

Effect of Dumbbell Thera Band Exercise and Bow Training on the Archery Accuracy

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Abstract

*This study aims to determine the effect of dumbbell thera band and bow training on accuracy of archery athletes. This research is an experiment with a two groups pretest posttest design. The sample consisted of 24 athletes who were given treatment for 16 meetings. The instrument used the archery scoring test at a distance of 40m. The test for normality was done using skolmogorov smirnov and the homogeneity test with levene test at the significance level of 5% ($p > 0.05$). Hypothesis testing was performed using paired samples *t*-test. The results indicated that (a) there is an effect of dumbbell thera band exercise on the accuracy of archery athletes, (b) there is an effect of bow training on the accuracy of archery athletes, and (c) there is a difference in the influence between the exercises dumbbell thera band and bow training in increasing the accuracy of archery athletes, where dumbbell thera band exercise has a greater effect in improving archery accuracy.*

Keywords

Dumbbell thera; band exercise; bow training; archery accuracy



I. Introduction

The sport of archery was originally characterized by regionalism, but is now experiencing rapid development, starting from being contested with competition rules (Asaribab & Siswantoyo, 2015). Sports and Health Physical Education (Penjasorkes) is a means of encouraging the development of motor skills, physical abilities, knowledge, sportsmanship, habituation of healthy lifestyles and character building (mental, emotional, spiritual and social) in order to achieve the goals of the national education system (Birri, 2020). Physical education, sport and health are one of the main subjects that must be taught in schools, ranging from elementary school through high school (Novianti, 2020). Sports and Health Physical Education (PJOK) in Indonesia has had to change the paradigm of its fullness (Rahmansyah, 2021). In Indonesia, it was first introduced in Yogyakarta (prasetyo, 2013). This sport is a precision exercise that requires smooth muscles (Saparuddin, 2019). Since then the sport of archery has begun to develop (Susandi & Wikananda, 2018). Archery is an individual sport that requires an integrated complexity of movement which requires high stability and accuracy. In line with what was conveyed (Arisman, 2018), archery accuracy consist of firing an arrow at the center point or the result of a shot from the archer to point X. Basically an athlete must be equipped with several elements in order to reach high achievements. These elements are, psychological, tactical, technical, physical, trainer, training facilities and infrastructure (AllSabah et al., 2019). Archery accuracy is very important even though physical endurance and muscular endurance of arm muscles, understanding technique, mentality or tactics will not achieve high points if the arrow misses (Yachsie, 2019). From placing the arrow in the bow, aiming it at the target until it reaches the

target, the athlete must ensure that it is focused (Prasetyo et al., 2018). Thus, it is concluded that archery is an individual sport that requires archery accuracy so that arrows gets in (X) perfect points.

Dumbbell theraband is a training alternative in the sport of archery. This exercise can be done anytime and anywhere because the tools used are very effective and easy to carry everywhere (Prasetyaningtyas & Windraswara, 2017). Because it only needs a dumbbell tool to replace the handle and theraband to replace the bowstring (Yachsie, 2019). For this training program, namely: training to pull the theraband modified with dumbbells, the dumbbell load of 2-3 kg from the bow is weighed first, 3 kg for men and 2 kg for women using 3-5 sets and 15-20 reps, each rep is done by holding 15-30 seconds, 1 repetition of this exercise is pulled to reach the crank position after that it is held for 15-30 seconds, recovery for each rep is twice the time of holding the bow, for example, pulling 15 seconds, 30 seconds of rest is required, while recovery for each set is 30-90 seconds.

