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The Effect Of Resistance Band Training And Ankle Weight Training On The Front Kick Speed Of Pencak Silat Athletes

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Keywords

Pencak Silat; Resistance Band; Ankle Weight; Front Kick Speed;

Abstract

This study aims to determine the effect of resistance band training and ankle weights on the front kick speed of pencak silat athletes at the Tri Gerak Sakti in North Jakarta. This study used a quantitative method with a quasi-experimental two-group pretest-posttest design. The study sample consisted of 12 female athletes divided into two groups, namely the resistance band training group (n = 6) and the ankle training group (n = 6). The instrument used was a 10-second front kick speed test. Data were analyzed using the Shapiro-Wilk normality test, homogeneity test, and paired sample t-test hypothesis testing with the help of SPSS version 22 at a significance level of 0.05. The results showed that both groups experienced an increase in average scores from pretest to posttest. The resistance band group increased from a mean of 20.33 to 23.67, while the ankle group increased from a mean of 19.83 to 22.67. The hypothesis test showed a significance value of 0.000 <0.05 in both groups, so that resistance band training and ankle weights had a significant effect on increasing front kick speed. In addition, resistance band training provides benefits in the moderately effective category with an average N-Gain value of 62.5% compared to Ankle Weight in the less effective category with an average N-Gain value of 53%. However, both training methods can be used as options in pencak silat training programs to improve the biomotor component of athletes' front kick speed.

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INTRODUCTION

Sport can be defined as an organized physical activity aimed at promoting and enhancing individuals' physical, mental, and social capacities (Utamayasa, 2020). Pencak silat in Indonesia is seen as a genuine cultural heritage of the nation that has not only developed domestically (Soedjatmiko, 2023). Pencak silat, as an indigenous Indonesian culture, exists not only for self-defense purposes but also to enhance its identity as a sport that develops fitness and physical potential in its practitioners. This martial art is used for both self-defense and offense when faced with threats (Mirfa'ani & Nurrochmah, 2022).

Sports achievement reflects an athlete's ability to achieve the best results in a competition, both individually and as a team (Aghna Nugraha et al., 2021). As interest grows from generation to generation, pencak silat has developed into a sport frequently competed in at various levels. When pencak silat was first competed in the 1973 National Games (PON) VII in Jakarta (Susanto et al., 2023), this sport experienced rapid development in terms of achievements. To date, as a forum to continue its achievements at the university level, especially in DKI Jakarta, the PPLM (Center for Cross-Student Training) has been established. PPLM DKI Jakarta, as one of the martial arts institutions, has proven successful in entering the DKI Jakarta Regional Training Center and the Indonesian National Training Center and has ultimately been able to compete in various international championships (Wardoyo, 2021).

Pencak Silat competitions are currently divided into five categories: sparring, singles, doubles, teams, and creative solo (Aga et al., 2023). The sparring category consists of three rounds, each lasting 2 minutes (both clean and dirty), where in each round the athlete must physically interact with their opponent, both attacking and defending (Mujahid & Subekti, 2021). This category is a contact sport, which requires good biomotor skills. An athlete with strong biomotor skills will be able to perform movements effectively and efficiently, which will ultimately improve their performance in competitions. Therefore, good biomotor skills are crucial to supporting performance in competitions. The biomotor components required in the Pencak Silat sparring category include endurance, strength, speed, coordination, and flexibility (Az-Zahra & Awan Hariyono, 2020).

The front kick is one of the main attack techniques that athletes must master in a match, this technique can be the key to an athlete's success in gaining points. According to (Suryadin et al., 2021), a front kick is a type of attack carried out using the feet and legs, with the direction of the trajectory towards the front. The body position faces forward, and the part that hits the target is the base of the inner toes or heel, with the target at the solar plexus. According to (Anhar et al., 2023), several steps in performing a front or straight kick include: a) Lifting the thigh forward in line with the hip, with the knee in a bent position so that there is anteflexion in the upper leg and retroflexion in the lower leg. b) Straightening the lower leg forward with the toes bent upwards. The part of the foot that hits the target is the tip of the foot; c) Pulling back the leg used for kicking while taking a position ready to face the opponent's attack.

