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The Effect of Training Model and Arm Muscle Strength on Arm Power in Judo Sport

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ABSTRACT: The purpose of this study was to determine the effect of training models and arm muscle strength on arm power judo sports in Bandar Lampung City in order to determine whether there is an effect of training models and arm muscle strength on arm power in athletes. The type of research is factorial 2 x 2. The sample used was judo athletes in Bandar Lampung City totalling 50 athletes. The sampling technique used was purposive sampling. The instrument used was the Two Medicine Ball Put test. Data analysis techniques include descriptive analysis, prerequisite tests (normality and homogeneity tests), hypothesis testing using paired sample tests and independent sample tests. The data analysis technique used in this study using SPSS 20 is by using two-way ANOVA (two-way ANOVA). The results showed (1) There was a significant difference in influence between elastic training of Uchikomi tyres and push ups on arm power of judo athletes in Bandar Lampung City, with a p-value of 0.009 < 0.05. The Uchikomi elastic tyre training group was better than the push up group with an average posttest difference of 0.37 metres. (2) There is a significant difference between athletes with high and low arm muscle strength on arm power of judo athletes in Bandar Lampung City, with a p-value of 0.003 <0.05. Athletes with high arm muscle strength are better than athletes with low arm muscle strength with a posttest average difference of 0.44 metres. (3) There is a significant interaction between Uchikomi tyre elastic training and push ups and arm muscle strength (high and low) on arm power of judo athletes in Bandar Lampung City, with a p-value of 0.002 <0.05. The results showed that the Uchikomi tyre elastic training group was a more effective method used for athletes with high arm muscle strength and the push up group was more effective for athletes with low arm muscle strength.

KEYWORDS: intensive interval, extensive interval, VO_2 Max

INTRODUCTION

The sport of judo is a sport of slamming or removing an opponent's balance by using slamming techniques (Lampe et al., 2022). Judo sport is also inseparable from physical condition, where physicality is the basis for an athlete to carry out sports activities. Physical condition is the ability of a person to deal with the demands of physical sports activities optimally. There are various physical components, namely: strength, speed, agility, balance, flexibility, endurance, and coordination. Judo sport recognises two kinds of training, namely Kata and Randori. Kata is a continuous system that includes basic techniques such as slams, locks, chokes, breaks and attacks dangerous body parts. While Randori is a free exercise on everything taught through kata training that is practised in the form of attack and defence (Callan & Bountakis, 2022).

Judo athletes rely heavily on strength and conditioning to ensure success. Judo coaches should be aware of this, and should work closely with strength and conditioning coaches to develop appropriate strength and conditioning programmes for their athletes. Strength for Judo is necessary because judo is a body contact sport that uses strength as one of the components to defeat an opponent. While a judo player must perform movements such as throwing, resisting the opponent's strength during a match, or slamming the opponent, a judo player must also perform movements such as throwing (Lubis & Pambudi, 2021). Uchikomi is a technical exercise that is performed repeatedly or continuously. The advantages of uchikomi using bicycle tyre rubber are: (1) Because bicycle tyres are made of rubber so that when doing uchikomi the rubber works like a spring that is able to pull back when doing uchikomi, (2) Uchikomi with bicycle tyre rubber trains physical components that combine two physical components at once, namely strength and speed or often referred to as power, (3) Rubber uchikomi can be done independently, (4) From an economic point of view, rubber uchikomi is easy to buy because the price is not too expensive (Suwarli, 2016).

The Effect of Training Model and Arm Muscle Strength on Arm Power in Judo Sport

In previous studies to determine the difference in influence between rubber uchikomi and road uchikomi training on judo slamming results. Previous research reinforced that uchikomi using rubber serves to train timing and speed when slamming because timing and speed are needed by every judo player. From using this uchikomi helps athletes train strength and speed. And previous research states that arm power in judo athletes is very necessary, not only in judo but in all sports is very important. Power is one of the influences on the results of judo athletes' slams. Therefore, this study examines the effect of training models and arm muscle strength on arm power in judo sports in Bandar Lampung City in order to determine whether there is an effect of training models and arm muscle strength on arm power in athletes.