Bow training is a practice in archery that is quite simple and archers can definitely do it because it only requires a bow and arrow. Exercises that use the bow's functional tool are great for developing specific muscle strength and endurance in archery, because the exercises are the same as in archery (Piqué et al., 2015). Because it can increase the training intensity and the total volume during the bow training phase, it is also possible to clarify archery techniques and learn new skills more quickly, efficiently and stable (Prasetyo, 2011). There are many variations of exercises that can be done in archery, one of which is bow training. However, this exercise is done by ensuring that doing these exercises must be accompanied with the correct technique (Abramowicz-Gerigk & Gerigk, 2020). Referring in the book of World Archery (2015), This exercise is very effective to improve the endurance of the arm muscles and the accuracy of archery because it allows the athlete to maintain the same concentration as when arching, the only thing that is different is that the arrow is not released. Bow training is an exercise that uses the string on the bow to be drawn, holding the maximum pull in the correct position for 15 to 30 seconds. After that rest, the time used is doubled. eg executing 15 seconds, resting 30 seconds (Bsskoro, 2018). Dumbbell theraband and bow training have variations of training in archery however. The dumbbell theraband training and Bow training are still not known for their accuracy and whether these exercises have a different effect on the accuracy of archery athletes at a distance of 40 m (Gunawan H, Arafat Y, 2020). Because the components needed by archers to achieve good accuracy are not only archery training but require good arm muscle endurance, stability, and regularity of archery, therefore this study is aimed to determine the effect of dumbbell theraband training and bow training on archery accuracy results, and to find the difference between the effect of dumbbell theraband and bow training on the accuracy of archery athletes at a distance of 40m.

II. Research Methods

The type of this study is an experimental research. The main characteristic of experimental research is the provision of treatment to a group. The research instrument was a 40 m archery scoring test. In this study, one group was given dumbbell theraband training activities and the other was given bow training. The treatment was given as much as 16 times and carried out 3 times a week. The participants were given a pretest before being given activities and posttest after treatment. The population of this research was 26 athletes' archery athletes in Banyumas Regencyas. The sample of this research was 24 athletes which was determined using purposive sampling techniques, with the criteria that they were still athletes, routinely participated in training for regional competitions, were not injured or under medical care, and were willing to participate in this research. The data were collected by performing a

scoring test at a distance of 40 M. After the pretest, the sample was divided in two groups of 12 athletes. One group was given a treatment of dumbbell thera band training and the other group was given bow training. After the treatment, the athlete performed a posttest. After the data were collected, the prerequisite tests were carried out, namely the normality test using the Kolmogorov Smirnov technique and the homogeneity test using the Levene statistical technique at a significance level of 5% ($p > 0.05$). Furthermore, the hypothesis was tested using paired samples t-test to determine the effect of the dumbbell thera band and bow training on archery accuracy. The hypothesis in this study was (a), there is an effect of dumbbell thera band training on increasing the accuracy of archery athletes (b) there is an effect of bow training on increasing the accuracy of archery athletes in archery, and (c) there is a difference between the effect of dumbbell thera band training and bow training on archery athlete results.

III. Results and Discussion

3.1 Results

Table 1. Deskriptif Statistik

	N	Minimum	Maximum	Mean	Std. Deviation
Pretest Dumbell Thera band	12	188	621	443.92	152.005
Posttest Dumbell Thera band	12	424	639	547.00	81.981
Pretest Bow training	12	242	552	419.58	112.642
Posttest Bow training	12	261	587	435.08	112.778

Based on the descriptive statistics table above, the pretest value of the dumbbell thera band exercise showed a minimum of 188, a maximum of 621, a mean of 443.92, and a standard deviation of 152.005. The posttest value of the dumbbell thera band exercise had a minimum of 424, maximum 639, mean 547.00, and standard deviation 81.981. The pretest value of bow training had a minimum of 242, maximum 552, mean 419.58, and standard deviation of 112,642. The posttest values of bow training showed a minimum of 261, a maximum of 587, a mean of 435.08, and a standard deviation of 112,778.

