prasetyo, *Siis Suhasto, ***Putri Famelia, *Amri Hartanto
*Universitas Negeri Yogyakarta (Indonesia), **Universitas Tanjungpura (Indonesia), ***Hasselt University (Belgia)

Resumen. Los taladros de perforación fijos y cambiantes son ejercicios que rara vez se realizan por lo que existe un desconocimiento para conocer el uso y finalidad de los taladros de perforación a distancia fijos y cambiantes que aún no han sido comprobados mediante investigaciones científicas. El objetivo de esta investigación fue determinar el efecto del entrenamiento de ejercicios a distancia fija sobre el aumento de la precisión del tiro con arco en atletas de tiro con arco. Este tipo de investigación es una investigación experimental cuantitativa con un Diseño Pretest-Posttest de Dos Grupos. La población fue de 20 personas, tomadas mediante muestreo intencional: deportistas de tiro con arco masculinos con edades entre 15 y 20 años, antes de dividir la muestra se dividieron en dos mediante emparejamiento ordinal. El entrenamiento se llevó a cabo a lo largo de 18 encuentros con tiro con arco a distancias variables y fijas. Distancia del instrumento de tiro con arco 40 metros. La técnica de análisis de datos es la prueba t. Resultados de la investigación: 1) existe un efecto significativo del entrenamiento de ejercicios a distancia fija en el aumento de la precisión del tiro con arco de los atletas de tiro con arco, con un valor de p de $0,000 < 0,05$; 2) existe un efecto significativo de cambiar el entrenamiento de ejercicios a distancia en el aumento de la precisión del tiro con arco de los atletas de tiro con arco, con un valor de p de $0,000 < 0,05$; 3) existe una diferencia significativa entre los ejercicios de distancia fija y variable en la precisión del tiro con arco de los atletas de tiro con arco, con un valor de p de $0,000 < 0,05$. Conclusión. Los taladros de distancia fija y variable pueden mejorar la precisión del tiro con arco. El entrenamiento con perforación es aún más adecuado para atletas de tiro con arco principiantes y adolescentes, mientras que la perforación se ha vuelto más adecuada para un entorno adulto.

Palabras clave: perforación a distancia fija, perforación a distancia variable, precisión, tiro con arco.

Abstract. Fixed and changing drilling drills are exercises that are rarely carried out so there is a lack of knowledge to know the use and purpose of fixed and changing distance drilling drills that have not been proven by scientific research. The aim of this research was to determine the effect of fixed distance drilling training on increasing archery accuracy in archery athletes. This type of research is quantitative experimental research with a Two Groups Pretest-Posttest Design. The population was 20 people, taken by purposive sampling: male archery athletes aged 15-20 years, before dividing the sample they were divided into two using ordinal pairing. Training was carried out over 18 meetings with archery at varying and fixed distances. Archery instrument distance 40 Meters. The data analysis technique is the t-test. Research results: 1) there is a significant effect of fixed drilling training distance on increasing the archery accuracy of archery athletes, with a p-value of $0.000 < 0.05$; 2) there is a significant effect of changing drilling training distance on archery athletes' archery accuracy, with a p-value of $0.000 < 0.05$; 3) there is a significant difference between fixed and changing drilling training distances on archery athletes' archery accuracy, with a p-value of $0.000 < 0.05$. Conclusion. Fixed and variable distance drilling drills can improve archery accuracy. Fixed drilling drills are more suited to beginner/teen archery athletes while variable drilling is suited to an adult environment.

Keywords : fixed distance drilling, variable distance drilling, accuracy, archery.