METHODS

This type of research is an experiment using a 2 x 2 factorial research design. This experimental research uses two groups that will be given different treatments, namely elastic tyre training and push ups seen from the athletes' high and low muscle strength abilities. The population in this study were judo athletes in Bandar Lampung City totalling 50 athletes. The sampling technique used was purposive sampling, totalling 38 athletes. Furthermore, from each existing data, it will be divided into two groups with ordinal pairing and obtained 5 athletes each who have high muscle strength are given treatment using elastic tyre and push up exercises, while the low muscle strength group is given treatment using elastic tyre and push up exercises.

The instrument used, namely the Two Medicine Ball Put test. The instrument used in this study is to use a tool, namely a test. The arm power test using medicine-ball has been more than thirty years and is still often used for tests to assess upper body power. The test technique is to obtain data related to arm and shoulder muscle power, namely by using the Two-Hand Medicine Ball-put test.

The data analysis technique used in this study using SPSS 20 is by using two-way ANOVA (two-way ANOVA) at a significance level of 0.05. Previously, prerequisite tests were carried out as (1) normality test and (2) homegenity test.

RESULTS

The implementation of the treatment lasted for 18 meetings with a frequency of 3 times a week. Arm power pretest and posttest data are presented in Table 1 as follows.

Table 1. Pretest and Posttest Data of Arm Power

No	**High Arm Muscle Strength**					
	Uchikomi Tyre Elastic (A1B1)			***Push Up* (A2B1)**		
	Pretest	***Posttest***	**Difference**	***Pretest***	***Posttest***	**Difference**
1	4.64	5.36	0.72	4.13	4.60	0.47
2	4.08	5.07	0.99	4.08	4.24	0.16
3	3.62	5.25	1.63	3.51	3.95	0.44
4	3.36	4.85	1.49	3.42	4.06	0.64
5	3.29	4.66	1.37	3.02	3.42	0.40
Mean	**3,80**	**5,04**	**1,24**	**3,63**	**4,05**	**0,42**
No	**Low Arm Muscle Strength**					
	Elastis Ban Uchikomi (A1B2)			***Push Up* (A2B2)**		
	Pretest	***Posttest***	**Difference**	***Pretest***	***Posttest***	**Difference**
1	3.19	3.25	0.06	3.15	3.22	0.07
2	2.90	3.27	0.37	2.98	3.39	0.41
3	2.55	3.02	0.47	2.46	2.86	0.40
4	2.17	2.66	0.49	2.29	3.25	0.96
5	1.99	2.35	0.36	1.76	2.05	0.29
Mean	**2,56**	**2,91**	**0,35**	**2,53**	**2,95**	**0,43**

Based on Table 1 above, it shows that the arm power of the A1B1 group averaged a prestest of 3.80 metres and increased at the posttest of 5.04 metres, the A2B1 group averaged a prestest of 3.63 metres and increased at the posttest of 4.05 metres, the A1B2 group averaged a prestest of 2.56 metres and increased at the posttest of 2.91 metres, the A2B2 group averaged a prestest of 2.53 metres and increased at the posttest of 2.95 metres.

The data normality test uses the Shapiro-Wilk method with a significance level of 0.05. A summary of the normality test results is presented in Table 2 as follows:

Table 2. Normality Test Analysis Results

Group	Shapiro-Wilk		
	Statistic	df	Sig.
Pretest A1B1	0,903	5	0,428
Posttest A1B1	0,963	5	0,826
Pretest A2B1	0,911	5	0,475
Posttest A2B1	0,979	5	0,929
Pretest A1B2	0,958	5	0,795
Posttest A1B2	0,897	5	0,395
Pretest A2B2	0,957	5	0,787
Posttest A2B2	0,826	5	0,129

Based on the statistical analysis of the normality test that has been carried out using the Shapiro-Wilk test in Table 5 above, it shows that all pretest and posttest arm power data obtained p-value> 0.05, which means that the data is normally distributed. Homogeneity test using Levene Test. The results of the homogeneity test are presented in Table 3 as follows.