Table 2. Uji Normalitas

	Kolmogorov-Smirnova		
	Statistic	Df	Sig.
Pretest Dumbell Thera Band	.186	12	.200*
Posttest Dumbell Thera Band	.204	12	.179
Pretest Bow Training	.149	12	.200*
Posttest Bow Training	.181	12	.200*

Based on the normality test table above using the Kolmogorov Smirnov technique, the results exhibited a sig value of 0.200 for the dumbbell thera band pretest, 0.179 for the dumbbell thera band posttest, 0.200 for the pretest bow training, and 0.200 for the posttest bow training ($p > 0.05$). it can be concluded that all data were normally distributed.

Table 3. Uji Homogenitas

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

The table above shows the results of the homogeneity test using the Levene statistic technique. The results obtained showed a sig value 0.277 ($p > 0.05$). Then it can be concluded that all data were homogeneous.

Table 4. Uji Hipotesis 1

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

Based on the results of the paired samples test in the table above, we can see that a sig (2-tailed) of 0.009 ($p < 0.05$) then it can be concluded that there is an influence of the dumbbell theraband training on the accuracy of archery athletes.

Table 5. Uji Hipotesis 2

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

Based on the table above for paired samples test, the result of sig (2-tailed) is 0.002 ($p < 0.05$), it can be concluded there is an influence of bow training on archery accuracy at a distance of 40 meter.

Table 6. Uji Hipotesis 3

	N	Minimum	Maximum	Mean	Std. Deviation
Thera Band Dumbbell Difference	12	14	337	103.08	113.810
Difference Bow Training	12	1	35	15.50	12.810
Valid N (listwise)	12				

Based on the table above for the hypothesis test 3, the average value of the difference between the dumbbell theraband training is 103.08 and the average difference between the bow training exercises is 15.50. It can be concluded that dumbbell theraband training has a greater effect on archery accuracy results.

3.2 Discussion

The results of this study revealed that there was an increase in the accuracy of archery after giving the training. The training increased the accuracy of archery athletes. The results of this study showed that the higher dumbbell thera band training, the more accurate the shooting accuracy. The weight of the dumbbell can be adjusted by weighing the bow, but if after weighing the bow, the athlete still feels that his muscles have not contracted (still feels light) then in this condition the weight of the dumbbell is determined using 1RM. According to Jidovtseff et al. (2015) 1RM is the movement of lifting a load of body weight in one motion then, take half of the maximum weight lifted. 1RM uses a dumbbell lateral raise by holding it down before lowering it back down, counting the units of seconds for holding the load, then taking 30% - 40% of the maximum weight (Coratella et al., 2020).

However, in this study, the weight / load of the dumbbell only used the bow weight method because it is sufficient. When the body is given a training load that is too light, it will certainly not have an effect and yet if the body is given a very heavy training, this might cause tissue damage and injury (Nasrulloh et al., 2018). Because there are 4 principles of weight training according to (Suharjana, 2015) namely: Overload, Progressive, Reversibility, Recovery, then the dumbbell thera band exercise is done programmatically and its progress is monitored. There are two types of weight training, the first is free weight training that requires external tools or weights such as dumbbells, barbell and other GYM machines, while body weight uses internal weights such as pushups, chin ups, pull ups, planks and other exercises (Bittar et al., 2016).

The dumbbell itself is a tool (free weight) from outside loads, which means that it increases the athlete's physical condition, of course the bow weight with the dumbbell weight must be different, the bow weight weighed by the dumbbell weight will definitely be heavier in the dumbbell because of the material. Therefore, after the athlete does this exercise, they feel light when shooting and the accuracy increases because when the holding position with the left hand will not feel heavy and will reduce tremors when shooting. According to (Yachsie, 2019), a Dumbbell thera band is an exercise using tools or free weigh. A combination of dumbbell and Thera Band makes it easy for physical training. The Dumbbell Thera Band training is inspired and varies bow training exercises so that when athletes don't have a bow, they can practice with makeshift tools to increase arm muscle endurance, archery accuracy, and muscle strength arm (Mulyawan, 2020). This exercise is effective in doing physical training because it is practiced anywhere. This dumbbell thera band exercise not only improves the accuracy of the archery, but also increases the endurance of the arm muscles, strength and sharpness when shooting. Bow training is a physical archery exercise, this exercise is done by archers during training to learn more about mastering the new techniques taught by the coach or technical improvements in archery. According to researchers, technical training alone without physical training in archery cannot affect the accuracy of the archery (Ganter et al., 2010). Therefore, bow training is considered very effective for practicing archery techniques, not for training physical conditions.

