



The Effect Of Rubber Resistance Band Training On Basic Crescent Kick Tehniques

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ABSTRACT

This research is motivated by the importance of mastering the crescent kick technique in pencak silat, especially for FIKK UNM students who are being prepared as future educators, coaches, and sports practitioners. In practice, students are still found to be unable to perform crescent kicks quickly, powerfully, in balance, and precisely according to the principles of basic pencak silat techniques. One factor suspected of influencing this condition is the lack of leg muscle strengthening exercises specific to kicking movements. Therefore, this study aims to determine the effect of resistance band training on the basic crescent kick technique in FIKK UNM students. This study used a quantitative experimental method with a pretest-posttest design. The research sample consisted of 20 students divided into an experimental group and a control group, each consisting of 10 people. The experimental group was given resistance band training, while the control group underwent regular training. The research instrument used a crescent kick technique ability test with assessment based on the number and quality of kicks within a specified time. The results of the descriptive analysis showed that the experimental group experienced an increase in the average score from 17.8000 in the pretest to 20.2000 in the posttest, with a difference of 2.4000 points. Meanwhile, the control group increased from 17.3000 to 18.6000, with a difference of 1.3000 points. The results of the paired sample t-test showed a t-count value of 14.697 > t-table 1.833 with a significance of 0.000 < 0.05. Thus, it can be concluded that resistance band training has a positive and significant effect on improving the basic technique of crescent kicks in FIKK UNM students.

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INTRODUCTION

Sport has a strategic role in Indonesian society because it is not only practiced as recreation and a healthy lifestyle activity, but also developed as a medium for achievement, character formation, and national identity. In the context of national sport development, the Indonesian Government emphasizes that sport achievement must be nurtured through systematic, gradual, sustainable, and science-based programs supported by sport science and technology (Government of Indonesia, 2022). This policy direction is highly relevant to pencak silat, an Indonesian martial art that integrates self-defense, sport, art, spirituality, discipline, and moral values. Since pencak silat has also been recognized as part of Indonesia's intangible cultural heritage, its development in higher education should not only preserve tradition but also strengthen evidence-based performance training (UNESCO, 2019; Ediyono et al., 2023).



In pencak silat competition, kicking techniques are decisive because they produce strategic points when executed with speed, accuracy, balance, and proper timing. One of the most frequently used attacking techniques is the tendangan sabit or crescent kick. This technique requires coordinated movement from the stance, hip rotation, knee lift, lower-leg swing, foot trajectory, impact direction, and recovery phase. However, preliminary observations among FIKK UNM students indicate that many students have not achieved optimal crescent kick performance. The main problems appear in limited leg muscle power, unstable balance during the kicking phase, slow execution, poor hip rotation, and insufficient technical consistency when the kick is performed repeatedly within a specified time. Similar findings have been reported in previous studies showing that leg muscle strength, explosive power, balance, agility, and coordination are closely related to kick speed and crescent kick performance in pencak silat athletes (Sahril, 2019; Firmanto et al., 2023; Hadisan et al., 2024; Islam et al., 2025; Ahmad et al., 2026). Therefore, the weakness of crescent kick technique among students should not be treated only as a technical error, but as a training problem requiring an appropriate physical-conditioning intervention.

Recent sport science literature indicates that kicking performance in martial arts is strongly influenced by neuromuscular ability, lower-limb power, movement efficiency, and biomechanical coordination. Biomechanical studies show that effective martial arts kicking depends on proximal-to-distal sequencing, hip rotation, knee extension velocity, trunk stability, and center-of-mass control (Gavagan & Sayers, 2017; Vagner et al., 2023; Karo-Karo et al., 2023; Maghribi et al., 2026). In pencak silat, the crescent kick requires a rapid transfer of force from the supporting leg and hip toward the attacking foot, making explosive leg power and dynamic balance essential components of performance (Pratama & Candra, 2021; Fuady et al., 2026).