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Betrix Teofa Perkasa Wibafied Billy Yachsie
betrixbilly@uny.ac.id

Introduction

Archery is a sport that uses accuracy supported by arm muscle endurance as the main element that every athlete must have (Yachsie, Suharjana, Graha, & Hartanto, 2023). Achievement in archery requires a special ability, both accuracy, coordination ability, and mental as well as excellent physical condition (Suhasto, Tomoliyus, Widiyanto, Yachsie, & Fimbriata, 2023). Training is defined as a process to systematically prepare the athlete's organism in order to obtain maximum quality performance by giving physical and mental loads on a regular, directed, graded and repeated basis in time. (Sabillah, Tomoliyus, Nasrulloh, & Yuniana, 2022). The training program is a process of change for the better, due to increased physical quality, functional abilities of the body components and psychological qualities of the children being trained so that the method to be applied is fixed and changing drilling, these two exercises are better done before 6 months of the core competition. Drill method is a method that aims to improve archery

techniques and skills (Low, Freeman, Butt, Stoker, & Maynard, 2023). Besides that, the (Heyworth, Edmonds, Murnaghan, & Kocher, 2014; Saing, Suharjana, Nasrulloh, Yachsie, & Arianto, 2022)fixed distance drill method is included in motor learning which is closed, meaning that someone does something with a fixed environment, so that an athlete can control it and plan ahead and is easily controlled and planned by the athlete himself. So, practicing the fixed distance drill method will be very useful and it is hoped that using this method can improve archery accuracy that is efficient and perfect. Meanwhile, the variable distance (de Dios-Álvarez, Castellano, Padrón-Cabo, & Rey, 2023)drill method is an archery athlete with varying distances. That is, there are variations in training and setting target distances that are not fixed or changing not sequentially/regularly in one practice session, but more emphasis on variations in several target distances in practice, for example the order of practicing a number of different tasks is mixed, or mixed, during training period. Random practice is defined as practicing tasks in random

order in such a way that each task is not practiced successively.

Accuracy is the main thing in archery that must be mastered by athletes (Dhawale, 2018; Susanto, Siswantoyo, Prasetyo, & Putranta, 2021; Yachsie, Suharjana, Wijaya, & Nasrulloh, 2022). If an archer does not have good shooting accuracy, athletes will find it difficult to win the competition (Prasetyo, Arjuna, & Rahayu, 2020; Serrien, Witterzeel, & Baeyens, 2018). Athletes in archery are not required to have perfect technique but an archer is required to have good shooting accuracy supported by archery techniques (Park, Tan, & Park, 2016). If the technique is good and precise, it will produce good shots and accuracy, of course it will be imagined that there is a target or point that must be aimed at or hit with a certain object. Accuracy is supported by the statement (Sezer, 2017) that a person's ability to control the free movement of a target. The target can be a distance or it may be an object. Accuracy in archery is the degree of proximity of the arrow to the "X" point on the target which is yellow (10 points) so that accuracy in archery can be achieved through continuous and systematic exercises, so that the goal can be achieved (Kuswahyudi et al., 2021).

This research was conducted at the Taurus Archery Banyumas Regency Club. Achievement that Taurus Archery got Clubs include at the 2018 Central Java Regional Sports Week, athletes from Taurus Archery The club won 4 gold, 1 silver and 4 bronze. At POPDA in 2019 athlete Taurus Archery Club won 2 silvers, POPDA in 2020 athlete Taurus Archery Club gains 1 gold. Based on the results of observations and data above Taurus Archery The club in October 2022 showed that archery accuracy was still low, this was shown by the data provided by the trainers that there were 32.00% very low category, 40.00% low category athletes, 12.00% moderate category athletes, and 16.00 % good category athletes. The training program provided by the trainer so far has mostly used the drilling method, but the training components such as sets, repetitions, recovery and intervals have not been considered. Examples of drilling exercises carried out during training are archery athletes with a distance that is not paid enough attention to and repetition in archery is also never noticed by the coach. In addition to the low accuracy of archery, some researchers also found common mistakes that archers often make regarding archery technique, namely: (1) the pulling elbow is too high above the arrow line, (2) the front and back shoulders are too high, (3) the hands or too many fingers on the bow, (4) chest swells, (5) bowstring touches the center of the chin, (6) body weight is placed on the heels, (7) there is no set up position, (8)

does not pull up to the holding position, (9) the bowstring touches the center of the chin during anchoring, (10) pulls continuously without reaching the holding position, (11) shoots too fast and loses connection with the back muscles (Haywood & Lewis, 2013; Samah, Shamsudin, & Darus, 2019; Simsek & Ertan, 2014; Tinazci, 2011; Vendrame et al., 2022; Vynogradskyi, 2020).