The weight of the training bow cannot be changed or added because the average weight of the standard bow is almost the same. For athletes who have high muscle intensity, this practice will not affect the target muscles if there is an increase in the endurance of the arm muscles, the strength of the arch and the accuracy of the shot (Kolayis et al., 2014). Due to the provision of programmed and monitored training so as to create an increasing effect on archery accuracy, however, if this training program is given to professional athletes who often participate in the PORPROV, KEJURNAS and PON championships, it seems that this will not have an effect because the weight of the bow cannot be added and the professional athlete's personal bow load is heavier than the bow that is used. Based on this research it can be seen that the bow training can improve archery accuracy, however, there is not much

increase because this practice is the same as training on the field. The only difference is that for this exercise the athlete does not release arrows and bows in 10-30 seconds by pulling until the tip of the arrow reaches the maximum point and if the clicker sounds and is heard then it is repeated from the beginning again. Based on the research of (Bsskoro, 2018), a bow training is a training system using a bow, from this exercise the most important thing is that there are bows and arrows that aim to focus more on archery techniques to be more effective at deepening techniques, increasing arm muscles and archery accuracy, just one hour of practice is like releasing 200 arrows even though it takes more than two hours to release 200 arrows.

Because the accuracy of archery requires consistency when shooting arrows (Susanto, 2015), giving the dumbbell thera band and bow trainings might bring some consistency when shooting. This dumbbell thera band and bow training is a program to train the muscle complexes involved in archery movements. This exercise uses the muscles directly involved when releasing an arrow, which is considered to be very effective, because the muscle movements performed are the same as with archery (Yulianto et al., 2015). The accuracy in the archery sport is an important component for athletes to shoot right in the target (Putranto et al., 2018). In line with (Manazi, 2013)), the accuracy of the archery is an activity using a bow and arrow, to aim at an object so that it sticks into the point being aimed.

This archery is carried out in an open and safe place from disturbance. Because of the arrow has sharp points, hitting a living object can be dangerous. In line with (Sari, 2020) who stated that athletes are also required to be vigilant if at any time someone passes behind the target athlete and must be able to improve its accuracy so as not to slip when the arrow is released. This is because the arrows can cause injury and even death (Aji, 2016). Therefore, the accuracy in archery is needed not only to get the highest score, but to keep the match area or training area safe and under control.

Archery at 40 meters is an intermediate section between 30 and 50 meters. This 40 meter distance is the hardest distance in the standard bow round because of the distance that requires the left hand to be stable parallel to the body (Basuki, 2019). The official competition rules for PERPANI, the 40-meter distance is the distance used for individual and team competition in the standard bow round. Therefore, this study used a distance of 40 meters as a test tool to measure the accuracy of archery.

An archery athlete must have a consistent arrow shooting technique, because it can increase achievement (Baskoro, 2016) and in mastering the perfect technique will appear regularity. In the sport of archery, correct and consistent archery techniques are needed from the techniques that have been mastered (Humaid, 2014). It is needed to ensure and fully master the nine basic techniques of archery, namely: stand, nocking arrow, drawing, set up, anchoring, holding, aiming, release, follow through (Prasetyo, 2016). 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 and are required to understand biomechanical parameters such as muscle activity, heart rate, balance, and body posture as well as the draw force line chosen as important parameters for athlete performance. Other factors that contribute to successful archery include quickly releasing an arrow, being able to see the situation, and being able to control emotions (Abu Samah et al., 2019). Because if an athlete delays releasing an arrow, then the results of his shooting accuracy will be imperfect because the bow is quite heavy and the time of the match is long causing the athlete to release one draw of the bow only 3-4 seconds (Aryani, 2017).

