

Walk back tuning and paper tuning: How do they improve archery accuracy?

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ABSTRACT

Limited knowledge to determine the use and purpose of the two tunings has not been proven by scientific research. Research to find precise tuning for standard bow, recurve, and compound rounds to improve archery accuracy. This type of research is quantitative experimental research with a two-group pretest posttest design. The sample consists of 24 athletes who are given treatment in 16 meetings. The instrument used is a test scoring archery at a distance of 40m. The collected data will be tested for normality using the Kolmogorov Smirnov technique and the homogeneity test using the Levene statistic technique with a significant level of 5% ($p > 0.05$). Hypothesis testing uses paired samples t-test technique. The results this study indicate (a) there is an effect of walk back tuning increasing archery accuracy of archery athletes, (b) there is an effect of paper tuning training increasing archery accuracy of archery athletes, (c) there is different effect between walk back tuning and paper tuning increasing archery accuracy of archery athletes, where walk back tuning exercises have a greater effect on increasing archery accuracy in archery athletes. This research is expected to be source of reference for athletes and coaches to explore the bow tuning method.

Keywords: Walk back tuning; paper tuning; archery accuracy

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INTRODUCTION

Sports with the characteristics of net game target games are sports that are in great demand by the general public to support fitness, health, or just having fun (Hallmann & Giel, 2018). One of the target sports is archery which is liked by various people which is considered a sunnah sport, with specifications for adults, children, and the elderly who like this sport and are originally regional in character, until now experiencing rapid development starting from being contested with competition rules (Satria, 2019; Putri, 2019; Asaribab & Siswantoyo, 2015). This branch has been existed in ancient times and for the first time in Indonesia it is introduced, namely in Yogyakarta which uses the target as a point count, the largest point is 10 and the lowest is 5, if the arrow goes out of the target it gets a miss point or 0 (Kolayis et al. 2014; Clemente, Couceiro, & Mendes 2016). This sport is a precision sport that requires smooth muscles (Saparuddin, 2019;

Leliavski et al., 2015; Taha et al., 2018). Since then the sport of archery began to develop until now, which can be grouped into individual sports that require complex movement in an integrated manner that requires stability and high archery accuracy (Kolayis et al., 2014). In line with what was conveyed Arisman (2018), accuracy or shooting arrows to the center point (X) is the essence of accuracy, generally what can affect accuracy is physical condition and perfect bow tuning. From some of the expert opinions above, it is concluded that in order to achieve maximum achievement in archery, it is based on good physical condition and maximizing bow tuning in order to increase archery accuracy.

Archery accuracy is very important even though physical endurance and endurance of the arm muscles, understanding technique, mentality or good tactics, will not realize high points if the arrow misses (Yachsie, 2019). From placing the arrow in the bow, aiming it at the target all the way to the target, the athlete needs to ensure that it is in focus (Prasetyo et al., 2018). Thus, it can be concluded that archery is an individual sport that requires archery accuracy so that arrows get perfect points. The tuning technique in archery that is rarely done by archers in Indonesia may be because they don't know how to do tuning or other obstacles (Haywood & Lewis, 2013). Two of them are called walk back tuning and paper tuning.

Walk back tuning when translated into Indonesian means walking backwards, the process used to change the left and right positions of the arc to the correct distance, this is the most accurate method of arc tuning (Zanevskyy et al., 2021). In line with research of Guo et al. (2015) This process shows the actual speed of the arrow. This method can also make it possible to correct poor arrow speed (Needham, 2012). According to the research of Ogasawara et al. (2021) where walk back tuning is a tuning method carried out by elite coaches in the sport of archery, this training method is carried out by walking backwards without changing the first sight/sight, which is 5 meters and continued to 20 meters, if this tuning method is successful then the arrows will align form the letter I. It can be concluded that the walk back tuning method is a tuning method by shooting at a certain distance at a certain point, then the archer retreats at a certain distance and then shoots at the same point.

While paper tuning is a way of tuning using paper tools to find out the results of the arrow speed, where the arrow speed can be said to be good or the output is smooth as seen from the results of the tear in the paper that the arrow passes through (Freeman, 2018). To do this tuning, you have to prepare a tool to put the paper in front of the bearing with a shooting distance of only 3-4 meters (Kim et al., 2021). Based on research of Baskoro and Prasetya (2018) in Indonesia paper tuning, not many coaches and athletes know this tuning method. However, this method is often used abroad because it is easy and the results are very precise. Most who often use this paper tuning method are compound athletes who want to know the speed of their arrows and the level of precision of their tools (Maguire et al., 2021; Guo et al., 2015). Meanwhile, according to Lu et al. (2021) this paper tuning is a tuning that is done by shooting at close range with a shooting target in the form of paper then seeing the impact of the arrow if the hit forms an X, it means that the tuning method is successful. It can be concluded that most trainers only do bow tuning by analyzing the impact and do not use this paper tuning method.