Pencak Silat is highly complex and requires precise, accurate, and effective attacks to achieve targets (PALSA HETAMY et al., 2023). Several factors influence the development of an athlete's performance in the sport, one of which is the quality of training and coaching. Effective training is crucial for improving muscle quality, which is the foundation for athletes' ability to learn techniques more easily, reduce the risk of injury, and achieve optimal performance (Nabila et al., 2021). Regarding the front kick technique, this study will focus on developing basic front kick skills. To achieve this ability, structured and varied training is required, such as using aids such as resistance bands and ankle weights tailored to the basic movements of the front kick. Training is a learning process that is carried out repeatedly to improve an athlete's skills.

The Resistance Band is a highly effective and portable rubber fitness tool. The use of Resistance Bands in training regimens aims to increase the speed of front kicks (Waskito, 2021). In contrast, Ankle Weights are leg equipment made of fabric and filled with iron powder, designed to increase the strength and speed of the limb muscles (Lestari, 2023). The advantage of combining Resistance Band and Ankle Weight exercises lies in their ability to increase muscle strength and speed. These forms of training require athletes to have the ability to

regulate muscle force, synchronize movement rhythm, and maintain proper posture to optimize and increase the effectiveness of the training.

Research on the effect of Resistance Band training on kick speed is not an unprecedented effort. Through an examination of empirical data and discussion (Syarip et al., 2025) it can be concluded that "the combination of resistance band training and obstacle training is effective in increasing the speed of straight kicks of pencak silat athletes". Then (Haryani, 2022) also conducted research on the effect of Ankle Weight training on the speed of Mawashi Geri kicks, where this study concluded that "training using Ankle Weight and Rubber Resistance can increase the speed of Mawashi Geri kicks for Karateka Dojo Wadokai Gorontalo Province". In addition, research conducted by (Arifin, 2023) concluded that the results obtained from Resistance Band training significantly increased the speed of crescent kicks. Furthermore, research conducted by (Hartono & Abdulaziz, 2025) concluded that "Resistance Band and Ankle Weight training can have an effect on increasing strength if done effectively according to the training program in addition, training with rubber weights on the feet can increase the motivation and response of athletes in kicking quickly".

Tri Gerak Sakti National Silat School is known as a school that is always a regular in producing athletes both at the City Government and DKI Jakarta Provincial Government levels. Based on the results of the researcher's observations during the observation at the Tri Gerak Sakti National Silat School in North Jakarta, the researcher observed that in mastering the front kick technique the athletes were quite good, but it was seen that when sparring the athletes still lacked speed both when kicking the front kick, and not being fast enough in pulling back the kick so that the opponent could easily anticipate the kick, not only in the sparring session but this phenomenon was also seen by researchers when athletes were competing in championships, especially for female athletes so that the opponent could easily slam or avoid the kick.

To objectively determine an athlete's front kick speed, a scoring reference in the form of a kick speed category is required. Martial arts athletes' front kick speed categories are used as the basis for grouping athletes' abilities based on their front kick speed test scores. The front kick speed categories for martial arts athletes are presented in **Table 1.**

Table 1. Front Kick Speed Category

Male	Female	Category
> 25	> 24	Very Good
20 – 24	19 – 23	Good
17 – 19	16 – 18	Fairly Good
15 – 16	13 – 15	Not Good
< 14	< 12	Very Bad

Source: (Nuryastuti & Upara, 2023).

Based on the martial arts athletes' front kick speed categories, researchers then conducted initial observations through front kick speed tests on Pencak Silat athletes from Tri Gerak Sakti, North Jakarta. These initial observations aimed to determine the athletes' initial front kick speed before receiving specific training treatments.

Initial observations indicate that the front kick speed of Tri Gerak Sakti North Jakarta Pencak Silat athletes is still suboptimal. Some athletes are unable to display maximum front kick speed, either in the swing phase of the leg during the kick or in the retraction phase after the kick. This indicates that front kick speed still needs to be improved through a planned training program that aligns with the characteristics of pencak silat movements.

Front kick speed is a crucial component in pencak silat because it directly impacts the effectiveness of attacks and the athlete's ability to score points in matches. Athletes with good kicking speed are more capable of executing attacks quickly and are difficult for opponents to anticipate. Therefore, appropriate training methods are needed to improve the speed of a pencak silat athlete's front kick.

One training program that can be applied to increase the speed of the front kick is weight-based training. Resistance band and ankle weight training are forms of resistance training that add additional load to the leg muscles, which is expected to increase muscle strength and speed adaptation. However, the load characteristics of resistance bands and ankle weights differ, so they are thought to have different effects on increasing front kick speed in pencak silat athletes.