Resistance band training has become a practical method in sport training because it provides elastic resistance, adjustable load, movement-specific stimulus, and relatively low equipment cost. Systematic reviews and meta-analyses have shown that elastic resistance training can improve muscular strength, lower-limb explosive power, sprint performance, change-of-direction ability, and neuromuscular activation (Lopes et al., 2019; Makaruk et al., 2024; Rong et al., 2025; Stanković et al., 2025; Mănescu et al., 2025). In martial arts, elastic resistance training has been reported to improve roundhouse kick velocity, impact scoring, muscle strength, and specific physical performance in taekwondo athletes (Paulauskas et al., 2025). These findings conceptually support the use of resistance bands for crescent kick training because the tool can create additional load along the same direction as the kicking movement.

Empirical studies in pencak silat also support this approach. Rahman et al. (2025) found that resistance band training significantly improved sabit kick speed after a structured intervention. Aziz et al. (2025) reported that both resistance band and ladder drill training increased crescent kick speed, but resistance band training showed stronger effectiveness. Similar studies also confirmed positive effects of resistance band training on sabit kick speed and kicking outcomes among pencak silat athletes (Harahap & Mahfud, 2023; Rezeki et al., 2025; Prasetiawan et al., 2025; Rozzaq & Irawan, 2026; Putra & Wahid, 2026; Togala, 2024). These results indicate that resistance band training is not only relevant for general strength development, but also suitable for technique-specific martial arts performance.

Although previous studies have examined the relationship between leg muscle strength, balance, and crescent kick ability, most of them focused on school athletes, club athletes, or extracurricular participants. Studies involving university students, especially students of the Faculty of Sport and Health Sciences at Universitas Negeri Makassar, remain limited. This gap is important because FIKK UNM students are future sport educators, coaches, and practitioners who are expected to master both theoretical and practical aspects of pencak silat training. Another gap is that many studies have measured kick speed as the main outcome, while fewer studies have examined crescent kick technique as an integrated performance involving movement quality, execution speed, balance, and repetition within a determined time. In addition, several training programs still rely on conventional repetition without progressive external resistance, although recent evidence suggests that movement-specific resistance can stimulate neuromuscular adaptation more effectively (Suchomel et al., 2018; Lopes et al., 2019; Stanković et al., 2025).

Therefore, research on rubber resistance band training for crescent kick technique among FIKK UNM students is necessary to fill the empirical and contextual gap. This study is expected to strengthen the evidence that a simple, accessible, and movement-specific training tool can improve the quality of pencak silat kicking technique in a university learning and training environment.

This study aims to determine the effect of rubber resistance band training on the crescent kick technique among FIKK UNM students. Specifically, this research seeks to analyze whether structured resistance band exercises can improve students' ability to perform the crescent kick more quickly, powerfully, accurately, and technically correct within the time determined by the researcher. The novelty of this study lies in its focus on university-level pencak silat learning, the use of resistance band training as a technique-specific intervention, and the integration of physical-conditioning principles with technical performance assessment. Unlike general strength training, resistance band exercises can be designed to follow the actual movement pattern of the crescent kick, thereby training the muscles, joints, and coordination pathways that are directly used during kicking execution.

In conclusion, the crescent kick is a critical technique in pencak silat that requires the integration of leg power, balance, coordination, speed, and technical precision. The problems observed among FIKK UNM students indicate the need for a structured training intervention that is practical, measurable, and scientifically grounded. Based on recent empirical evidence, rubber resistance band training has strong potential to improve crescent kick performance because it provides progressive elastic resistance while maintaining the specificity of the kicking movement. Therefore, this study is expected to contribute both theoretically to sport training science and practically to pencak silat learning and coaching at the higher education level.

METHODS

This study employed a quantitative experimental method using a one-group pretest-posttest design. The experimental method was selected because the main objective of the study was to examine the effect of a specific treatment, namely rubber resistance band training, on students' crescent kick technique in pencak silat. In sport science research, an experimental approach is considered appropriate when researchers intend to test whether a structured intervention produces measurable changes in physical or technical performance (Daniel & Harland, 2017; Creswell & Creswell, 2018). The pretest-posttest design was used to compare participants' kicking performance before and after the training program, allowing the researcher to identify improvement caused by the intervention.