Based on the results of observations in Banyumas Regency which was carried out on October 15, 2020, most athletes only did feeling tuning, that is, by calculating the impact of the arrows that were released, then feeling tuning was carried out (Butnariu et al., 2018). This tuning feeling causes the arrow accuracy results to be unstable with the average total distance in the standard bow score division below the average, which is 789-800, even some trainers never know what the walk back tuning and paper tuning methods are. From the results of observations on October 17, 2020, archery athletes from Banyumas Regency in the Archery Field of the Satria Purwokerto sports building (GOR) still did not know how to do the walk back tuning and paper tuning methods. Actually this tuning is used to improve the quality of the shot or increase the accuracy of archery but it should be according to the specifications of the bow. Therefore, with this research, it is hoped that athletes and coaches will be able to find out how the tuning of their bows and arrows is, so that releasing arrows can get maximum results.

This research is specialized in the sport of archery and very few studies that examine the suitability of tuning in archery. Generally, previous studies only examined exercise programs to improve their physical condition (Decheline et al., 2020; Yachsie, 2019; Saparuddin, 2019), but from this research it was not with

the right bow tuning, therefore the accuracy of archery was obtained with the right tuning with the hope that the arrow hits the perfect point, which can be observed from the path of the arrow can be said to be good or escapes from the bow smoothly. Referring to the book [World Archery \(2020\)](#), this tuning method is very effective for increasing archery accuracy because in doing this tuning the athlete continues to practice and keeps his archery accuracy stable. Based on research of [Kolayis et al. \(2014\)](#) analyzing the impact of arrows can use the distribution of arrows targeted between the target zone and the number of errors by recording with a digital camera, then the data is evaluated after being transferred to digital media then analyzed for the difference in the number of arrows hitting the target and not approaching the midpoint by analyzing the distance from the target of the midpoint. In line with research of [Ergen et al. \(2021\)](#) a tuning method to improve accuracy is needed in order to maximize accuracy when releasing a shot as accurately as possible where the tool is set as best as possible so that the expected results are achieved in shooting and archery sports. It can be concluded that the walk back tuning and paper tuning methods are two different tuning methods in archery where the tuning has not been studied scientifically and has not been practiced regularly because the method is quite complicated.

Therefore, in this study, the formulation of the problem is obtained which reads: a) is there any effect of the walk back tuning method on the accuracy of archery; b) is there any effect of paper tuning on the accuracy of archery; c) is there any difference in the effect of the walk back tuning and paper tuning methods on the archery accuracy results for the standard bow division of archery athletes. This research is the latest research in Banyumas Regency, where this research examines bow tuning/settings that are previously very rarely studied. Because the components needed by archers to achieve good accuracy are not only field archery training and tactical, technical, physical, and mental training, but also require the right method of tuning / setting the bow, and archery stability / consistency. Based on this, the authors aim to find out empirical studies of walk back tuning and paper tuning on archery results and to find out the difference between walk back tuning and paper tuning on athletes' archery accuracy results at a distance of 40m.

METHOD

This type of research is experimental research. The main characteristic of experimental research is the provision of treatment or treatment in a group. The research instrument is the archery test scoring at a distance of 40 m ([Baskoro, 2016](#)). In this study, one group was given a walk back tuning treatment and the other was given a paper tuning treatment. The treatment was given as many as 16 meetings and carried out every 3 times a week ([Bompa & Buzzichelli, 2018](#)). The sample did a pretest before being given the activity and posttest after being given treatment.

The population in this research were archery athletes in Banyumas Regency as many as 26 athletes (2 female athletes). The sample of this study was 24 male athletes who were determined using purposive sampling with male gender criteria and willing to take part in research treatment from November-January with general period criteria. The grouping in this study was determined based on the results of the pretest score at a distance of 40 meters ([Asaribab & Siswantoyo, 2015](#)), so that they were divided into 2 groups, namely the walk back tuning group and the paper tuning group which were then treated. The method of collecting data was by doing a test scoring at a distance of 40 m with two sessions of archery, then after the test was complete the results of the scores of the two sessions are grouped, then analyzed using SPSS.