Based on the above-mentioned obser vations, it is crucial for athletes to combine Resistance Band and Ankle Weight training methodologies specifically designed to increase speed, thereby optimizing the efficacy of the forward kick results of the exercise.

METHODS

This study employed a quantitative approach using a quasi-experimental method. The research design implemented was a two-group pretest–posttest design structured as **Table 2.**

Table 2. Two Group Pretest Posttest Research Design

Group	Pretest	Treatment	Posttest
Eksperimen 1	O1	X1	O2
Eksperimen 2	O1	X2	O2

Source : (Sugiyono, 2020)

The population in this study were 12 Pencak Silat Tri Gerak Sakti athletes from North Jakarta. Because there were only 12 athletes, the sampling technique used total sampling so that all members of the population became the research sample. The instrument used in this study was a test using a front kick speed test for 10 seconds using peching, then the best score was taken in three trials. The tools used were peching, a meter, and a stopwatch (Hidayat et al., 2024).

The research procedure was carried out with the following steps: a. Giving a pretest (O) to both experimental groups before the research began to measure the initial conditions of the two experimental groups. Then, after the conditions of the two groups had been confirmed, the next step was to conduct the research. During the research, the first experimental group (X1) was given resistance band training treatment while the second experimental group (X2) was given ankle weight training treatment. Only after that, the two groups were given a posttest (O) to see the results.

Data on the athletes' front kick speed were collected using a standardized front kick speed test as the research instrument. The collected data were processed through inferential statistical analysis, specifically the paired sample t-test, to examine the effect of resistance band and ankle weight training on improving kick speed. Statistical processing was conducted using SPSS version 22 with a significance level set at 0.05. Initially, descriptive statistics were applied to determine the mean values of the data, followed by paired sample t-test analysis to evaluate the effectiveness of both training interventions in enhancing kick performance.

In addition to the paired t-test analysis, this study also used N-Gain analysis to determine the effectiveness of increasing front kick speed after resistance band and ankle weight training. N-Gain calculations were performed using SPSS version 22 with the formula N-Gain = (posttest – pretest) / (maximum score – pretest). The maximum score in the front kick test was set at 26 kicks based on the athlete's highest score in the 10-second test.

$$\text{N-Gain} = \frac{\text{Posttest-Pretest}}{\text{Skor Maksimal-Pretest}}$$

Figure 1. N-Gain Formula (Christman et al., 2024)

This research was conducted at the Tri Gerak Sakti Silat School in North Jakarta from November to December 2025.

RESULTS AND DISCUSSION

Prior to the application of the analytical techniques used, data related to each investigated variable were initially presented, with the research findings illustrated through the results of the pretest and posttest assessments. This involved the use of a measurement instrument administered three times for a duration of 10 seconds, where the maximum number of front kicks performed was recorded, and the best front kick was taken. The instrument functioned to compare the initial and final test scores following training with resistance bands and ankle weights, and the comparison results are presented in the following table:

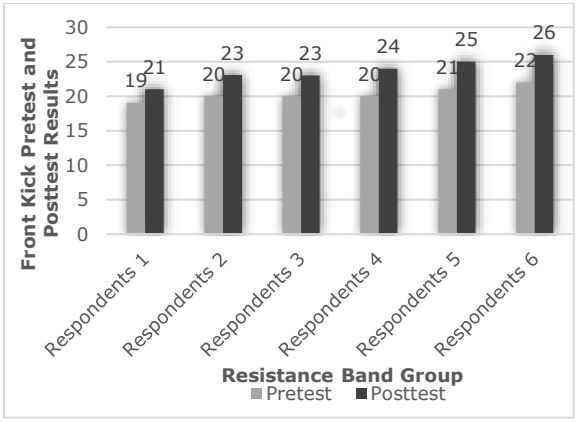

Figure 2. Resistance Band Group Front Kick Pretest and Posttest Results

The image above shows the results of data obtained before treatment (pre-test) and after treatment (post-test) in the resistance band group. The diagram shows the results of the 10-second front kick pre-test conducted by researchers on six Pencak Silat Tri Gerak Sakti athletes in the resistance band group. The numbers are as follows: 0 = very good, 6 = good, 0 = sufficient, 0 = poor, and 0 = very poor. Furthermore, the post-test results are as follows: 3 = very good, 3 = good, 0 = sufficient, 0 = poor, and 0 = very poor.

