

The Use of Junior Weight Vest on Arm Strength in *Junior Pencak Silat* Athletes

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Abstrak

Latihan beban untuk atlet junior tidak disarankan menggunakan alat berat di pusat kebugaran. Atlet junior sangat membutuhkan latihan beban, namun dengan menggunakan beban yang aman. Penelitian ini bertujuan untuk menganalisis penggunaan Junior Weight Vest (JWV) terhadap kekuatan otot lengan pada atlet Junior Pencak Silat. Jenis penelitian ini yaitu deskriptif kuantitatif, dengan desain eksperimen menggunakan pre-test dan post-test control group desain. Sampel penelitian ini terdiri dari 20 atlet Junior Pencak Silat yang dipilih secara acak dengan rentang usia 10-15 tahun. Metode yang digunakan dalam mengumpulkan data yaitu observasi, wawancara, dan instrumen. Instrumen yang digunakan dalam mengumpulkan data yaitu kuesioner. Analisis data dalam penelitian ini menggunakan analisis kuantitatif menggunakan analisis Uji t Paired Sample T Test dan ANAVA Satu Jalur. Hasil penelitian yaitu terdapat perbedaan pengaruh bagi yang menggunakan JWV terhadap kekuatan otot lengan atlet Junior Pencak Silat. Kedua, tidak adanya perbedaan pengaruh bagi yang tidak menggunakan JWV (Non-JWV) terhadap kekuatan otot lengan atlet Junior Pencak Silat. Ketiga, diperoleh perbedaan pengaruh pada kedua kelompok. Disimpulkan bahwa menggunakan JWV dalam latihan pencak silat memiliki hasil yang lebih baik dibandingkan yang tidak menggunakan JWV (Non-JWV). Implikasi penelitian ini diharapkan dapat menggunakan JWV untuk meningkatkan kemampuan fisik lainnya seperti kecepatan, kelincahan, power dan daya tahan

Kata kunci: Junior Weight Vest (JWV), Kekuatan Otot Lengan, Atlet Junior Pencak Silat

Abstract

Weight training for junior athletes is not recommended using heavy equipment at the fitness center. Junior athletes need weight training but use safe weights. This study analyzes the Junior Weight Vest (JWV) use on arm muscle strength in *Junior Pencak Silat* arts athletes. This type of research is descriptive quantitative, with an experimental design using a pre-test and post-test control group design. The sample of this study consisted of 20 randomly selected *Junior Pencak Silat* athletes with an age range of 10-15 years. The methods used in collecting data are observation, interviews, and instruments. The instrument used in collecting data is a questionnaire. Data analysis in this study used quantitative analysis using the Paired Sample T Test and Way ANOVA analysis. The study results show differences in the effect of those who use JWV on the arm muscle strength of *Junior Pencak Silat* athletes. Second, there is no difference in the effect of those who do not use JWV (Non-JWV) on the arm muscle strength of *Junior Pencak Silat* arts athletes. Third, there is a difference in the effect on the two groups. It was concluded that JWV in Pencak silat arts training had better results than those who did not use JWV (Non-JWV). The implications of this research are expected to be able to use JWV to improve other physical abilities such as speed, agility, power, and endurance.

Keywords: Junior Weight Vest (JWV), Arm Muscle Strength, *Junior Pencak Silat* Athletes

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1. INTRODUCTION

Indonesia has many unique types of sports, and this uniqueness characterizes the Indonesia. One of the sports that are in great demand by Indonesian people is Pencak silat. Pencak silat is a sport that also needs coaching, especially in the physical aspect and the sparring category. The sport of Pencak silat requires muscle strength, so various exercises are needed. One of the exercises that can be done is weight training. Weight training is one of the most important efforts to improve the physical abilities of athletes (Bompa, 2009). Weight training increases the muscles' ability to accept resistance so that the muscles become stronger (Sung et al., 2016; Tambing et al., 2020). For junior athletes, weight training is partially the same as for adult athletes. Weight training for junior athletes is not recommended using heavy gym equipment, such as dumbbells or complicated weight

machines. Junior athletes need weight training, but using a safe weight is sticking to the body as far as possible so that it is not dangerous and the weight can be adjusted (Sibte, 2003). The Weight vest is used for weight training. Arm strength is very important for Pencak silat athletes (Saputra, 2018); (Prasetyo & Prasetyo, 2022). Arm strength can be used for hitting, parrying or other movements (Murad, 2020); (Sung et al., 2016). Having arm strength is one element of physical ability that is needed.