IV. Conclusion

Based on the results of research, it can be concluded that there is an effect of dumbbell theraband training on increasing the accuracy of archery athletes. The dumbbell theraband training group was higher than the bow training exercise on the archery accuracy results, although the results of bow training showed an increase in the results of archery accuracy. The dumbbell theraband training is highly recommended because the dumbbell theraband itself includes free weight training, which means that this exercise increases the athlete's physical condition and consequently the accuracy of archery. Meanwhile, bow training is considered very effective for deepening grounding techniques, not as a training to improve archery accuracy.

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References

- Abramowicz-Gerigk, T., & Gerigk, M. K. (2020). Experimental study on the selected aspects of bow thruster generated flow field at ship zero-speed conditions. *Ocean Engineering*, 209(May), 107463. <https://doi.org/10.1016/j.oceaneng.2020.107463>
- Abu Samah, I. H., Shamsudin, A. S., & Darus, A. (2019). Psychological Relatedness Factor influencing Performance in Archery. *International Journal of Innovative Technology and Interdisciplinary Sciences*, 2(1), 192–199. <https://doi.org/10.15157/IJITIS.2019.2.1.192-199>
- Ahmad, Z., Taha, Z., Hassan, H. A., Hisham, M. A., Johari, N. H., & Kadirgama, K. (2014). Biomechanics measurements in archery. *Journal of Mechanical Engineering and Sciences*, 6(June), 762–771. <https://doi.org/10.15282/jmes.6.2014.4.0074>
- Aji, B. (2016). Identifikasi Faktor-Faktor Pendukung Mahasiswa Dalam Belajar Olahraga Panahan Di Unit Kegiatan Mahasiswa (Ukm) Panahan. <http://eprints.uny.ac.id/30166/>
- Arisman, A. (2018). Pengaruh Metode Latihan Sirkuit terhadap Keterampilan Memanah. *Gelanggang Olahraga: Jurnal Pendidikan Jasmani Dan Olahraga (JPJO)*, 2(1), 150–157. <https://doi.org/10.31539/jpjo.v2i1.489>
- Aryani, K. D. (2017). Pengaruh Plank Exercise terhadap Daya Tahan Otot Lengan dan Akurasi Memanah Siswa Sekolah Dasar di Kota Yogyakarta. 15, 1–10.
- Asaribab, N., & Siswantoyo, S. (2015). Identifikasi Bakat Olahraga Panahan Pada Siswa Sekolah Dasar Di Kabupaten Manokwari. *Jurnal Keolahragaan*, 3(1), 39–55. <https://doi.org/10.21831/jk.v3i1.4968>
- Baskoro, D. A. (2016). Persepsi Kinestetik Terhadap Akurasi Tembakan Jarak 50 Meter Pada Atlet Pplp Panahan Jawa Tengah Tahun 2016 Skripsi. 9.
- Basuki, S. (2019). Kontribusi Tingkat Konsentrasi Terhadap Ketepatan Hasil Panahan Ronde Nasional Jarak 40 Meter (Studi Pada Atlet Putra Unit Kegiatan Mahasiswa Panahan Universitas Negeri Surabaya). *Jurnal Kesehatan Olahraga*, 7(2), 383–390.
- Birri, M.S., Hariyanto, A., and Tuasikal, A.R.S. (2020). Development of Traditional Sport Game Model “Bentengan” for Student’s Physical Fitness in Sports and Health Physical Education Learning (Case Study on Class IV MI Students of Maduran Lamongan District). *Budapest International Research and Critics in Linguistics and Education (BirLE) Journal Vol 3 (3)*: 1614-1622.
- Bittar, S. T., Maeda, S. S., Marone, M. M. S., & Santili, C. (2016). Physical exercises with free weights and elastic bands can improve body composition parameters in

