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Mental Training to Improve the 40-Meter-Distance Archery Accuracy with Imagery and Meditation Methods

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Abstract Lack of concentration and accuracy can lead to less optimal shot results in archery sports. This study aimed to find the effect of imagery and meditation exercises on the accuracy of 40-meter-distance archery performed by archery athletes. This research was an experimental study with two groups of pretest-posttest designs. The sample included 24 athletes selected using purposive sampling, with the criteria included: being men, being active athletes, and doing routine training. The sample was divided into two groups through ordinal pairing. The first half went into an imagery group, and the other went into a meditation group. Both groups were given treatment in 10 meetings. The research instrument used involved an archery test scoring for a 40-meter distance. The collected data were tested for their normality using the Kolmogorov-Smirnov technique and homogeneity using the Levene statistic technique with a significant level of 5% ($p>0.05$). Meanwhile, the researcher applied the paired samples t-test for hypothesis testing. Conclusions. The study results showed (a) there was an influence of imagery training and meditation practice on improving the archery athletes' accuracy, (b) and there is a difference in the effects between imagery practice and meditation on improving archery accuracy, where imagery practice has a greater degree of improving archery accuracy in archery athletes than meditation practice.

Keywords Imagery, Meditation, Archery Accuracy, Archery

1. Introduction

Archery is an individual sport requiring a unified complexity of movement, stability, and high archery accuracy. Therefore, to achieve high achievements, archery athletes must be equipped with several mental elements [1]. The archery accuracy is critical because even if the physical and arm endurances are good, but the mentality is not, it will prevent from getting high points. After all, there is also a high possibility of the arrow missing [2]. From placing an arrow on the bow and aiming it at the target until it reaches the target, the athlete needs to ensure his focus [3]. Thus, it is concluded that archery is a sport that demands high concentration and stability, especially when aiming at targets, which requires physical and technical training and mental training. Mental training is a systematic, regular, and long-term exercise that aims to

make the athlete control his thoughts, emotions, and behavior better during the display of his sports performance [4], [5]. Mental training is carried out through several methods, goal-setting, physical relaxation, thought/attention control, imagery, and meditation [6].

Imagery is one method used in mental training, defined as a form of mental creation carried out consciously and intentionally and aims to form the perception of something by forming a creative image in a person's mind [7]. Through this creative mental process, a person can change his perception of something because it forms the image of something in various frames of perception or sees a particular state from different points of view [8], [9], [10]. Implementing imagery exercises in the field does not mean that these exercises can completely replace those real in physical demonstrations. However, both must be given in one unit, fill each other to optimize the athletes' achievements, or is an integrated program, as previously mentioned [11]. The study's results [12] have reported that when individuals engage in imagery, the brain interprets images identical to the actual stimulus situation. Imagery relies heavily on experiences stored in memory, and perpetrators experience them internally by reconstructing external events in their minds [13]. Imagery is an imitation movement carried out to perfect engineering abilities and done by remembering the entire technique [14]. According to [15] implementation of imagery is achieved by imagining that the athlete is at the firing line, closing their eyes, and then displaying 12 steps of technique without using tools. In line with [16] always being careful with fear will bring negative thoughts into the athlete's mind until it becomes stressful or leads to depression. This means that by trying to practice visualizing, athletes can relax and feel comfortable with themselves, which is expected to control themselves at the time or conditions of competition or when conditions are under pressure.

Meditation is a relaxation technique that regulates the breath, concentrating the mind and giving suggestions to be put into the mind. Meditation in psychology literature is an exercise to limit thought, attention, and consciousness [17]. In line with what is conveyed by [18], meditation is a process to achieve self-balance that eventually can reduce worries, fears, and anxiety. Meditation has steps in its implementation. They are breathing and sound and mind cultivation [19]. Meditation also has factors that influence its course, such as should be carried out in a closed room with a comfortable temperature. Another factor is the movements and postures that should be posed correctly so that the individual will feel the benefits of meditation. Lastly, it is suggested that the time for meditation is one hour a day [20]. Meditation is a soul-exercising exercise that can balance a person's physical, emotional, mental, and spiritual [21]. This means that meditation is a technique or practice method used to train attention to increase the level of consciousness, which further brings mental processes to be more consciously controlled.

Athletes' performance errors usually happen in a match or training situation because they should be the same in training or matches [22], [23]. Based on empirical facts and analysis results of the scoring results every month carried out in Banyumas Regency, the scoring results of POPDA match included for the 50 meters-distance, the average score was 298-303, for the 30 meters-distance, the average score was 300-332, and lastly, for 40 meters-distance, which was carried out in May 2022, the average score was 230-250. Because the last test had the lowest average score, the test was taken at a distance of 40 meters. Based on the results of observations and analysis from the results of scoring every month at a distance of 40 meters carried out in Banyumas Regency, it was found that there were students who mentally competed low, causing the score obtained to be relatively low. Some athletes also felt that the distance of 40 meters was difficult and it caused anxiety. The problem in this study is only limited to the psychological component that is dominant in archery so this research is more focused on imagery and meditation on the results of archery accuracy. The athletes who were mentally competing low felt that their techniques were correct. However, it turned out that the techniques carried out differed from what their trainer had taught, affecting the outcome of the arrows released. Therefore, the results were not maximal, as evidenced by failure to become winners and losing matches with opponents whose level of play was lower.