The population of this study consisted of students of the Faculty of Sport and Health Sciences, Universitas Negeri Makassar. The sample involved 20 students selected through purposive sampling. This sampling technique was used because the participants had to meet specific criteria, namely being physically healthy, actively participating in pencak silat practice, and being willing to follow the full resistance band training program. Purposive sampling is commonly applied in sport intervention studies when participants are selected based on technical readiness, training relevance, and accessibility to the research setting (Cohen et al., 2018; Thomas et al., 2022).

The independent variable in this study was rubber resistance band training, while the dependent variable was crescent kick technique. The treatment was designed to improve kicking speed, leg muscle power, balance, and movement coordination. Resistance band training was chosen because elastic resistance can provide progressive loading, stimulate neuromuscular adaptation, and support movement-specific strength development (Lopes et al., 2019; Stanković et al., 2025). Previous studies also reported that resistance band exercises significantly improved kick speed and martial arts performance, particularly in crescent kick and roundhouse kick movements (Togala, 2024; Rahman et al., 2025; Aziz et al., 2025; Paulauskas et al., 2025).

Data collection was conducted in three stages. First, a pretest was administered to measure students' initial crescent kick ability before treatment. Second, participants received rubber resistance band training through repeated crescent kick movements using elastic resistance and kicking targets. The kicking test was conducted by counting the number of technically correct kicks performed within 30 seconds, with scoring ranging from 10 to 20 points according to performance

quality and kick frequency. Third, a posttest was administered after the treatment period to determine changes in students' crescent kick technique.

The data were analyzed using descriptive and inferential statistics. Descriptive statistics were used to calculate mean, standard deviation, minimum, and maximum scores. Before hypothesis testing, normality testing was conducted to ensure that the data met parametric assumptions. The main hypothesis was tested using a paired-sample t-test to determine whether there was a significant difference between pretest and posttest scores. In addition, simple correlation and regression analysis were used to examine the strength of the relationship and the contribution of resistance band training to crescent kick performance. All statistical analyses were processed using SPSS with a significance level of 0.05.

RESULTS AND DISCUSSION

Result

This section presents the empirical findings regarding the effect of rubber resistance band training on the crescent kick technique among FIKK UNM students. The data were analyzed in three stages: descriptive statistical analysis, normality testing, and hypothesis testing using a paired-sample t-test. The descriptive analysis was conducted to provide an initial overview of the pretest and posttest scores in both the experimental group and the control group. Meanwhile, the normality test was used to determine whether the data met the assumptions for parametric testing.

Descriptive Statistical Analysis

The descriptive statistical results of the crescent kick technique scores are presented in Table 1.

Table 1.
Descriptive Statistics of Crescent Kick Technique Scores

Variable	N	Range	Min.	Max.	Sum	Mean	Stdv
Pretest crescent kick – resistance band group	10	4.00	16.00	20.00	178.00	17.8000	1.47573
Posttest crescent kick – resistance band group	10	5.00	18.00	23.00	202.00	20.2000	1.93218
Pretest – control group	10	6.00	14.00	20.00	173.00	17.3000	2.35938
Posttest – control group	10	7.00	14.00	21.00	186.00	18.6000	2.63312

Based on Table 1, the experimental group that received rubber resistance band training showed an increase in the mean score from 17.8000 in the pretest to 20.2000 in the posttest. The mean improvement was 2.4000 points, indicating a clear increase in students' crescent kick technique after the intervention. The minimum score also increased from 16.00 to 18.00, while the maximum score increased from 20.00 to 23.00. This result suggests that the resistance band training program was able to improve not only the average performance but also the lower and upper performance levels of the participants.

In the control group, the mean score increased from 17.3000 in the pretest to 18.6000 in the posttest, with a mean difference of 1.3000 points. Although the control group also showed improvement, the increase was smaller than that of the resistance band group. Descriptively, this finding indicates that students who received rubber resistance band training experienced a stronger improvement in crescent kick technique than students in the control group.

