The effect of circuit training on the archery accuracy of fikk uny archery athletes

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Abstract
This study aims to reveal the physiological demands on esports athletes when competing. To achieve The purpose of this study is to determine the effect of circuit training on the archery accuracy of SELABORA Archery FIKK UNY athletes. The type of research used in this study is experimental. The research design used in this study is a "one group pretest-posttest design". The subjects in this study are 11 SELABORA Archery FIKK UNY athletes. Data collection was carried out through archery accuracy tests before and after the training treatment. Data analysis techniques used a t-test with a significance level of 5%. Based on the results of the t-test, the calculated t-value was greater than the table t-value, indicating that the hypothesis was accepted. Therefore, it can be concluded that circuit training has an effect on the archery accuracy of SELABORA Archery FIK UNY athletes. Based on the results of the previous research and discussion, it can be concluded that the data analysis of archery accuracy above obtained a t-value (7.807) > t-table (2.28). Thus, it can be concluded that circuit training has an effect on the archery accuracy of SELABORA Archery FIKK UNY athletes.
Keywords: Circuit training, Archery Accuracy

INTRODUCTION

Many individuals are interested in various sports activities for hobbies, health, recreation, and even as part of their lifestyle. A popular example is archery. Archery attracts people of all ages, from children to teenagers to adults, because it is accessible to everyone. In addition, archery is one of the sports recommended by the Prophet, thus attracting many enthusiasts. In the past, archery was used as a hunting tool, but with the advancement of time, archery has become a competitive sport. This sport requires calmness, patience, high concentration, and a strong mentality.

In terms of characteristics, archery is an activity of releasing arrows through a certain path towards a target at a predetermined distance. When compared to other sports that involve fixed movements or closed skills such as shooting, the main difference between archery and shooting lies in the type of propulsive force used.

In archery, in addition to requiring good physical condition, an archer must also master the basic techniques of archery correctly in order to achieve maximum results. The following are nine basic

techniques for beginners in archery, according to Hadi & Faturrohman (2022), who explain that there are nine basic nine basic techniques that an archer needs to master, namely:

Stand (standing position), nocking (attaching the arrow), extend (raising the arms), drawing (pulling the bowstring), anchoring (determining the range point), tighten (maintaining the archery position), aiming (placing the target), release (releasing the string or arrow), and after hold (maintaining the position after releasing the arrow).

Based on its basic nature, archery consists of the activity of releasing an arrow toward a target at a certain distance. Unlike other sports that require static movements or closed skills, the main difference between archery and shooting lies in the category of the sport itself. Archery requires a combination of technical and physical training, both of which are very important in practice (Kurniawati & Subagio, 2022). In Indonesia, physical training for archers tends to be monotonous, with little innovation to support physical improvement, even though physical condition greatly affects an athlete's performance, including a lack of understanding of the impact of circuit training on archery accuracy. At SELABORA Archery FIK UNY, a muscle strengthening program using weights, both internal and external, has been implemented, but circuit training methods have not yet been applied, even though aerobic and anaerobic endurance are needed to improve performance in archery.

METHOD

This study is classified as a quasi-experimental study, in which the researcher does not have the freedom to manipulate the subjects, which means that random groups are often used as the basis for determining the treatment group and the control group. According to Setyo (1997: 36), experimental research is often recognized as the most scientific type of research compared to all other types of research because researchers have the ability to manipulate treatments that cause an effect.

The design applied in this study is the "One Groups Pretest-Posttest Design," which is a research design that involves a pretest before treatment and a posttest after treatment is given. In this way, the results can be determined more accurately, as it allows for comparisons to be made before the treatment takes place (Sugiyono, 2001: 64).

This research aims to evaluate the varying effects of circuit aerobics on the archery accuracy of SELABORA Archery FIKK UNY athletes. The researcher wanted to find out whether there would be an improvement in the posttest after receiving training or treatment after the pretest.

One Groups Pretest-Posttest Design Formula:

O1 X O2

Rumus Pre Experiment One Group Pre-Test-Post test Design

Explanation:
> O1: pre-test
> X: treatment
> O2: post-test

The first step in conducting this single-sample experiment design was to administer a test to the sample group that had not yet received treatment, known as the pre-test (O1), which included a 30-meter distance assessment and a beep test. After the total scores and times for the circuit training were determined, the treatment (X) was administered in the form of circuit training for two months or 24 sessions. After the athletes performed the aerobic circuit training, the test was repeated to evaluate the total score and the bow pulling test after the application of the experimental variable (X), called the post-test (O2), where the experimental data would show whether there was an improvement in the athletes' archery accuracy or no change at all. O1 and O2 were compared to determine how significant the differences were, if any, due to the experimental variable treatment. The data obtained was then processed using a t-test (Arikunto; 2002).

RESULTS AND DISCUSSION

Table 1. Archery Accuracy Data for SELABORA Archery Athletes, Faculty of Sports Science and Health, Yogyakarta State University.