This imagery and meditation are two primary components, Because the components needed by archers to achieve good accuracy are not only archery training but require a good mentality of competing, and archery stability [24], [25]. Therefore, this study aimed to determine the effect of imagery and meditation exercises on archery accuracy and to find differences in the influence between imagery and meditation on the results of athlete archery accuracy at a 40-distance.

2. Materials and Methods

This research is experimental two groups research with treatment in groups carried out in Banyumas Regency. The research instrument was the archery test scoring at 40 meters distance with validity 0,895 > r tabel 0,344 and reliability 0,944 > 0,60 [26]. The treatment was given in June 2022, consisting of 10 meetings, and the imagery and meditation treatment was carried out for 15 minutes for each meeting, three times a week [24]. The population in this study included 26 archery athletes in Banyumas Regency. The sample of this study was 24 athletes selected using purposive sampling techniques, with criteria, being men and active athletes, routinely participating in training for regional competitions, not injured or in the care of doctors, and willing to be research material. The sample was given a pretest before doing the treatment and a posttest after the treatment. The researcher collected the data by conducting a test scoring at 40 meters distance

through two archery sessions. After the test was completed, the score results of the two sessions were summed up. After obtaining the pretest results, the sample was divided into two groups with ordinal pairing techniques. Group 1, which consisted of 12 athletes, was given the imagery training treatment, and group 2, which also consisted of 12 athletes, was given a meditation training treatment. After the treatment was given, the athlete did the post-test scoring. After the data were collected, prerequisite tests were carried out: normality tests using the Kolmogorov-Smirnov technique and homogeneity tests using the Levene statistic technique with a significant level of 5% ($p>0.05$). Furthermore, the hypothesis testing was carried out using paired samples t-test to determine the influence of imagery and meditation on the acquisition of archery accuracy.

3. Results

The hypothesis in this study is that (a), there is an influence of imagery training on increasing the archery accuracy of archery athletes (b) there is an influence of meditation training on improving archery accuracy of archery athletes, and (c) there is a difference in the influence between imagery and meditation training on archery results of archery athlete.

Table 1. Statistical Descriptive

	N	*Minimum*	*Maximum*	*Mean*	*Std. Deviation*
Pretest imagery	12	188	621	443.92	152.005
Posttest imagery	12	424	639	547.00	81.981
Pretest meditasi	12	242	552	419.58	112.642
Posttest meditasi	12	261	587	435.08	112.778

Table 2. Normality Test

Data		p	Sig.	Information
Imagery Exercises	pretest	0.834	0,05	Normal
	posttest	0.952	0,05	Normal
Exercise Meditation	pretest	0.552	0,05	Normal
	posttest	0.484	0,05	Normal

Table 3. Homogeneity Test

Data	Sig.	Information
Imagery exercises	0,962	Homogeneous
Exercise Meditation	0,624	Homogeneous

Table 4. Hypothesis Test 1

Paired Samples Test									
		Paired Differences					t	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pretest-Posttest	-3.71429	.75593	.28571	-4.41340	-3.01517	-13,000	11	.000

Table 5. Hypothesis Test 2

Paired Samples Test									
		Paired Differences					t	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 2	Pretest-Posttest	1.42855	1,27239	.48090	-2.60533	-.25175	-2.967	11	.002

Table 6. Hypothesis Test 3

	N	*Minimum*	*Maximum*	*Mean*	*Std. Deviation*
Imagery differences	12	14	-3.71429	.28571	.75593
The Difference in *Meditation*	12	1	1.42855	.48090	1,27239
Valid N (listwise)	12				

Based on the descriptive statistics above, the pretest values of the imagery exercise were at a minimum of 188, a maximum of 621, and a mean of 443.92, with a standard deviation of 152.005. The posttest values of the imagery exercise were at a minimum of 424, a maximum of 639, a mean of 547.00, and a standard deviation of 81.981. The pretest values of meditation practice were at a minimum of 242, a maximum of 552, a mean of 419.58, and a standard deviation of 112.642. The posttest scores of meditation practice were at a minimum of 261, a maximum of 587, a mean of 435.08, and a standard deviation of 112.778.

Based on the normality table above, the results show that the sig value was 0.05, the imagery pretest value was 0.834, the posttest imagery value was 0.952, the sig value was 0.05, the meditation pretest value was 0.552, and for the meditation posttest, the value was 0.484 ($p>0.05$).

From the homogeneity test table above, conducted using the Levene statistic technique, the imagery sig exercise value was 0.962, and the Exercise Meditation sig value was 0.624 ($p>0.05$). Then it can be concluded that all the data were homogeneous.

As seen from the paired samples test table above, when the sig (2-tailed) result was 0.00 0 ($p<0.05$), it can be concluded that there was an influence of imagery training on the results of archery accuracy over a distance of 40 meters.