Normality Test

Before conducting the hypothesis test, a normality test was performed using the Kolmogorov-Smirnov and Shapiro-Wilk tests. The results are shown in Table 2.

Table 2.
Normality Test Results

Variable	Kolmogorov-Smirnov		Shapiro-Wilk		α	Interpretation
	Statistic	Sig.	Statistic	Sig.		
Resistance band training group	0.233	0.133	0.881	0.136	0.05	Normal
Control group	0.219	0.191	0.846	0.051	0.05	Normal

Table 2 shows that the data in the resistance band group were normally distributed. The Kolmogorov-Smirnov significance value was 0.133, and the Shapiro-Wilk significance value was 0.136. Both values were higher than 0.05, meaning that the data met the assumption of normality. Similarly, the control group also showed normal distribution, with a Kolmogorov-Smirnov significance value of 0.191 and a Shapiro-Wilk significance value of 0.051. Since all significance values were greater than 0.05, the data were considered normally distributed. Therefore, parametric testing using the paired-sample t-test was appropriate for testing the research hypothesis.

Hypothesis Testing

The paired-sample t-test was used to examine whether there was a significant difference between the pretest and posttest scores in the resistance band training group. The results are presented in Table 3.

Table 3.
Paired-Sample t-Test of the Resistance Band Group

Group	Test	Mean	Mean Difference	t-count	df	Sig. (2-tailed)	t-table
Resistance band group	Posttest	20.2000	2.40000	14.697	9	0.000	1.833
	Pretest	17.8000					

The paired-sample t-test showed that the t-count value was 14.697, while the t-table value was 1.833. Since the t-count was higher than the t-table value, and the significance value was 0.000, which was lower than 0.05, the null hypothesis was rejected. This means that there was a significant effect of rubber resistance band training on the crescent kick technique among FIKK UNM students.

The mean difference of 2.4000 points demonstrates that the students' crescent kick technique improved after participating in the rubber resistance band training program. This improvement can be understood through the principle of movement-specific resistance training. During the training process, the elastic resistance provided by the band required the students to produce greater force during the kicking movement. As a result, the muscles involved in the crescent kick, especially the hip flexors, quadriceps, hamstrings, gluteal muscles, and supporting leg muscles, were stimulated more intensively. This condition helped students perform the crescent kick with better speed, power, balance, and technical control.

Overall, the findings indicate that rubber resistance band training is an effective exercise method for improving crescent kick technique in pencak silat. The increase in posttest scores, the normal distribution of the data, and the significant paired-sample t-test result all support the conclusion that the training intervention produced a meaningful improvement. Therefore, the research hypothesis stating that rubber resistance band training has a significant effect on the crescent kick technique among FIKK UNM students is accepted.

Discussion

The findings of this study demonstrate that rubber resistance band training had a positive and statistically significant effect on the crescent kick technique among FIKK UNM students. The paired-sample t-test in the experimental group showed a t-count value of 14.697, which was higher than the t-table value of 1.833, with a significance value of $0.000 < 0.05$. This result confirms that the null hypothesis was rejected and the research hypothesis was accepted. In practical terms, the mean score increased from 17.8000 in the pretest to 20.2000 in the posttest, with a mean difference of 2.40000 points. Although the control group also improved from 17.3000 to 18.6000, the increase of 1.3000 points was lower than that of the resistance band group. Therefore, the improvement observed in the experimental group cannot be interpreted merely as a natural learning effect, but as a meaningful training adaptation produced by the rubber resistance band intervention.

This finding is consistent with the principle of specificity in sport training. The crescent kick in pencak silat is not only a simple leg swing, but a complex attacking movement that requires stance stability, hip rotation, rapid knee lifting, lower-leg acceleration, foot trajectory control, and quick recovery after impact. Resistance band training is relevant to this movement because it provides external elastic resistance along the kicking path, forcing the athlete to produce greater force while

maintaining the technical structure of the kick. According to Bompa and Buzzichelli (2019), Haff and Triplett (2016), and Suchomel et al. (2018), specific resistance training can improve performance when the direction, rhythm, and muscular demands of the exercise resemble the target sport movement. In this study, students repeatedly performed crescent kick movements while overcoming elastic resistance, so the neuromuscular system was trained to coordinate force production and kicking speed in a more specific manner.