- postmenopausal women: WEB protocol with a randomized controlled trial. *Menopause*, 23(4), 383–389. <https://doi.org/10.1097/GME.0000000000000542>
- Bsskoro, R. A. (2018). Pengaruh Bow Training Terhadap Daya Tahan. *Jorpres (Jurnal Olahraga Prestasi)*, 1–14.
- Coratella, G., Tornatore, G., Longo, S., Esposito, F., & Cè, E. (2020). An electromyographic analysis of lateral raise variations and frontal raise in competitive bodybuilders. *International Journal of Environmental Research and Public Health*, 17(17), 1–12. <https://doi.org/10.3390/ijerph17176015>
- Ganter, N., Matyschiok, K. C., Partie, M., Tesch, B., & Edelmann-Nusser, J. (2010). Comparing three methods for measuring the movement of the bow in the aiming phase of olympic archery. *Procedia Engineering*, 2(2), 3089–3094. <https://doi.org/10.1016/j.proeng.2010.04.116>
- Gunawan H, Arafat Y, J. I. (2020). Perbandingan hasil memanah ronde nasional square stance, open stance, dan close stance di club adi sucipto 13 Palembang. *PGRI Palembang*, 435–442.
- Humaid, H. (2014). Influence of arm muscle strength, draw length and archery technique on archery achievement. *Asian Social Science*, 10(5), 28–34. <https://doi.org/10.5539/ass.v10n5p28>
- Jidovtseff, B., Harris, N. K., Crielaard, J.-M., & Cronin, J. B. (2015). Using the Load-Velocity Relationship For 1RM Prediction. *Journal of Strength and Conditioning Research*, 25(1), 267–270.
- Kolayis, İ. E., Çilli, M., Ertan, H., & Knicker, J. A. (2014). Assessment of Target Performance in Archery. *Procedia - Social and Behavioral Sciences*, 152, 451–456. <https://doi.org/10.1016/j.sbspro.2014.09.230>
- Manazi, F. N. (2013). Pengaruh Penerapan Latihan Imagery Terhadap Hasil Tembakan Pada Jarak 30 Meter Ekstrakurikuler Olahraga Panahan Smp Negeri 02 Bakung Blitar. *Jurnal Pendidikan Olahraga Dan Kesehatan*, 1(2), 454–458.
- Muhammad Akbar Husein AllSabah, Weda, Irwan Setiawan, A. S. N. et al. (2019). JUARA : Jurnal Olahraga. Profil Kondisi Fisik Pemain Sepakbola Wanita Candra Kirana, 4(2).
- Mulyawan, R. (2020). Pengaruh Recovery Aktif Dan Pasif Terhadap Daya Tahan Otot. *Medikora*, 19(1), 53–60. <https://doi.org/10.21831/medikora.v19i1.30886>
- Nasrulloh, A., Prasetyo, Y., & Apriyanto, K. D. (2018). Dasar-dasar latihan beban.
- Novianti, D., Mahardika, I.M.S., and Tuasikal, A.R. (2020). Improvement of Physical, Honesty, Discipline and Cooperation in Class IV Elementary School Students through Circuit Training Learning Model. *Budapest International Research and Critics in Linguistics and Education (BirLE) Journal Vol 3 (1)*: 244-250.
- Piqué, R., Palomo, A., Terradas, X., Tarrús, J., Buxó, R., Bosch, À., Chinchilla, J., Bodganovic, I., López, O., & Saña, M. (2015). Characterizing prehistoric archery: Technical and functional analyses of the Neolithic bows from La Draga (NE Iberian Peninsula). *Journal of Archaeological Science*, 55, 166–173. <https://doi.org/10.1016/j.jas.2015.01.005>
- Prasetyaningtyas, A. Y., & Windraswara, R. (2017). Study of Home Physical Condition Characteristics and Personal Hygiene in The Leprosy Patient and Surrounding Environment in Weding Village. In *The 4th Ismina*. http://www.academia.edu/download/53783933/PROCEEDINGS_THE_4th_ISMINA_CONFERENCE_PROCEEDINGS.pdf#page=685
- prasetyo, Y. (2013). Olahraga Panahan. *Journal of Chemical Information and Modeling*, 53(9), 1689–1699. <https://doi.org/10.1017/CBO9781107415324.004>