However, every time you do physical activity, especially exercising, you face the possibility of injury, impacting physical activity, psychology, and achievement. In addition, many people who will learn or have already taken advanced Pencak silat need to stretch properly and correctly (K Halbatullah et al., 2019). Many training methods are monotonous, and athletes need more training time (Yuliana & Wahyudi, 2022). Endurance, strength, and arm muscle power are weaknesses that need improvement (Romadona, 2021; Sutini, 2018). So the ability of strength, endurance, and arm strength is the focus of improvement. An athlete is injured if the player does not have strong enough muscle strength to play (Apriantono et al., 2013; Suprpto et al., 2019). Weight training for junior athletes is not recommended using heavy equipment at the fitness center. Junior athletes need weight training but use safe weights. Therefore, weight training using the JWV is allegedly very important to increase the arm strength of junior Pencak silat athletes in Buleleng Regency.

The existence of weighted vests for children is very limited or even nonexistent. Based on the needs analysis, coaches and athletes need weighted vests. The weight attached to the body is made in such a way that it resembles clothing in the form of a vest designed in such a way that it has a certain weight according to the needs of junior athletes. Weight vests have been used as weight training since 1978, which was applied to soldiers in military education, by using vests in military training is proven to increase the strength of soldiers in their physical abilities. It is possible to apply the characteristics of a very safe vest to children (Brocken et al., 2020). Using aluminum cans as a raw material for this ballast vest is a green industry-based product development, so it is very helpful in reducing the impact of global warming due to aluminum can waste. The development of environmentally friendly weight vests for junior athletes was developed for three years under the name Junior Weight Vest (JWV). The findings of previous studies stated that training using rubber weights increased the speed of Pencak silat sickle kicks (Murad, 2020). An advanced flexibility training model in learning Pencak silat is feasible (Kholil Halbatullah et al., 2019). Many studies have related to training for the sport of Pencak silat. However, research related to using the Junior Weight Vest (JWV) on arm muscle strength in junior Pencak silat athletes at BNB Buleleng. This study aimed to analyze Weight Vest (JWV) use on arm muscle strength in BNB Buleleng junior Pencak silat athletes.

2. METHODS

This research is quantitative descriptive research, with an experimental design using a pre-test and post-test control group design. The sample for this study was 20 junior Pencak silat athletes in Buleleng Regency, with an age range of 10-15 years, with details of ten male athletes and ten female athletes, who were randomly divided into an experimental group of ten people using JWV and a control group of 10 students use their weight (Non-JWV). The study was conducted for 12 meetings to determine the effect of JWV on physical abilities in the form of arm muscle strength in junior Pencak silat athletes at BNB Buleleng. The instrument for measuring arm muscle strength uses a standard 30-second push-up test. Data analysis in this study used quantitative analysis using the Paired Sample T Test and One-way ANOVA analysis with the help of IBM SPSS 25.

3. RESULTS AND DISCUSSION

Results

Based on the results of experimental tests, 20 junior Pencak silat arts athletes at the Banyuning BNB Club, Buleleng Regency, used JWV for 1 hour of Pencak silat practice (from warm-up, core, and closing). Training is carried out three times a week at Singaraja City Park. The study was conducted using a pre-test and post-test control group design. As many as ten junior athletes in the experimental group used JWV in training, and ten people in the control group did not use JWV (Non-JWV). The weight vest used is a weight vest developed by the researchers for three years, and the weight of the JWV used is 1 Kg, as shown in [Figure 1](#).



Figure 1. Junior Weight Vest (JWV) with a Weight of 1 Kg

Before analysis, the data obtained in the Prerequisite Test were analyzed with the Kolmogorov-Smirnov Normality Test and homogeneity using the Levene Test. Based on the test results, the data obtained were declared normal with a significance score (α) $0.733 > 0.05$ and homogeneous with a significance score (α) $0.86 > 0.05$. The description of the data on the results of arm muscle strength in the experimental group using weight in the form of JWV is shown in [Table 1](#).

Table 1. Description of the Experimental Group Data using the JWV Weight

Variable	The Experimental Group uses the JWV Weight	
	Pre-Test	Post-Test
Number of Samples (N)	10	10
Mean (M)	18.80	24.40
Standard Deviation (SD)	2.859	2.836
Variance (r)	8.178	8.044
Maximum score	24	30
Minimum score	16	20
Sum	188	244
Range	8	10

[Table 1](#) shows that the Mean (M) score in the pre-test was $M = 18.80$; in the post-test, it was $M = 24.40$. Meanwhile, the standard deviation (SD) for the pre-test is $SD=2.859$, and for the post-test is $SD=2.836$. Furthermore, to find out the difference in the effect on the experimental group (the group using the JWV weight) between the pre-test and post-test, it was tested through a t-test using the Paired Sample T-Test via SPSS IBM 25 at a significance level (α) 0, 05. Based on the test, the results are obtained in [Table 2](#).