The increase of 2.40000 points in the experimental group also reflects improvements in lower-limb power and movement control. A crescent kick requires explosive power from the supporting leg, hip flexors, quadriceps, hamstrings, gluteal muscles, and core stabilizers. Previous pencak silat studies have shown that leg muscle explosive power has a strong relationship with crescent or sickle kick performance (Hadisan et al., 2024; Islam & Octavia, 2025; Ahmad et al., 2026). Ihsan et al. (2022) also reported that explosive power, flexibility, and motivation influence sickle kick performance in pencak silat learning. Similar evidence was presented by Firmanto et al. (2023), who found that balance and leg muscle power were related to kicking speed, while Pomatahu (2018) emphasized that leg characteristics contribute to crescent kick execution. Thus, the present study strengthens the argument that improving the physical components supporting the kicking movement can directly enhance technical performance.

From a physiological perspective, rubber resistance band training may improve crescent kick technique through several mechanisms. First, elastic resistance increases muscle activation during the concentric phase of the kick, particularly when the band is stretched and the load becomes progressively higher. Second, the student must control the eccentric phase when returning the leg to the initial position, which may improve deceleration ability and joint stability. Third, repeated movement under resistance can sharpen intermuscular coordination, allowing the hip, knee, ankle, and trunk to move in a more synchronized sequence. These mechanisms are in line with the findings of Lopes et al. (2019), Stanković et al. (2025), Makaruk et al. (2024), Fuentes-García et al. (2024), and Xu et al. (2026), who reported that elastic or variable resistance training can improve lower-limb explosive power, speed, change-of-direction ability, and sport-specific performance. Dai et al. (2025) and Kocakulak et al. (2026) also support the view that elastic resistance can enhance lower-limb power and sprint-related ability because the resistance profile increases as the athlete reaches stronger joint positions.

The statistical result in this study is also in line with recent empirical studies on resistance band training in pencak silat. Aziz et al. (2025) found that both resistance band and ladder drill training improved crescent kick speed, but resistance band training produced a stronger effect. Rahman et al. (2025) reported a significant improvement in sabit kick speed after resistance band training, with a paired-sample t-test significance value of $p < 0.05$. Putra, Bustang, and Wahid (2026) compared shadow kick training and resistance band training and found that resistance band training produced a more significant increase in sabit kick speed than shadow kick training. Pratiwi et al. (2024) also showed that an eight-week resistance band program improved sickle kick speed in pencak silat extracurricular participants, while Akhbar and Imansyah (2023) reported that resistance band training improved sabit kick outcomes among school-level pencak silat athletes. The present study extends these findings to the context of university students at FIKK UNM, showing that the same training method is relevant not only for athletes in clubs or schools, but also for students in a sport science faculty setting.

The improvement found in this study can also be explained through motor learning theory. In technical sports such as pencak silat, performance improvement does not depend only on strength development, but also on the quality of repeated movement practice. Schmidt et al. (2018) and Magill and Anderson (2021) explain that repeated practice strengthens motor programs, improves error detection, and increases movement efficiency. When resistance band training is applied to the crescent kick, students do not merely train muscles; they also refine movement timing, body alignment, and kicking direction. This explains why the posttest score increased meaningfully after treatment. The band provides a form of "controlled constraint" that requires students to maintain technique while overcoming resistance. As a result, the movement becomes more stable, powerful, and efficient after repeated training sessions.