Based on the paired samples test table above, the sig (2-tailed) result was 0.002 ($p<0.05$), so it can be concluded that there was an influence of meditation practice on the results of archery accuracy over a distance of 40 meters.

Based on the table in hypothesis test 3 above, the average value of the difference in imagery practice was 101.08, and the average value in meditation practice was 15.57. From this result, this can be concluded that imagery exercises have a more significant influence on the results of archery accuracy.

4. Discussion

The results of the total test scoring before and after the training indicated a significant increase in archery accuracy, despite the imagery exercises showing higher results. The meditation practice program also improved, even though it was less significant. These results meant that imagery exercises were more effective in improving archery accuracy. This simple exercise resulted in a high impact, characterized by increased self-confidence, which causes concentration to increase. The pretest and posttest average result of this test was 337-347.

The athletes who were given meditation training also showed an increase in pretest and posttest scores, with an average of 329-325. Based on research [27], imagery exercises can improve archery accuracy if carried out regularly. This means that imagery exercises are more effectively carried out by athletes who want to improve archery accuracy quickly. Meanwhile, meditation is intended for athletes with high anxiety. When they have high anxiety, it is more effective to be given meditation treatment.

Imagery exercises are exercises by imagining in the mind [28]. In the sport of archery, imagery is done by imagining the archery movements, from the technical movements to the release of the arrows [29]. Imagery in the sport of archery significantly impacts the performer/athlete to lower anxiety and increase self-confidence [30]. Imagery training is one of the most effective mental training methods for an athlete, including an archer who wants to master a complex skill in the sport he is engaged in [31]. The term imagery is visualization, and this mental training has been used measurably by researchers, sports psychologists, coaches, and athletes to describe powerful mental training techniques [32]. It can be concluded from the explanation that imagery exercise is an exercise that is focused on increasing concentration. Specifically, in archery, this exercise can improve techniques and archery. Programmed and monitored meditation exercises provide an increased effect on archery accuracy. However, when this training was given to professional athletes, who often participate in national/international championships, it felt to have no effect. It was because professional athletes have been trained to experience various competing situations that require them to coordinate between the heart, mind, and soul. So the meditation practice's effect is not too high compared to imagery practice [33]. However, this exercise is not suitable for novice athletes because this visualization exercise means that the athlete must actually experience the match conditions so that there is a recorded memory while doing this exercise. Meaning, that it does not rule out the possibility of this exercise being provided because it also has a vital role for archers and can support their mental component.

Meditation here is a mental training that empties the mind with a calm state and regulates breathing to feel comfortable and relaxed [34]. Meditation practice can be

done anytime and anywhere by doing it alone or accompanied by a coach [35], [36]. Meditation practice can also increase inner, mind, soul, and body calmness with the help of voices to increase calmness and loss of negative thoughts [37], [38]. The human brain produces four doses of wave frequency: beta, alpha, theta, and delta waves. When they are related to meditation, the result of the work of alpha waves is the gateway between the conscious brain and the subconscious brain that arise during the meditation and calm phases [39]. Meditation is also very effectively done with a guide so that the practice can be directed [40]. This means that in archery, meditation practice is often given to athletes who have high anxiety. There is a need for calmness training for those athletes. Therefore, the meditation practice must be more focused on junior athletes. So that in addition to physical training and techniques, a meditation practice for the mental component is also provided.

The archery accuracy in the 40-meter-distance competition is the most challenging distance in the standard bow division. This 40-meter distance is often contested in POPNAS, KEJURNAS, PON, PORDA, and PORPROV events (sports weeks at national, regional, and provincial levels). Archery accuracy requires consistency/precision when releasing [41]. Archery accuracy can be interpreted by releasing arrows with the correct technique and not missing the target [42], [43]. Imagery and meditation are programs to train the dominant psychology component in the movement of releasing arrows. This exercise is the most crucial component because if the athlete has high anxiety, then the release of arrows will be less stable and will not meet the target. Other factors that support the success of archery include quickly releasing arrows, seeing the situation, and being able to master emotions [44], [45]. This lack of confidence is interpreted when the archer releases the arrow. The results obtained are not optimal, and the release of the arrow feels long, actually when pulling and then removing the arrow, the archer/athlete only needs 4 seconds, but if the athlete releases it for more than that time, it can be interpreted that the athlete is experiencing anxiety so that accuracy decreases. Finally, it can be concluded that those two exercises can increase self-confidence, control anxiety, increase agility, and increase archery accuracy. This research has limitations, namely not being able to control probands activities every day because they are not collected in one place/training center and this research uses private funding sources.

5. Conclusions

Based on the results of the research and the results of data analysis it was concluded that there is an influence of imagery on increasing the accuracy of archery athletes. The imagery group was higher (good) than the meditation exercise in the accuracy results of the archery athletes, although the results of the meditation practice research showed that this increase in archery accuracy was less than optimal and considered less effective. This exercise can be given to beginner athletes so that it can improve calm and concentration. Meanwhile, imagery is more suitable for more professional athletes. It is highly recommended for elite athletes who are approaching a competition to practice imagery regularly to improve their concentration and accuracy.

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