- Prasetyo, Y. (2011). Bow Training to Improve Skills Archery. *Proceeding Of The 3 International Seminar International Seminar Sport & Physical Education*, 2(41), 541–544.
- Prasetyo, Y. (2016). Pengaruh latihan deep breathing terhadap peningkatan hasil score total jarak ronde nasional pada UKM panahan UNY. *Jorpres (Jurnal Olahraga Prestasi)Ournal Olahraga Prestasi*, 12, 27–35.
- Prasetyo, Y., Nasrulloh, A., & Komarudin, K. (2018). Identifikasi Bakat Istimewa Panahan Di Kabupaten Sleman. *Jorpres (Jurnal Olahraga Prestasi)*, 14(2), 195–205. <https://doi.org/10.21831/jorpres.v14i2.23830>
- Putranto, T. D., Wulandari, F. Y., & Sifaq, A. (2018). Profil kondisi fisik atlet panahan gresik. *Journal of Sport and Exercise Science*, 1(1), 20–24. <https://doi.org/dx.doi.org/10.26740/jses.v1n1.p20-24>
- Rahmansyah, F., Nurhasan, and Tuasikal, A.R.S. (2021). Development of Teaching Materials Theme 1 Growth and Development of Living Life in Combinations of Basic Locomotors through Role Playing Activities. *Budapest International Research and Critics in Linguistics and Education (BirLE) Journal Vol 4 (4)*: 1193-1205.
- Saparuddin, S. (2019). Pengaruh Latihan Push-Up Dan Pull –Up Terhadap Kekuatan Otot Lengan Pada Atlet Panahan Perpani Kabupaten Banjar. *Riyadhoh : Jurnal Pendidikan Olahraga*, 2(2), 36. <https://doi.org/10.31602/rjpo.v2i2.2480>
- Sari, E. R. (2020). Perlindungan Hukum Terhadap Kesejahteraan Pelaku Olahraga Panahan Di Jawa Tengah Berdasarkan Undang- Undang Nomor 3 Tahun 2005 Tentang Sistem Keolahragaan Nasional. Universitas Negeri Semarang. <https://lib.unnes.ac.id/30216/>
- Suharjana, -. (2015). Latihan Beban : Sebuah Metode Latihan Kekuatan. *Medikora*, 1. <https://doi.org/10.21831/medikora.v0i1.4719>
- Susandi, D., & Wikananda, R. (2018). nalisis Beban Pada Olahraga Panahan Dengan Menggunakan Metode Fisiologi. *Prosiding Industrial Research Workshop and National Seminar*, 9, 432–437.
- Susanto, S. (2015). Pengaruh Latihan Sirkuit terhadap Peningkatan Kebugaran Jasmani dan Ketepatan Membidik Panahan pada Anak Usia Dini. *Ta'allum: Jurnal Pendidikan Islam*, 3(2), 185–199. <https://doi.org/10.21274/taalum.2015.3.2.185-199>
- World Archery. (2015). *Coach ' s Manual Entry Level*.
- Yachsie, B. T. P. W. B. (2019). Pengaruh Latihan Dumbell-Thera Band Terhadap Daya Tahan Otot Lengan Dan Akurasi Memanah Pada Atlet Panahan. *Medikora*, 18(2), 79–85. <https://doi.org/10.21831/medikora.v18i2.29200>
- Yulianto et al. (2015). Pengaruh Latihan Hand Grip Terhadap Peningkatan Ketepatan Tembakan Anak Panah Ke Sasaran Trianggeltarget Face Pada Klub Panahan Mustika Blora Tahun 2013. *JSSF (Journal of Sport Science and Fitness)*, 4(2), 27–30.