The results also correspond with findings from other martial arts. Paulauskas et al. (2025) found that eight weeks of incremental elastic-resistance kick training improved roundhouse kick quality and physical performance in taekwondo athletes. Liu et al. (2023) showed that effective kicking depends on biomechanical coordination between dominant and non-dominant legs, while Sun et al. (2025) highlighted the importance of lower-limb muscle activation during roundhouse kicks. Although taekwondo and pencak silat differ in rules and technical style, both sports require rapid hip rotation, lower-limb acceleration, postural control, and precise impact. Therefore, evidence from taekwondo supports the interpretation that elastic-resistance kick training can improve martial arts kicking performance when the exercise is designed according to the technical movement pattern.

Another important point is that the control group also improved, although the improvement was smaller. This suggests that regular practice, repetition, and technical familiarity may still enhance crescent kick ability. However, the larger improvement in the experimental group indicates that ordinary practice may not be sufficient when students need to increase speed, power, and technical consistency simultaneously. Studies on plyometric training, core stability, and flexibility interventions in pencak silat also show that structured physical-conditioning programs are more effective than unstructured repetition alone (Kamarudin & Zulraflil, 2020; Satria et al., 2021; Sudiana et al., 2023; Setiawan et al., 2024; Manihuruk & Siahaan, 2025; Nasirudin et al., 2025). This means that pencak silat learning at the university level should combine technical instruction with targeted physical training.

The practical implication of this study is clear: rubber resistance band training can be used as an effective, affordable, and accessible training method to improve crescent kick technique among FIKK UNM students. Coaches and lecturers can integrate this exercise into pencak silat practice sessions, especially during the development phase of kicking speed, leg power, hip control, and technical precision. The tool is simple, portable, and adaptable to different ability levels. However, the resistance load must be controlled progressively. If the band is too light, the training stimulus may be insufficient; if it is too heavy, the kicking pattern may become rigid and technically incorrect. Therefore, the exercise should be implemented with proper supervision, gradual progression, adequate warm-up, and consistent technical feedback.

Despite the significant findings, this study has several limitations. The sample size was relatively small, consisting of 20 FIKK UNM students divided into experimental and control groups. The study also measured short-term improvement, so it cannot fully explain long-term adaptation or retention of crescent kick technique. In addition, the assessment focused on performance scores and did not include biomechanical analysis, electromyography, or video-based motion analysis. Future studies should involve larger samples, longer training duration, gender-based comparison, different resistance levels, and biomechanical measurement to obtain a more comprehensive explanation of how resistance band training improves crescent kick technique.

Overall, the findings confirm that rubber resistance band training significantly improves the basic crescent kick technique of FIKK UNM students. The significant t-test result, the higher posttest mean, and the greater improvement compared with the control group indicate that this training method provides a specific and effective stimulus for pencak silat kicking performance. The study contributes to sport coaching science by showing that a simple elastic-resistance tool can support technical mastery, neuromuscular adaptation, and performance improvement in pencak silat learning at the higher education level.

CONCLUSION

Based on the results of the study, it can be concluded that rubber resistance band training has a positive and significant effect on the crescent kick technique among FIKK UNM students. The descriptive data showed that the experimental group experienced an increase in mean score from 17.8000 in the pretest to 20.2000 in the posttest, with a mean improvement of 2.4000 points. This increase was higher than that of the control group, which improved from 17.3000 to 18.6000, with a mean difference of 1.3000 points. These findings indicate that students who received rubber resistance band training achieved better technical development than students who followed regular training.

The normality test confirmed that the data were normally distributed, allowing the use of parametric statistical analysis. The paired-sample t-test further demonstrated a significant difference between the pretest and posttest scores in the experimental group. The t-count value was 14.697, which was greater than the t-table value of 1.833, with a significance value of $0.000 < 0.05$. Therefore, the null hypothesis was rejected and the research hypothesis was accepted.

In practical terms, rubber resistance band training can be considered an effective training method for improving crescent kick technique in pencak silat. The elastic resistance provided by the band helps strengthen leg muscles, improve kicking speed, support balance, and enhance movement control during kick execution. Therefore, this training model is recommended as an alternative exercise method for lecturers, coaches, and students in developing more powerful, accurate, and technically correct crescent kicks.

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