Table 2. The Results of the Paired Sample T-Test for the Experimental Group using the JWV Weight

Model	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
JWV Pre-Test-JWV Post-Test	-5.600	2.1705	0.6863	-7.1526	4.0473	-8.159	9	0.000

Based on Table 2 shows the tcount = -8.159 and the calculated significance score = 0.000. It shows that if tcount > ttable, and if the significance score (α) < 0.05, then there is a different effect on the use of JWV on arm muscle strength. From the data obtained tcount = (-) 8.159 > from ttable = 2.228 and a significance score (α) = 0.000 < 0.05, so this means that the treatment using JWV weights in Pencak silat training has a different effect on arm muscle strength. A description of the data on the results of arm muscle strength in the control group using self-weighting/not using weights in the form of JWV is shown in Table 3.

Table 3. Description of the Control Group Data that does not use the JWV Weight

Variable	The Control Group did not use JWV Weight (Non-JWV)	
	Pre-Test	Post-Test
Number of Samples (N)	10	10
Mean (M)	18,70	19,00
Standard Deviation (SD)	2,451	2,160
Varian (r)	6,011	4,667
Maximum score	22	23
Minimum score	14	15
Sum	187	190
Range	8	8

Table 3 shows that the Mean (M) score in the pre-test was M = 18.70, and in the post-test, it was M = 19.00. Meanwhile, the pre-test's standard deviation (SD) is SD=2.451, and the post-test is SD=2.160. The overall increase in the results of arm muscle strength (pre-test and post-test) for those using the JWV can be seen in Figure 2.

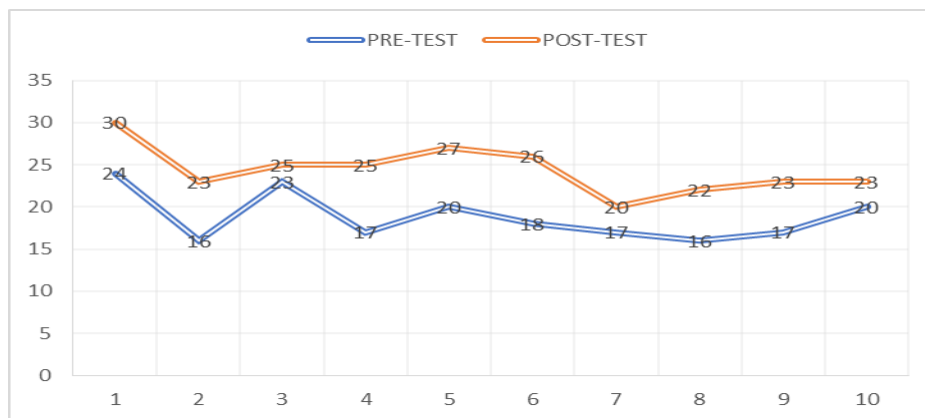


Figure 2. The Increase in the Results of Pre-Test and Post-Test Arm Muscle Strength in Samples using JWV

Analysis to determine the difference in the effect on the control group (the group that does not use the JWV weight) between the pre-test and post-test, then is tested through a t-test using the Paired Sample T Test via IBM SPSS Version 25 at the significance level (α) 0.05. Based on the test, the results are obtained in Table 4.

Table 4. The Results of the Paired Sample T-Test for the Control Group that did not use the JWV Weight (non-JWV)

Model	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
NONJWV Pre-Test	-0.300	1.0593	0.3350	-1.0578	0.4578	-0.897	9	0.394
NONJWV Post-Test								

Table 4 shows the t-count = -0.897 and the arithmetic significance score = 0.394. It shows that if t-count > from t-table, and if the significance score (α) < 0.05, there is a difference in the effect on the treatment given. From the data obtained t-count = (-) 0.1897 < from t-table = 2.228 and a significance score (α) = 0.394 > 0.05, so this means that giving treatment using self-loading or not using JWV weights in Pencak silat arts training did not have a different effect on the strength of the arm muscles. The overall increase in arm muscle strength (pre-test and post-test) for those who do not use the JWV can be seen in Figure 3.