After doing the pretest, the sample was then divided into two groups consisting of the first group, 12 athletes being treated with walk back tuning exercises and the second group, 12 athletes being given paper tuning exercises. After the treatment was given, the athlete did a posttest scoring. After the data was collected, a prerequisite test was carried out, namely the normality test using the Kolmogorov Smirnov technique and the homogeneity test using the Levene statistic technique with a significant level of 5% ($p > 0.05$). Next, a hypothesis test will be conducted using paired samples t-test to determine the effect of walk back tuning and paper tuning on the accuracy of archery. The hypotheses in this study are: a) there is an effect of walk back tuning exercise on increasing archery accuracy of archery athletes; b) there is an effect of paper tuning exercises on increasing archery accuracy of archery athletes; c) there is a difference in

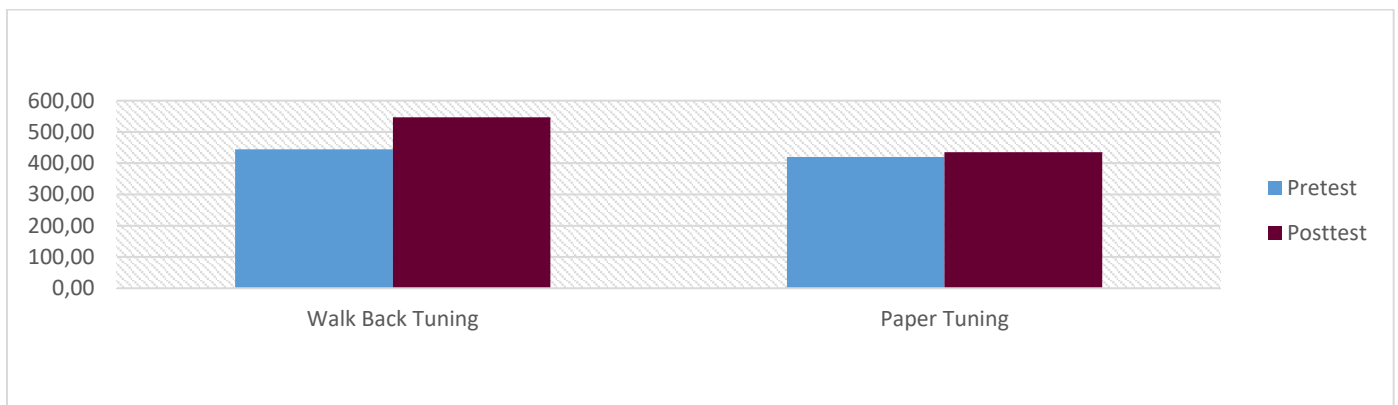
the effect between the treatment of walk back tuning and paper tuning on the archery athlete's archery results.

RESULTS AND DISCUSSION

Table 1. Statistic Descriptive

	N	Minimum	Maximum	Mean	Std. Deviation
Pretest Walk Back Tuning	12	188	621	443.92	152.005
Posttest Walk Back Tuning	12	424	639	547.00	81.981
Pretest Paper Tuning	12	242	552	419.58	112.642
Posttest Paper Tuning	12	261	587	435.08	112.778

If it is performed in diagram form, so the data pretest and posttest are served on Graph 1 as following:



Graph 1. Statistic Descriptive

Based on the graph of descriptive statistics above, score of pretest from exercise of walk back tuning is minimum 188, maximum 621, mean 443,92, and standar deviation 152,005. Score of posttest from exercise of walk back tuning that is minimum 424, maximum 639, mean 547.00, and standar deviation 81.981. Score of pretest from exercise of paper tuning that is minimum 242, maximum 552, mean 419.58, and standar deviation 112.642. Score of posttest from exercise of paper tuning that is minimum 261, maximum 587, mean 435.08, and standar deviation 112.778.

Table 2. Normality Test

	Kolmogorov-Smirnov ^a		
	Statistic	Df	Sig.
Pretest Walk Back Tuning	.186	12	.200*
Posttest Walk Back Tuning	.204	12	.179
Pretest Paper Tuning	.149	12	.200*
Posttest Paper Tuning	.181	12	.200*

Based on table of the normality test above, it uses technique of kolmogorov smirnov, obtained the result that is score of sig. amount 0,200 for pretest walk back tuning, 0,179 for posttest walk back tuning, 0,200 for pretest paper tuning, and 0,200 for posttest paper tuning ($p > 0,05$). Therefore it can be concluded if all data distribute normally.