Table 3. Results of Homogeneity Test Analysis

F	df1	df2	Sig,
1,721	3	16	0,203

Based on the statistical analysis of the homogeneity test that has been carried out using the Levene Test in Table 3 above. The results of the homogeneity test calculation obtained a p-value of 0.203 ≥ 0.05. This means that the data group has a homogeneous variant. Thus the population has a similar variant or homogeney.

Hypothesis testing was conducted based on the results of data analysis and interpretation of two-way ANOVA analysis. The results of hypothesis testing are presented in Table 4:

Table 4. Results of two-way ANOVA Analysis

Source	Type III Sum of Squares	df	Mean Square	F	Sig
Exercise Method	0,688	1	0,688	8,926	0,009
Arm muscle strength	0,981	1	,981	12,727	0,003
Exercise*Arm muscle strength	,999	1	0,999	12,958	0,002

From the ANOVA test results in Table 4 above, it can be seen that the F-value is 8.926 and the p-value is 0.009 <0.05, meaning that H0 is rejected. Thus there is a significant difference in influence. This means that the research hypothesis which states that "There is a significant difference in influence between Uchikomi elastic tyre training and push ups on arm power of judo athletes in Bandar Lampung City", is accepted. Based on the results of the analysis, it turns out that the training group using Uchikomi elastic tyres is better than the push up group with an average posttest difference of 0.37 meters.

From the ANOVA test results in Table 4 above, it can be seen that the F-value is 12.727 and the p-value is 0.003 <0.05, meaning H0 is rejected. Based on this, it means that there is a significant difference in influence. This means that the research hypothesis which states that "There is a significant difference in influence between athletes with high and low arm muscle strength on arm power judo athletes in Bandar Lampung City", is accepted. Based on the results of the analysis it turns out that athletes with high arm muscle strength are better than athletes with low arm muscle strength with an average posttest difference of 0.44 metres.

From the ANOVA test results in Table 4 above, it can be seen that the F-value is 12.958 and the p-value is 0.002 <0.05, meaning Ho is rejected. Based on this, the hypothesis stating "There is a significant interaction between Uchikomi tyre elastic training and push ups and arm muscle strength (high and low) on arm power of judo athletes in Bandar Lampung City", is accepted.

The graph of the results of the interaction test between elastic tyre Uchikomi and push ups and arm muscle strength (high and low) on arm power of judo athletes in Bandar Lampung City can be seen in Figure 1 as follows.

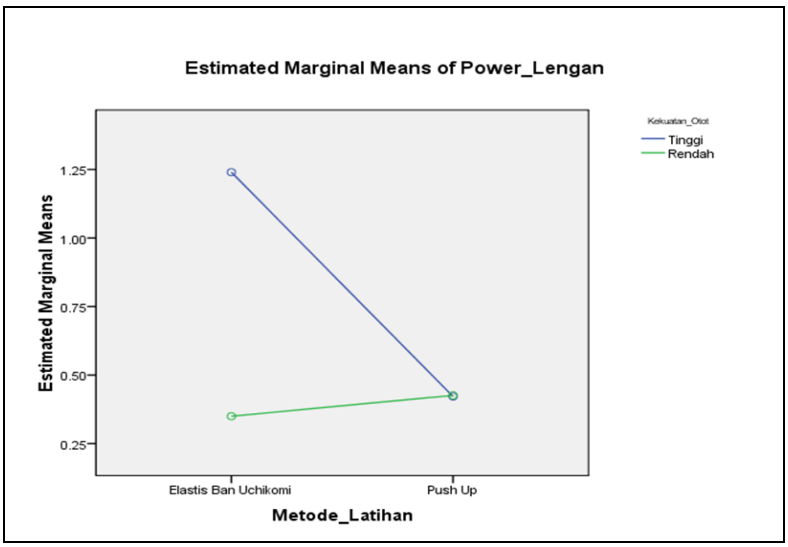

Figure 1. Diagram of Interaction between Uchikomi Tyre Elastic and Push Up and Arm Muscle Strength (High and Low) on Arm Power