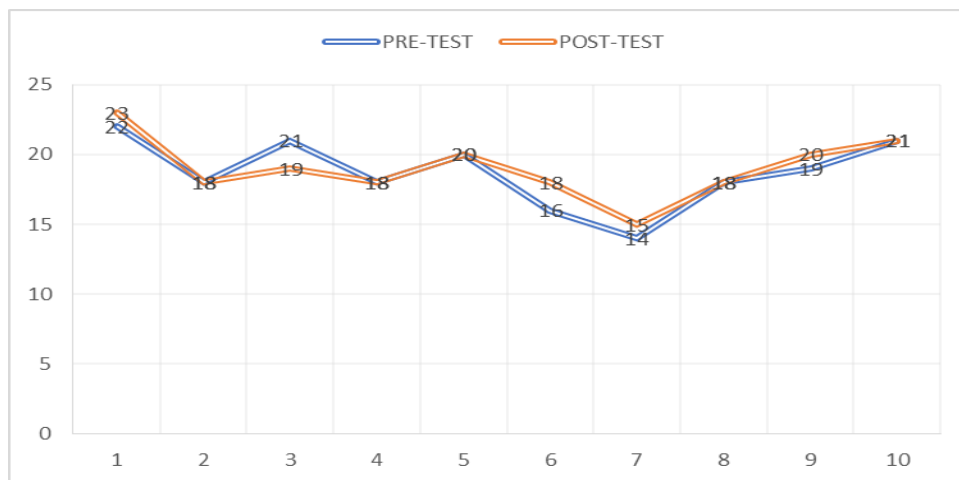


Figure 3. The Increase in the Results of Pre-Test and Post-Test Arm Muscle Strength in Samples that did not use JWV

The difference in the effect of the two treatments between those using the JWV and those not using the JWV has used a one-way ANOVA test with SPSS IBM Version 25 at a significance level (α) < 0.05. The results of the one-way ANOVA test can be seen in Table 5.

Table 5 shows the calculated F score = 22.941, while the significance score (α) = 0.000. When compared with the score of F-Table = 3.592, then F-Count (22.941) > F-Table (3.592) means that there is a difference in the effect of the two groups. In this regard, the significance score (α) is 0.000 < 0.05, so it can be interpreted that the two groups have significantly different effects because there were differences in the effect of the two groups.

Further tests or comparative tests were carried out using the Bonferroni Test described in Table 6.

Table 5. Results of One-Way ANOVA Test of Arm Muscle Strength

Source	Type II Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	145.80	1	145.800	22.941	0.000
Intercept	9417.80	1	9417.80	1481.82	0.000
JWV	145.800	1	145.800	22.941	0.000
Error	114.400	18	6.356		
Total	9678	20			

Table 6. Bonferroni Follow-Up Test Results on the use of JWV

(I) JWV	(J) JWV	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
Using JWV	Do not use JWV	5.400	1.127	0.000	3,031	7.769
Do not use JWV	Using JWV	-5.400	1.127	0.000	-7.769	-3.031

Table 5 shows the Bonferroni Follow-up Test from the Mean Difference (I-J) results. A comparison is obtained, namely for training that uses JWV and those that do not use JWV (Non-JWV) of 5.400, while comparisons that do not use JWV (Non-JWV) with those that use a JWV of -5,400. From these results, it can be concluded that training using JWV is better than not using JWV on the arm muscle strength of junior Pencak silat athletes. JWV use training is done through a systematic training program 12 times (3 times a week) for 1 hour during training (warm-up, core, and closing exercises). The training programs implemented for junior Pencak silat arts athletes who use JWV and those who do not use JWV/Non-JWV (Conventional) are described in Table 7 and Figure 4.

Table 7. Training Program for Using JWV and Non-JWV (Conventional)

Training Stage	Pencak Silat Micro (Daily) Training Program		
	Using JWV	Duration	Non-JWV (Conventional)
Warming up	<ul style="list-style-type: none"> • Warm-up Run 3 times around the field (using JWV) • Static warming up (using JWV) • Dynamic warming up (using JWV) 	10 Minutes	<ul style="list-style-type: none"> • Warm-up Run 3 times around the field (non-JWV) • Static Warming up (non-JWV) • Dynamic Warming up (non-JWV) • Strengthening (push-ups, sit-ups, scot jumps, back and forth running, etc.) (Non-JWV)
Core	<ul style="list-style-type: none"> • Practice punches, kicks, and Shadow. (Using JWV) • Practice punches, kicks, and Shadow in pairs with peers. (Using JWV) • Practice punches and 	45 Minutes for those using JWV and 60 Minutes	<ul style="list-style-type: none"> • Practice punches, kicks, and Shadow. (Non-JWV) • Practice punches, kicks, and Shadow in pairs with peers. (Non-JWV) • Punch training, kicking with a