Responden	Pretest	Posttest
1	280	306
2	266	295
3	298	310
4	274	308
5	284	311
6	306	320
7	315	327
8	265	289
9	310	325
10	315	329
11	250	289
Mean	**287,54**	**309,91**
Median	**284**	**310**
Mode	**315**	**289**
Std. Deviation	**22,57**	**14,50**

Based on the table, there was an increase in the archery accuracy of SELABORA Archery FIK UNY athletes after receiving treatment. The average score increased from 287.54 in the pretest to 309.91 in the posttest. The median also rose from 284 to 310, indicating an improvement in the performance of most athletes. In addition, the standard deviation decreased from 22.57 to 14.50, indicating that the athletes' shots in the posttest were more consistent. This shows that the training provided was effective in improving the athletes' archery accuracy.

Table 2. Normality Test.

Variabel		Z	p	Sig.	Keterangan
Archery Accuracy	Pretest	0,520	0,950	0,05	Normal
	Posttest	0,410	0,996	0,05	Normal

The table above shows that the significance value (p) of the variable is greater than 0.05, so the data is normally distributed. Because the data is normally distributed, the analysis can be continued with parametric statistical analysis.

Table 3. Homogeneity Test

Test	df	F tabel	F *hit*	P	Keterangan
Archery Accuracy	1:20	4,35	0,118	0,735	Homogen

Based on the results of the homogeneity test of archery accuracy data, the calculated F value (0.118) < F table (4.35), with the results obtained, it can be concluded that the variance is homogeneous.

Table 4. Hypothesis Test.

Pretest – posttest	Df	T tabel	T hitung	P	Sig 5 %
Archery Accuracy	10	2,28	7,807	0,000	0,05

Based on the analysis of archery accuracy data above, the calculated t-value (7.807) is greater than the table t-value (2.28), and the p-value (0.000) is less than 0.05. These results indicate that the calculated t-value is greater than the table t-value. Thus, it can be interpreted that circuit training has an effect on the archery accuracy of SELABORA Archery FIK UNY athletes.

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Archery is a sport that involves shooting arrows at a target as accurately as possible. In practice, this sport does not require complex movements. In fact, archery is an activity that is quite easy to achieve a high level of accuracy, and consistency in archery movements is very important. In archery, accuracy or precision is a vital element that an athlete must have in order to hit the target well when shooting.

The goal of each training session is to improve the athlete's skills and performance, and they are guided by a coach to achieve the final results of the training.

In addition to mastering the correct technique, each player also needs to be in good physical condition and have good biomotor components. If a person's physical condition and biomotor components are optimal, their archery skills will improve. Circuit training can improve archery accuracy. Research shows a significant increase in the accuracy of novice athletes' shots after participating in a circuit training program (Susanto et al., 2021). In addition, arm muscle endurance training also contributes significantly to improving archery accuracy (Yachsie et al., 2022). Circuit training involving arm muscle endurance exercises, such as push-ups and pull-ups, has shown a significant increase in arm muscle strength and endurance, which are important components in improving archery accuracy (Yachsie et al., 2024).

Circuit Training

Circuit training is an exercise system introduced by R.E. Morgan and G.T. Anderson in 1953 at the University of Leeds in England (Sharma et al., 2024). In the circuit training system, there are a number of stations or exercise posts that include movements such as push-ups, sit-ups, jumping jacks, burpees, planks, and others. Some people also do circuit training using hydraulic equipment, machines, and their own body weight, with a duration between stations of 15 seconds to 3 minutes to keep muscle performance optimal.

Circuit training is an exercise system that includes several activities performed in sequence with very short breaks between each session (Tereshchenko et al., 2021). This system is designed to strengthen muscles, increase endurance, and improve other physical abilities through the implementation of repetitive exercises in a predetermined sequence.

There are many benefits to circuit training; it is effective in increasing muscle strength, cardiovascular endurance, and anaerobic capacity (Sonchan et al., 2017; Hermassi et al., 2020). This program has also been successful in improving agility and overall physical performance (Bhat, 2017). This method is flexible and can be applied to various age groups and needs, including young soccer players and wheelchair athletes (Păun et al., 2022; Yulianto et al., 2021).

Griffin, John C. (2006:165) states that there are several types of aerobic exercise methods that can be done continuously, and interval methods are the two most commonly used training techniques. It may be more appropriate for your athletes to adopt circuit training, cross-training, fartlek, or simply being active. Circuit training generally consists of 10 to 15 different exercise stations with the circuit repeated two to three times.

In this exercise, circuit training involves archers combining bodyweight exercises and jogging. The exercise begins with a movement at the first station, namely jumping jacks, followed by jogging, then a movement at the second station, namely plank jacks, followed by jogging again. The entire sequence is counted as one circuit.

Archery Accuracy

In existing fields of knowledge, engineering, statistics, and the accuracy of a measurement system, accuracy refers to the extent to which quantitative measurements approximate actual values. Accuracy reflects how close arrows hit the center of the target. Arrows that stick closer to the center of the target are considered more accurate. The closer the measurement results are to the predetermined number, the higher the level of accuracy. When many arrows are released, precision shows the extent to which each arrow in the group is close to one another. If the distance between arrows is smaller, then the system is considered to be more precise.

CONCLUSION

Based on the results of the previous research and discussion, it can be concluded that the accuracy data analysis shows a calculated t-value (7.807) > table t-value (2.28). Thus, it can be

concluded that circuit training aerobic exercise has an effect on the archery accuracy of SELABORA Archery athletes at FIKK UNY.

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