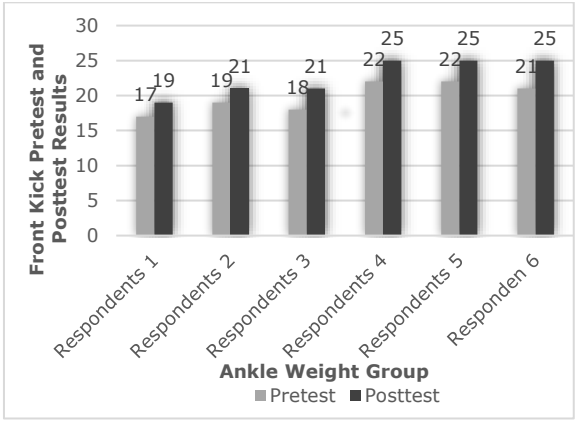

Figure 3. Front Kick Pretest and Posttest Results for the Ankle Weight Group

The image above shows the results of data obtained before treatment (pre-test) and after treatment (post-test) in the ankle weight group. The diagram shows the results of the 10-second front kick pre-test conducted by researchers on six Pencak Silat Tri Gerak Sakti athletes in the ankle weight group. The results were as follows: 0 = very good, 4 = good, 2 = sufficient, 0 = poor, and 0 = very poor. Furthermore, the post-test results were as follows: 3 = very good, 3 = good, 0 = sufficient, 0 = poor, and 0 = very poor.

From the two diagrams above in **Figures 1 and 2**, the results of the initial test (Pretest) that have been tested on 12 samples of female Pencak Silat Tri Gerak Sakti athletes were carried out before being given treatment. The smallest value of the initial test results (Pretest) was 17 front kicks and the largest value was 22 front kicks. While the data from the final test results (Posttest) conducted after being given resistance band and ankle weight training treatment, the smallest value of the final test results (Posttest) was 19 front kicks and the largest value was 26 front kicks. From the results of the two diagrams above, the average of the pretest and post-test results can be calculated using the **Table 3** and **Figure 4.**

Table 3. Table of Mean Pretest and Posttest Scores

No	Data	Mean Pretest	Mean Posttest
1	Resistance Band	20.33	23.67
2	Ankle Weight	19.83	22.67

Source: 2025 Research

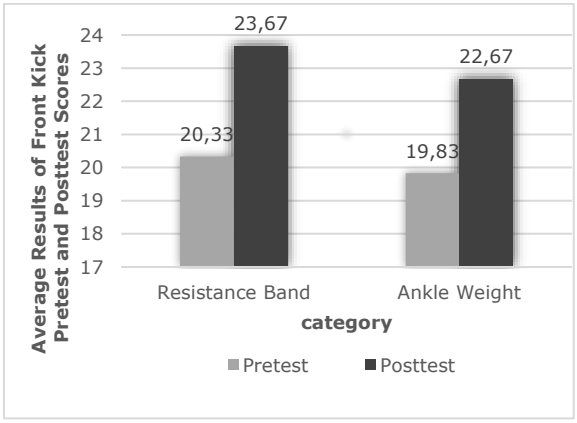

Figure 4. Mean Score Results of Front Kick Pretest and Posttest Scores

Based on the front kick speed category, the pretest results showed that most athletes were in the good category, while a small portion was still in the sufficient category. After the treatment given, the posttest results showed an improvement, where some athletes increased to the very good category and there were no more athletes in the sufficient category. Overall, the pretest showed 10 athletes (83%) were in the good category and 2 athletes (17%) in the sufficient category, while the posttest showed 6 athletes (50%) were in the very good category and 6 athletes (50%) in the good category to test the data is said to be normally distributed a normality test will be carried out.

Assessment of data normality in experimental investigations is a prerequisite that must be met before conducting hypothetical testing. The data evaluated consisted of pretest and posttest results derived from the front kick instrument, using the Shapiro-Wilk test with SPSS 22 software. According to the established testing criteria, the distribution is considered normally distributed if the significance value exceeds 0.05 ($p > 0.05$); conversely, if the significance value is below 0.05 ($p<0.05$), the distribution is classified as abnormal. The results of the front kick test normality data on Pencak Silat Tri Gerak Sakti athletes can be seen in the following table.

Table 4. Normality Test

Tests of Normality				
		Shapiro-Wilk		
	class	Statistic	df	Sig.
results	Pretest (Resistance Band)	.915	6	.473
	Posttest (Resistance Band)	.974	6	.918
	Pretest (Ankel Weight)	.892	6	.331
	Posttest (Ankel Weight)	.805	6	.065

Source: 2025 Research

Referring to the table above, the significance values obtained from the normality test the significance values obtained from both the resistance band and ankle weight groups in the pretest and posttest exceeded the 0.05 threshold (p > 0.05). Therefore, based on the established criteria, the data can be considered normally distributed.