Achievement in archery requires a special ability, both accuracy, coordination ability, and mental as well as excellent physical condition. The drill method is good for training, especially when practicing skills in a sport. Skills are given by the drill method because the same movements are carried out repeatedly, so an athlete will remember when carrying out these movements (Rohadi, Sugiharto, Rahayu, & Mugiyo Hartono, 2021). The characteristic of archery is releasing arrows through a certain trajectory towards the target at a certain distance (Butnariu et al., 2018; Raphals, 2022). meaning that this archery sport requires consistent precision and stable movement stability so that arrows are hit accurately, so drill training is interpreted as very suitable to improve archery accuracy. if an archer does not have good shooting accuracy, then he will find it difficult to win the competition.

Method

Study participants

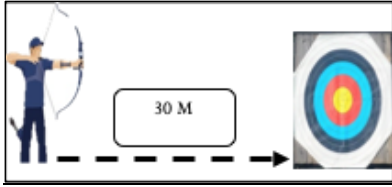
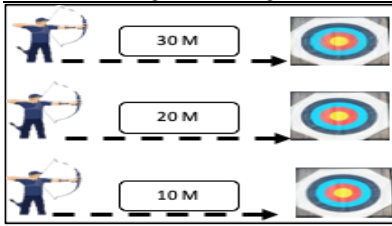
The population is archery athletes at Taurus Archery Clubs Banyumas Regency, totaling 20 people, male with an age range of 15-20 years. The sample then takes the pretest, is sorted based on the pretest score, then is paired with the A-B-B-A (Ordinal Pairing) pattern. It was found that ten athletes were trained using fixed distance drilling, and 10 athletes were given training using variable distance drilling. The division of the groups in this way will be more objective for all research subjects. It is based on equal chance for all objects to be included in each group.

Research design

This type of research is an experiment with the design used is "Two Groups Pretest-Posttest Design". The training was carried out for six weeks with 18 meetings. Exercise in progressive form, fixed distance training releasing arrows 72X a distance of 30 meters.

The form of distance training changes is to release arrows 72X over a distance of 10 meters, 20 meters and 30 meters. Repetition of archery in this exercise follows the rules in the word archery, namely 1 session containing 6x series in 1x series containing 6 arrows released. More details in table 1 below:

Table 1.
Distance Drilling Program fixed and changing

Week	Meeting	Training material	Dose Training
		1. Procedures and equipment	Coach guide
		a) Athlete guided for do dynamic static stretching.	Warm up / stretch for 5 minutes
		b) Equipment field: target shoot and meter, flag marker wind.	
		2. Warm-up	Warm-up/stretch for 5-10 minutes.
		a) Static, dynamic flexibility and experiments field.	2x series: 12 children arrow
		3. Drilling distance still	
			Rhythm medium. Distance 30 Meters. 65% intensity 12x Series. 12x Sessions, consisting from 1 session contains 6 children arrow. Recovery 45 minutes.
		4. Drilling distance changed	
1-6	1-18		Rhythm medium. Distance 10,20, & 30 Meters. 65% intensity 12x Series. 12x Sessions, consisting from 1 session contains 6 children arrow. Recovery 45 minutes.
		5. cooling down	cooling down / evaluate for 5-7 minutes

Note: Distance Drilling Program fixed and changing for 18 meetings with objective accuracy archery for athlete archery

Instruments

The instrument used is an archery test with a distance of 40 meters ring 6 (Yacshie, Prasetyo, & Arianto, 2022), the highest point is 10/x and the lowest is 5, this test aims to measure accuracy in archery. Archery accuracy is the way an archer shoots 36 arrows from a distance of 30 meters and the total result of each arrow is called the total score, and the process is called scoring (points). The total score is a maximum of 360 with content validity. validity 0.935, and Cronbach's reliability alpha of 0.825 (Yachsie, Suharjana, Graha, Prasetyo, et al., 2023).