DISCUSSION

Difference in Effect between Uchikomi Tyre Elastic and Push Up on Arm Power

Based on hypothesis testing, it is known that there is a significant difference in effect between Uchikomi tyre elastic training and push ups on arm power. Based on the results of the analysis it turns out that the Uchikomi tyre elastic exercise group is better than the push up group on arm power. These results are reinforced by several studies including (Yoon et al., 2017) that the use of elastic bands provides a significant improvement in the level of cognitive function, physical function, and muscle strength. Research results (Spracklin et al., 2017) by placing a circular resistance band around the thighs can be used as a training strategy to increase hip muscle activation during free barbell back squats using moderate to heavy loads without negatively affecting performance.

A meta-analysis study conducted by (Lopes et al., 2019) showed that training using elastic bands had similar muscle strength enhancement effects as conventional resistance training using weight machines and dumbbells. (Guillot et al., 2019) proved that elastic band training significantly improved sit-and-reach (29.16% increase, $p = 0.01$) as well as side split stretch performance (2.31% increase, $p < 0.001$). Exercise using elastic bands will improve neuromuscular function and can also cause post-activation potentiation, which is a temporary increase in muscle work that is the result of a previous contraction (Low et al., 2019).

Exercises using elastic bands provide resistance to muscle movement. The level of resistance depends on the stretching properties of the band material. Today, elastic bands are used for physical therapy and rehabilitation to improve the functional capacity of individuals, for chronic diseases and to develop the functional capacity of athletes. It is preferable to provide the opportunity to set individual strength and traction ratios. Elastic bands can be used to strengthen specific muscle groups, and also affect flexibility and balance (Oh, 2021). The benefits of elastic bands have been clearly proven after use and have a fairly high level of safety if done under the supervision of a trainer (Nebahatqoru et al., 2021).

Uchikomi is an exercise that incorporates or familiarises the movement of one of the judo slamming techniques to be performed repeatedly. Uchikomi is an exercise that incorporates or familiarises the movement of one of the techniques, to be performed repeatedly (Andalas & Purwanto, 2019). Uchikomi training is the practice of incorporating a technique or familiarising the movement of one technique repeatedly. Uchikomi has variations such as: uchikomi in place, uchikomi walk. Uchikomi is very necessary in judo because it is to get used to pulling (pulling) on the opponent to lose the opponent's balance in order to give us points. There are many variations of uchikomi training, for example shadow uchikomi, rubber tyre uchikomi and paired uchikomi (Andalas & Purwanto, 2019). So the uchikomi tyre elastic helps in the work that causes the pull, and using the uchikomi tyre elastic trains two components such as technical and physical training. In the research, uchikomi tyre elastic is very good for increasing hand power and also increasing the speed of technical movements, increasing leg power and also increasing grip and also flexing joints.

Difference in Effect between Athletes with High and Low Arm Muscle Strength on Arm Power

The results of the analysis show that there is a significant difference in influence between athletes with high and low arm muscle strength on arm power. Athletes with high arm muscle strength are better than athletes with low arm muscle strength. These results indicate that a person's power is influenced by one of them by the strength of the leg muscles. Strength and speed are the

main components in the formation of power, the higher the strength and speed possessed by a person, the more directly proportional to the power produced. Explosive power is the ability to direct force quickly in a short time to give the best momentum to the body or object in an explosive movement that fully achieves the desired goal. Opinion (Chen et al., 2018) that explosive power is the product of muscle strength and speed. Improving muscle strength is the basic condition for improving explosive power.