Table 5. Homogeneity Test

Test of Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.
Results Posttest	Based on Mean	4.091	1	10	.071
	Based on Median	3.673	1	10	.084
	Based on Median and with adjusted df	3.673	1	9.674	.085
	Based on trimmed mean	4.071	1	10	.071

Source: 2025 Research

According to the homogeneity test results presented above, the obtained significance value was greater than 0.05 (p > 0.05), indicating that the data met the assumption of homogeneity. Since the data fulfilled the assumptions of normality and homogeneity, hypothesis testing was conducted using the paired sample t-test technique. This analysis aimed to determine whether resistance band and ankle weight training significantly influenced the athletes' front kick speed. The decision-making criteria were based on the significance value (Sig. 2-tailed): if the value was less than 0.05, the null hypothesis (H0) was rejected and the alternative hypothesis (Ha) was accepted; conversely, if the value exceeded 0.05, H0 was accepted and Ha was rejected.

Table 6. Resistance Band Hypothesis Test Results

Paired Samples Test									
		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	sig. (2-tailed)
Pair1	Pretest Rasistance Band - Posttest Rasistance Band	-3.333	.816	.333	-4.190	-2.476	-10.000	5	.000

Source: 2025 Research

Based on the results of the table calculations above, Sig (2-tailed) was obtained 0.000 < 0.05 and because the t-count was 10,000 > t-table = 2.571 and the significant value was <0.05,

then Ho was rejected, which means that "there is a significant influence between resistance band training on the speed of front kicks in Pencak Silat Tri Gerak Sakti athletes".

Table 7. Ankle Weight Hypothesis Test Results

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pretest Ankel Weight - Posttest Ankel Weight	-2.833	.753	.307	-3.623	-2.043	-9.220	5	.000

Source: 2025 Research

Based on the results of the table calculations above, Sig (2-tailed) was obtained 0.000 < 0.05 and because the t-count was 9,220 > t-table = 2,571 and the significant value was < 0.05, then Ho was rejected, which means that "there is a significant influence between ankle weight training on the speed of front kicks in Pencak Silat Tri Gerak Sakti athletes".

Table 8. Front Kick Speed N-Gain Test Results

Exercise Group	Mean N-Gain (%)	N-Gain Minimum	N-Gain Maxsimum	Effectiveness Category
Resistance Band	62,5%	28,6%	100%	Quite Effective
Ankle Weight	53%	22%	80%	Less Effective

Source: 2025 Research

Based on calculations using SPSS 22, the average N-Gain for the resistance band training group was 62.5%, which is considered quite effective. Meanwhile, the ankle weight training group achieved an average N-Gain of 53%, which is considered less effective. These results indicate that both training methods can increase the speed of athletes' front kicks, but resistance band training has a higher level of effectiveness than ankle weight training.

This study was conducted to examine the extent of improvement in the front kick performance of Pencak Silat Tri Gerak Sakti athletes following the implementation of resistance band and ankle weight training programs. Based on the results of data analysis, pre-test and post-test data were obtained from resistance band and ankle weight training, from these results a descriptive analysis was carried out and it was found that the results of the average pre-test and post-test training using resistance bands were 20.33 for the pre-test and 23.67 for the average post-test results. While in ankle weight training, the results of the descriptive analysis were 19.83 for the pre-test and 22.67 for the post-test. In the results of this study, it can be categorized as good pre-test results of 83% which amounted to 10 athletes while the sufficient category was 17% which was 2 athletes, and the results of the post-test category were 50% for the very good category which was 6 athletes and 50% for the good category, which was 6 athletes.

After conducting a comprehensive evaluation of the pretest and posttest data, normality testing was carried out using the Shapiro-Wilk test. After the data was normally

distributed, hypothesis testing was continued using the paired sample T test and produced a significant value of 0.000 <0.05, so Ho was rejected and Ha was accepted. The normality test results indicated that the data were normally distributed. Furthermore, the paired sample t-test yielded a significance value of 0.000, which was less than 0.05. Accordingly, the null hypothesis (H0) was rejected and the alternative hypothesis (Ha) was accepted, confirming that resistance band and ankle weight training had a significant effect on improving the athletes' front kick speed. From these data, it can be concluded that there is a significant influence of resistance band and ankle weight training on the speed of the front kick of Pencak Silat Tri Gerak Sakti North Jakarta athletes.