Training Stage	Pencak Silat Micro (Daily) Training Program		
	Using JWV	Duration	Non-JWV (Conventional)
	kicking with a punching bag (pads). (Using JWV) • Independent practice in the art category/practice of art moves, using a knife, stick, etc. (using JWV)	for Non-JWV (Conventional)	punching bag (pads). (Non-JWV) • Self-training in the category of arts/artistic moves, using knives, sticks, etc. (Non-JWV)
Closing	• Muscle cooling down exercises. (Using JWV)	5 Minutes	• Muscle cooling down exercises. (Using JWV)



Figure 4. Use of JWV in Pencak Silat Training

Discussion

Based on the research results, several findings were obtained. First, there are differences in the effect of those using the JWV on the arm muscle strength of junior Pencak silat athletes. The use of weights in the form of JWV is a concept of weight training using weights attached to the athlete's body in the form of a vest containing weights called the Junior Weight Vest (JWV) (Gerhart et al., 2020). Using the JWV has increased muscle contraction in athletes because the weights in the JWV make the body contract more to support the weight. This contraction will physiologically force the muscles to work harder and expend more energy so that the intensity of the exercise and the principle of overweight training can be achieved. Increase in arm muscle strength in each athlete after using JWV in training. Junior athletes (12-16 years old) who train with weights will benefit their muscle abilities positively (Hasyati & Winarno, 2021; Yuliana & Wahyudi, 2022). Weight training for children does not break the rules and can be done according to the child's condition (Cahyono & Abdurrochim., 2022; Yusup et al., 2021). Endurance/weight-bearing exercises in children can improve physical abilities and performance in sports (Setiawati & Hadiana, 2016). In addition, using the JWV in training has trained the body to accept more weights than usual when not using the JWV. It makes the body adjust due to weight training to feel light when the JWV is released. With a light body, the athlete will feel easy in doing the exercise so that they will become stronger, faster, and more agile in the next exercise. That is why weight training using additional weight in the body is very important for children's age. Weight Vest can improve physical abilities and is safe to do (Falcão et al., 2020; Krakan et al., 2020). The benefits of weight vests are believed to be used as a physical training tool to improve athlete performance for running speed, jumping strength, and agility (Dharmadi et al., 2021).

Second, it was found that there was no difference in the effect of those who did not use JWV (Non-JWV) on the arm muscle strength of junior Pencak silat arts athletes. By not using the JWV, the body will contract as usual. There are no excessive contractions due to the weight. Contractions occur only due to strengthening exercises given in warm-up training sessions in the form of push-ups, sit-ups, scot jumps, back-and-forth running, and so on. Strengthening exercises can increase muscle ability but are limited to a minimal increase because the principle of being overweight or giving excess weight is not achieved (Juntara, 2019; Listiana & Isdaryono, 2019). The lack of improvement or even a decrease in the ability of the athlete's arm muscles by not using the JWV during training. The principle of being overweight greatly determines the progress of increasing one's strength abilities. Without weight training, you will not be able to increase your muscle mass, so by not increasing your muscle mass, you cannot increase your strength (Bayindir & Kolayış, 2015; Tambing et al., 2020). It is what happened that a group of junior athletes who trained without using the JWV could not increase their arm muscle strength.

Third, based on the one-way ANOVA test, it was found that using JWV in practicing Pencak silat had better results than those who did not use JWV (Non-JWV). It is very reasonable because, using the weight on the body (JWV), there is a contraction against the resisting force. So that it can involve strengthening and tightening of the muscles, which in the end the muscles will develop according to the resistance given in the weight training. Weight training is also recognized as absorbing oxygen in the body so exercise can be more efficient, improving muscle performance (Barnes et al., 2015; Tambing et al., 2020). Whereas this did not occur in the group that did not use JWV, the increase in arm muscle strength was minimal. As a result, the training carried out using the conventional model (Non-JWV) empirically still needed to improve the athlete's physical ability. Therefore, Pencak silat is expected to use weights training according to the athlete's ability to improve physical abilities significantly. It is recommended that coaches, sports teachers, parents, the community, sports organizations, and sports field leaders can believe that this study's results have measurable benefits in increasing arm muscle strength by using the Junior Weight Vest (JWV) in Pencak silat arts junior athletes.

4. CONCLUSION

The results showed differences in the effect of those using JWV on the arm muscle strength of junior Pencak silat athletes. There is no difference in the effect of those who do not use JWV (Non-JWV) on the arm muscle strength of junior Pencak silat athletes. The difference in the effect on the two groups and the follow-up test found that using JWV in Pencak silat training had better results than those who did not use JWV (Non-JWV). The implications of this research are expected to be able to use JWV to improve other physical abilities such as speed, agility, power, and endurance.

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