Table 3. Homogeneity Test

Test of Homogeneity of Variances			
Nilai	df1	df2	Sig.
Levene Statistic			
1.329	3	44	.277

Based on the homogeneity test table above it is using the Levene statistic technique. The results obtains sig value 0.277 ($p > 0.05$). Therefore, it can be concluded that all data are homogeneous.

Table 4. Hypothesis Test 1

		Paired Samples Test					t	df	Sig. (2-tailed)
		Paired Differences		95% Confidence Interval of the Difference					
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	Pretest-Posttest	-103.083	113.810	32.854	-175.395	-30.772	-3.138	11	.009

Based on the paired samples test table above, the results obtained are sig. (2-tailed) of 0.009 ($p < 0.05$), it can be concluded that there is an effect of the walk back tuning exercise on the accuracy of archery at a distance of 40 m.

Table 5. Hypothesis Test 2

		Paired Samples Test					t	df	Sig. (2-tailed)
		Paired Differences		95% Confidence Interval of the Difference					
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 2	Pretest-Posttest	-15.500	12.810	3.698	-23.639	-7.361	-4.192	11	.002

Based on the paired samples test table above, the results of the sig (2-tailed) of 0.002 ($p < 0.05$) can be concluded, so it can be concluded that there is an effect of paper tuning exercises on the accuracy of shooting at a distance of 40 m.

Table 6. Hypothesis Test 3

	N	Minimum	Maximum	Mean	Std. Deviation
Difference in walk back tuning	12	14	337	103.08	113.810
Difference in paper tuning	12	1	35	15.50	12.810
Valid N (listwise)	12				

Based on the table in hypothesis testing 3 above, the average value of the difference in walk back tuning exercises is 103.08 and the average value of the difference in paper tuning exercises is 15.50. It can be concluded that the walk back tuning exercise has a greater influence on the accuracy of archery. This research is a study to find the accuracy of tuning for standard bow, recurve, and compound rounds in order to improve archery accuracy. From this study, it is found that there was an increase in archery accuracy from the total test scoring results before being given training and after being given the method got significant results which made archery accuracy increased, but from the results of this study the walk back tuning exercise was higher and the archery accuracy level was higher. The walk back tuning method was a simple method, easy to understand and does not require media to be made, only with pads and a target for the shot you could do this tuning method (Ganter et al., 2010). It could be concluded that the walk back tuning method was a simple method but can affect the arrow speed. Supported by research (Humaid, 2014; Haywood & Lewis, 2013), walk back tuning is very influential for the arrow rate in athletes, with this method the athlete will get a more stable arrow rate so that the arrow accuracy level will increase. In line with research of Ganter et al., (2010), the experimental group obtains a pretest with a mean of 291 posttest a mean of 306.8 so that it experiences an increase from pretest to posttest with an average of 15.8. For the control group, the pretest mean of 295.5, posttest 294.8, decreases with an average of 0.7. Then the t test (t-test) is carried out and gets the result that $t_{count} > t_{table} = 2.17 > 2.10$ with a significance level of 0.05%. Thus, the hypothesis (H_0) is that there is an effect of the walk back tuning method on the archery accuracy

of the Archery Selabora athletes of FIK UNY. From some of the research above and the results of the study, it can be concluded that the walk back tuning method is more suitable to be given to the standard bow and recurve division, because the bows are almost similar and the technique used is also supported by additional tools, namely buttons to run and to hit children steady arrow.

Based on the research above, this tuning results in increased archery accuracy but the increase in archery results is not better than walk back tuning because actually paper tuning is more suitable for compound bows but there are still some trainers who think this tuning can be given in all divisions. Based on research of [Maguire et al. \(2021\)](#) this tuning is a tuning that is better done by archers during training to learn more about mastering accuracy, but this tuning method is more suitable for athletes who specialize in archery in the compound division. In line with research of [Freeman \(2018\)](#), because technical practice alone without proper tuning in the branch of archery also cannot affect the accuracy of the archery. Therefore, the paper tuning method is considered very effective to improve archery accuracy with the right bow criteria. With this precise arc tuning will affect the level of accuracy ([Kolayis et al., 2014](#); [Arisman et al., 2021](#)). Based on the research of [Baskoro and Prasetya \(2018\)](#), got the result that paper tuning can improve archery accuracy, but this tuning is maximized if it is given to the compound division by analyzing the torn results on the paper that the arrow passes through. Most of those who often use this paper tuning method are to determine the speed of the arrows and the level of precision of their tools. From the results of previous studies above, it can be concluded that this tuning method is more suitable for the compound division, because one of the most important bow settings in the compound division is the arrow throwing this division is very fast and if you use walk back tuning it will not be suitable because it is confirmed that the arrow will go straight to form the letter I, so a more accurate bow tuning is needed, namely using paper tuning, taking into account the tear in the arrow hit.