Strength is the ability of a muscle to contract in order to generate stress against a resistance (Vicens-Bordas et al., 2018). Physiologically, muscle strength is directly proportional to the volume / size of the muscle, the greater the volume of the muscle, the stronger the contraction produced to perform a movement. The movements produced are the result of activation of the motor unit in the muscle. A motor unit is one motor neuron with all the muscle fibres it innervates. The number of muscle fibres per motor unit and the number of motor units per muscle vary. Rough and forceful movements are produced by 1500-2000 muscle fibres. Thus, the more motor units that are recruited, the stronger the muscle contraction, so the stronger the movement produced.

Interaction between Uchikomi Tyre Elastics and Push Up and Arm Muscle Strength (High and Low) on Arm Power

Based on the results that have been stated in the results of this study, there is a significant interaction between Uchikomi tyre elastic training and push ups and arm muscle strength (high and low) on arm power. The results showed that the Uchikomi tyre elastic training group was a more effective method used for athletes with high arm muscle strength and the push up group was more effective for athletes with low arm muscle strength. Utilisation of elastic band (rubber) aids during uchikomi training is useful for developing hand grip strength, flexing joints, increasing movement speed and power in the limbs, and strengthening judoka's VO2Max endurance (Sugiharto) In addition to familiarising movement techniques, uchikomi training aims to develop judoka's physical fitness by performing repetitive movements (Posrikaew et al., 2018; Sogabe et al., 2015). The road uchikomi exercise has a better effect in improving the results of judo slams, so the coach or sports coach should choose the road uchikomi exercise in an effort to improve the results of judo slams. The advantages of uchikomi using bicycle tyre rubber are (1) Because bicycle tyres are made of rubber so that when doing uchikomi the rubber works like a spring that is able to pull back when doing uchikomi, (2) Uchikomi with bicycle tyre rubber trains physical components that combine two physical components at once, namely strength and speed or often referred to as power, (3) Rubber uchikomi can be done independently, (4) From an economic point of view, rubber uchikomi is easy to buy because the price is not too expensive (Suwarli, 2016). Therefore, this study shows that uchikomi tyre elastic is very useful for improving both physical ability and technical ability.

CONCLUSION

Based on the results of the research and the results of data analysis that has been done, the following conclusions are obtained. (1) There is a significant difference in effect between Uchikomi tyre elastic training and push ups on arm power of judo athletes in Bandar Lampung City, with a p-value of 0.009 < 0.05. The Uchikomi elastic tyre training group was better than the push up group with an average posttest difference of 0.37 metres. (2) There is a significant difference between athletes with high and low arm muscle strength on arm power of judo athletes in Bandar Lampung City, with a p-value of 0.003 <0.05. Athletes with high arm muscle strength are better than athletes with low arm muscle strength with an average posttest difference of 0.44 metres. (3) There is a significant interaction between Uchikomi tyre elastic training and push ups and arm muscle strength (high and low) on arm power of judo athletes in Bandar Lampung City, with a p-value of 0.002 <0.05. The results showed that the Uchikomi tyre elastic training group was a more effective method used for athletes with high arm muscle strength and the push up group was more effective for athletes with low arm muscle strength.

REFERENCES

1) Andalas, H. D. D., & Purwanto, S. (2019). Pengaruh latihan uchikomi osaekomi dan power lengan terhadap hasil osaekomi saat randori pada pejudo. *Jorpres (Jurnal Olahraga Prestasi)*, *15*(1), 1–13.
2) Callan, M., & Bountakis, G. (2022). How Expert Coaches Understand the Application of Rhythm in Judo. *The Arts and Sciences of Judo (ASJ)*.
3) Chen, L., Zhang, H., & Meng, L. (2018). Study on the influence of plyometric training on the explosive power of basketball players. *International Journal of Physical Education, Sports and Health*, *5*(3), 140–143.
4) Guillot, A., Kerautret, Y., Queyrel, F., Schobb, W., & Di Rienzo, F. (2019). Foam rolling and joint distraction with elastic band training performed for 5-7 weeks respectively improve lower limb flexibility. *Journal of Sports Science & Medicine*, *18*(1), 160.
5) Lampe, N., Kajmovic, H., Simenko, J., & Bečić, F. (2022). The Effects of Judo Rule changes on Contestants' Performance:

Paris Grand Slam Case Study. *The Arts and Sciences of Judo: An International Interdisciplinary Journal*.