The paired sample t-test analysis demonstrated that resistance band training significantly improved the speed of the athletes' front kicks. This is evidenced by the Sig. (2-tailed) value of 0.000 which is smaller than 0.05. In addition, the t-count value of 10,000 is also greater than the t-table of 2.571. Because the significance value is below 0.05, the null hypothesis (Ho) is rejected. Thus, it can be concluded that "There is a significant effect between resistance band training on front kick speed in Pencak Silat Tri Gerak Sakti athletes". (Paulauskas et al., 2025) Resistance-based training can significantly increase kick speed in martial arts athletes. In addition, research by (Stanković et al., 2025) shows that training using elastic bands can improve speed and coordination performance in game sports athletes. (Yan et al., 2025) in their meta-analysis explained that variable forms of resistance training (including the use of elastic bands) often provide better increases in leg power, because kick speed is highly dependent on the explosive power of the leg muscles, so this adaptation contributes directly to increasing front kick speed.

The results of data analysis using paired sample t-test showed that ankle weight training had a significant effect on increasing the speed of athletes' front kicks. This finding is supported by a Sig. (2-tailed) value of 0.000, which is below the 0.05 significance level. Furthermore, the calculated t-value (9.220) exceeds the critical t-table value (2.571), indicating statistical significance. Therefore, the null hypothesis (Ho) is rejected, confirming that "ankle weight training significantly improves the front kick speed of Pencak Silat Tri Gerak Sakti athletes". The use of ankle weights is a simple and effective method to increase the intensity of training in locomotor movements (Polechoński et al., 2023). (Akatsu et al., 2022) Ankle Weight is used as a practical way to add external loads. A comparative study by (Yan et al., 2025) in Applied Sciences showed that the form of external resistance applied to the lower extremities contributes significantly to the explosive power component which plays a major role in front kick speed.

The statistical analysis indicated a vari- ation in effectiveness between resistance band training and ankle weight training. In the resistance band training group, the t-test value was 10,000, while the t-table value was 2.571. Because the t-test was greater than the t-table, it can be stated that the effect is significant. Meanwhile, in the ankle weight training group, a significant effect was also found. The t-test value of 9,220 was higher than the t-table value of 2.571, so it can be concluded that there is a significant difference because the t-table <t-test. The mean improvement observed in the resistance band group (3.33) was greater than that recorded in the ankle weight group (2.83). The findings in this study are consistent with previous research which stated that training using resistance bands and ankle weights can improve the kicking ability of martial arts athletes (Tarigan et al., 2022).

The N-Gain test results showed that resistance band training was more effective than ankle weight training in increasing front kick speed. This is because resistance bands provide elastic resistance that matches the kicking movement pattern, thereby improving coordination, muscle contraction speed, and specific movement control. Meanwhile, the use of ankle weights tends to increase the external load on the leg, but adaptation to increased movement speed is not as optimal as elastic resistance. Therefore, resistance bands are more effective in a biomotor training program for kicking speed in pencak silat athletes.

CONCLUSION

This research was conducted to examine the influence of resistance band and ankle weight training programs on enhancing the front kick speed of Pencak Silat Tri Gerak Sakti athletes in North Jakarta. The results showed that both training methods had a significant effect on increasing the speed of front kicks of athletes, evidenced by a significance value (Sig. 2-tailed) of 0.000 <0.05. through the Paired Sample T-Test, where the resistance band group obtained a t-count value of 10,000 and the ankle weight group 9,220, both of which were greater than the t-table of 2,571. Resistance band training showed an average increase from 20.33 in the pretest to 23.67 in the posttest, while ankle weight training increased from 19.83 to 22.67. The results showed that the effect of Resistance Band training was higher than Ankle Weight, a greater average increase in the posttest in the Resistance Band group (3.33) compared to Ankle Weight (2.83). In addition, the t-value of the resistance band group (10,000) was slightly greater than that of ankle weight (9,220), so the resistance band showed a higher increase.

Based on the N-Gain analysis, resistance band training is included in the fairly effective category (62.5%), while ankle weight training is included in the less effective category (53%) in increasing the speed of front kicks of pencak silat athletes. Thus, resistance band training has a greater effect than ankle weights in increasing front kick speed in pencak silat athletes. Therefore, resistance band and ankle weight training can be applied as part of a training program to improve the biomotor component of speed, particularly in pencak silat.

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