Because the accuracy of archery in this archery sport requires consistency / constancy when releasing arrows ([Susanto, 2015](#)), by giving the walk back tuning and paper tuning method it causes stability when releasing arrows ([Ergen et al., 2021](#)). Walk back tuning and paper tuning are tuning methods that have an effect on archery, this method uses the muscles to be directly involved when releasing arrows, is considered very effective, because the muscle movements performed are the same as archery movements ([Kolayis et al., 2014](#)). This archery sport accuracy is an important component for athletes to be right on target ([Putranto et al., 2018](#); [Serrien et al., 2018](#)). In tune with [Manazi \(2013\)](#) archery accuracy is an activity using a bow and arrow, to aim at an object so that it sticks to the target point. This archery is carried out in an open place and safe from interference, because sharp arrows, such as being hit by a living object, can be dangerous ([Verawati & Valianto, 2020](#)). Similar to [Devoe et al. \(2019\)](#) stated that athletes are also required to be vigilant if at any time someone passes behind the bearing/target, the athlete must be able to increase his accuracy so as not to miss when the arrow is released. Because if a loose arrow hits it can cause injury and even death ([Rubin, 2018](#)). Therefore, archery accuracy is needed not only to get the highest score, but to keep the match area or practice area safe and under control. Based on research of [Ertan et al. \(2021\)](#), archery at a distance of 40 meters is an intermediate part between 30 and 50 meters. This 40 meter distance is the most difficult distance in the standard bow round due to the distance that requires the left hand to be stable parallel to the body ([Basuki, 2019](#)). PERPANI's official competition rules are the 40 meter distance, which is the distance used for individual and team competitions in the standard bow round ([Yachsie et al., 2021](#)). Therefore, the researchers used a distance of 40 meters as a test tool to measure archery accuracy and improve technique when releasing arrows.

An archery athlete must have a consistent technique of releasing arrows, because it can support achievement. Based on research of [Baskoro \(2016\)](#) in mastering perfect technique will appear constancy. In the sport of archery, correct and consistent archery techniques are needed from the techniques that have been mastered ([Humaid, 2014](#)). In line with research of [Kolayis et al. \(2014\)](#) ensure and master the nine basic archery techniques, namely: standing, nocking arrow, drawing, setting up, anchoring, holding, aiming, release, and following through. The nine techniques in archery are indeed very important but other components of archery must also be mastered, according to [Ahmad et al. \(2014\)](#) archers must be stable/steady and required to understand the biomechanical parameters such as muscle activity, heart rate,

balance, and body posture as well as the draw force line that is chosen as an important parameter for athlete performance. Other factors that support the success of archery include being able to quickly release arrows, being able to see the situation, and being able to control emotions (Samah et al., 2019). Based on research of Spratford and Campbell (2017) because if an athlete delays releasing an arrow, the results of his shooting accuracy will also be imperfect because the bow is quite heavy and the time of the match is long, causing the athlete to be required to release one bow for only 3-4 seconds when releasing this arrow from holding to release.

CONCLUSION

Based on the results of the study and the results of data analysis, it is concluded that there is an effect of walk back tuning on increasing archery accuracy of archery athletes. The walk back tuning group is higher (good) than the paper tuning exercise on archery athlete accuracy results, although the results of the paper tuning exercise research shows an increase in the results of this archery accuracy being less than optimal and deemed less effective because of the tuning of the tool and the impact is less stable if given in the standard bow and recurve divisions.

It is highly recommended for the ricurve and standard bow divisions to use this walk back tuning because the walk back tuning is considered very suitable for rounds with these bow specifications, which means that this exercise causes conditions where the accuracy of shooting when given the tuning increases. While the paper tuning method is considered very effective for the compound division because of the specifications of the bow and the ejection power of the bow is faster than the recurve and standard bow. This activity can be used as the basis for further research, especially in archery in order to improve Indonesian archery performance and increase the attractiveness of archery.

This study has limitations, namely the implementation is carried out during the COVID-19 pandemic so that during training or application of treatment all groups are not collected or quarantined, which means that there is no control over what activities the sample does outside of training, but rather stay in their respective homes. Indirectly this can affect the results of the study.

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CONFLICT OF INTEREST

The authors declared no conflicts of interest in preparing this article. The result of this study was not affected by any parties or sponsors.

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