Statistical analysis

The statistic used the t-test. There two t-tests, namely paired sample test and independent sample test with significance 0.05. The statistical analysis technique used the Statistical Packages for social Science (SPSS) version 21 software

Results

Results pretest and posttest arm Power stand muscle athlete archery after become given exercise free weights and gym machines are presented in Table 2.

Table 2.
Descriptive statistic pretest and archery accuracy posttest

No	Drilling changes (points)			Fixed Drilling (points)		
	Pretest	Posttest	difference	Pretest	Posttest	difference
1	290	303	13	287	308	21
2	283	302	19	288	311	23
3	280	297	17	286	310	24
4	277	290	13	269	298	29
5	270	283	13	281	302	21
6	266	280	14	284	306	22
7	270	285	15	268	301	33
8	267	280	13	273	300	27
9	260	275	15	280	302	22
10	261	274	13	273	298	25
Means	272.4	286.9	14.5	278.9	303.6	24,7

Note: The results of the provision of distance drilling exercises fixed and changing taken with pretest and posttest Where results matter totaled and summed with point unit

Based on Table 2 it can be seen that the average difference in archery accuracy for archery athletes is 14.5 and 24.7. The pretest in the distance drilling group changed by 272.4 and the Archery Accuracy Posttest increased after being given the drilling exercise changed by 286.9, while the pretest in the fixed drilling exercise group was 278.9, an increase during the posttest 303.6. Based on Table 2 the

average difference in archery accuracy for archery athletes is 14.5 and 24.7. The pretest in the distance drilling group changed by 272.4 and the Archery Accuracy Posttest increased after being given the drilling exercise changed by 286.9, while the pretest in the fixed drilling exercise group was 278.9, an increase during the posttest 303.6 accuracy archery increased by 24.7 % after being given exercises

remained for 18 treatments. Based on the results of the analysis in accuracy archery increased by 14.5 % after being given distance drilling exercises changed during the 18 treatments. The difference in archery accuracy of archery athletes after being given fixed distance drilling exercises and changing distance drilling is 16,700. This means that fixed distance drilling exercises are better than changing distance drilling exercises for archery accuracy of archery athletes.

Discussion

Discussion results study This give more interpretation carry on about results data analysis that has been put forward. Based on testing hypothesis produce two group conclusion analysis namely: (1) there is meaningful influence between factors main research; and (2) exists significant difference in effect between factors main. Discussion results analysis the can exposed more carry on as following.

The results showed that fixed and variable drilling exercises increased arm muscle endurance of archery athletes. The two groups both increased the results of archery accuracy which was marked by a result of $0.000 < 0.05$, meaning that the results of fixed and changing drilling exercises have been proven. Archery is a sport that requires a high level of consistency so that accuracy will increase as long as athletes are consistent in releasing arrows (Baifa, Xinglong, & Dongmei, 2023; Song, Kim, & Park, 2023; K. Wang, Li, Liu, Zhang, & Luo, 2023). Consistency is the ability to move at various levels of difficulty quickly and precisely and efficiently (Liu et al., 2023; Z. Wang, Liu, Yu, Wu, & Lyu, 2023). This means that the level of good or bad coordination of a person's movements is reflected in his ability to perform a movement skillfully, so an athlete with good coordination is not only able to perform a skill perfectly, but also easily and quickly perform skills that are new to him.