6) Lopes, J. S. S., Machado, A. F., Micheletti, J. K., De Almeida, A. C., Cavina, A. P., & Pastre, C. M. (2019). Effects of training with elastic resistance versus conventional resistance on muscular strength: a systematic review and meta-analysis. *SAGE Open Medicine*, *7*, 2050312119831116.
7) Low, J. L., Ahmadi, H., Kelly, L. P., Willardson, J., Boullosa, D., & Behm, D. G. (2019). Prior band-resisted squat jumps improves running and neuromuscular performance in middle-distance runners. *Journal of Sports Science & Medicine*, *18*(2), 301.
8) Lubis, V. M. T., & Pambudi, R. A. (2021). Hubungan Tingkat Kekuatan Otot Dengan Prestasi Atlet Cabang Olahraga Judo Pada Pekan Olahraga Nasional (Pon) Xviii 2012 Di Riau. *Jurnal Ilmu Faal Olahraga Indonesia*, *1*(2), 58–63.
9) Nebahatqoru, M., Sagitarius, S., Purnamasari, I., & Novian, G. (2021). Enam minggu latihan resistance band untuk meningkatkan power tendangan atlet taekwondo poomsae. *Multilateral: Jurnal Pendidikan Jasmani Dan Olahraga*, *20*(3), 215–244.
10) Oh, J.-C. (2021). Effects of resistive jaw-opening exercise with elastic resistance bands on suprahyoid muscle activation and tongue strength in the elderly: a pilot study. *Folia Phoniatrica et Logopaedica*, *73*(5), 376–383.
11) Posrikaew, N., Suttitum, T., Pasurivong, O., & Wongputthichai, P. (2018). Effects of Uchikomi Exercise Training with Hand and Leg Weight Load on Pulmonary Function and Respiratory Muscle Strength in Thai Judo Athletes. *Srinagarind Medical Journal, 33*(2), 136–145.
12) Sogabe, A., Maehara, K., Iwasaki, S., Sterkowicz-Przybycien, K., Sasaki, T., & Sterkowicz, S. (2015). Correlation analysis between special judo fitness test and uchikomi shuttle run rest. *Proceedings of the 1st World Congress on Health and Martial Arts in Interdisciplinary Approach, HMA, Ed RM Kalina (Warsaw: Archives of Budo)*, 119–123.
13) Spracklin, K. F., Button, D., & Halperin, I. (2017). Looped band placed around Thighs increases EMG of gluteal muscles without hindering performance during squatting. *J Perform Heal Res*, *1*(10.25036).
14) Suwarli, S. (2016). Pengaruh metode uchikomi dan flexibility terhadap hasil bantingan pada pejudo Daerah Istimewa Yogyakarta. *Jurnal Keolahragaan*, *4*(1), 47–59.
15) Vicens-Bordas, J., Esteve, E., Fort-Vanmeerhaeghe, A., Bandholm, T., & Thorborg, K. (2018). Is inertial flywheel resistance training superior to gravity-dependent resistance training in improving muscle strength? A systematic review with meta-analyses. *Journal of Science and Medicine in Sport*, *21*(1), 75–83.
16) Yoon, D. H., Kang, D., Kim, H., Kim, J., Song, H. S., & Song, W. (2017). Effect of elastic band-based high-speed power training on cognitive function, physical performance and muscle strength in older women with mild cognitive impairment. *Geriatrics & Gerontology International*, *17*(5), 765–772.