Based on hypothesis testing, it is known that there is a significant difference in effect between the fixed distance and variable distance drilling training methods on the archery accuracy of archery athletes. This is in line with research (Fenemor et al., 2023; Pramono, Rahayu, & Yudhistira, 2023) that drilling exercises are effective and appropriate exercises for archers, where archers perform maximum movements without making other movements so that the results obtained will be consistent with the drill training process. In line with the statement (Hulka, Strniste, Hruby, & Belka, 2023; IŞIK & ŞENEL, 2023) that drilling has advantages where the benefits are the same movement as the core movement of a branched physical activity in sports achievement.

drilling group was better than the changing distance drilling group . The results of the analysis show that there is a significant difference in the effect of athletes with fixed and changing distance training on archery accuracy, where archery athletes who are given fixed distance drilling treatment at the age of 18-20 years are better than athletes

who are the same age but are given changing distance drilling exercises. , with an average difference of 24.7 for fixed distances while for changing distances it is 14.5. The results of this study are supported by studies that show (Asadi, Shamsipour Dehkordi, & Entezari, 2023; Chen, 2023; Zhang, Feng, & Li, 2023) that there is a significant positive effect between fixed distance training and changing distance. So that means archery, an archer must be able to apply good and correct techniques, good and correct techniques will help increase the effectiveness and efficiency of energy use. In addition, applying good and correct techniques will make it easier to get consistent archery movements (Kim, Kim, & So, 2015). Consistency is important in archery so doing good and correct techniques consistently will produce good shots and prevent archers from being injured (Spratford & Campbell, 2017; Sushil, Chawla, Kumar, & Duggal, 2023). Drill method is carried out by archery at varying distances with a predetermined distance. That is, there are variations in training and setting target distances that are not fixed. Paying attention to the characteristics of the variable target distance drill training method also has advantages in terms of increasing cognitive skills (Hulka et al., 2023). The advantage of the variable distance method is that there is an opportunity for technical enrichment of the movement skills being trained . In this case , the target variable distance (Chathuranga, Thotawaththa, Gamlath, & Thotawaththa, 2023; Petiot, Vitulano, & Davids, 2023) drill is supported by the opinion that it makes a child show his best abilities and has technical development so that he can improve concentration and training goals. In addition, the opinion that the distance (Kahile, Acharekar, Deshmukh, Mendhe, & Dhawane, 2023) drilling method changes requires athletes to be more skilled, so that changing distance drilling exercises are more specifically for athletes at a young age where changing distances will be a challenge in itself to improve their motor components. However, if this changing distance drilling exercise is given to adult athletes, it will increase accuracy but not significantly. However, for drilling exercises , actually the component of arm muscle endurance also increases, but in this study, arm muscle endurance is used as a limitation to become a reference for future research.

Conclusion

Research results shows: 1) significant effect from distance drilling exercise still for increase accuracy archery athlete archery; 2) There is a significant effect from distance drilling exercise changed to enhancement accuracy archery; 3) There is a significant difference between distance drilling exercise fixed and changing, in accuracy archery athlete archery, with $p\text{-value } 0.000 \leq 0.05$. Drilling distance fixed and changing for 18 meetings can increase accuracy archery. Distance drilling exercise better and recommended For Pro athlete meanwhile distance drilling exercise changed recommended for athlete beginner so on the accuracy archery athlete archery will increase.

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Datos de los/as autores/as y traductores/as:

Betrix Teofa Perkasa Wibafied Billy Yachsie

Doni Pranata

Yudik Prasetyo

siis

Putri Famelia

amri

betrixbilly@uny.ac.id

doni.pranata@fkip.untan.ac.id

yudik@uny.ac.id

siisuhasto972@gmail.com

putriifameliaa@gmail.com

betrixbilly11@gmail.com

Autor/a

Autor- Traductor/a

Autor- Traductor/a

Autor- Traductor/a

Autor- Traductor/a

Autor- Traductor/a