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The Effect Of Rubber Weight Trainingon The Speed Of Gyaku Tsuki Punches In Karate Athletes

Sri Irmayana Tenriola[1A-E*], Reza Mahyuddin[2B-D], Nurul Musfira A.[3B-D]

[1,2,3] Universitas Negeri Makassar, Sulawesi Selatan, Indonesia

iphonetenri@gmail.com[1*], rezamahyuddin@unm.ac.id[2], nurul.musfira.a@unm.ac.id[3]

ABSTRACT

This research is motivated by the low speed of gyaku tsuki punches among karate athletes from the Bone Regency Branch of Akbar. In karate training, gyaku tsuki is one of the important punching techniques often used in kumite because it has a fast, effective attack direction, and has the potential to produce points. However, based on initial observations, some athletes still show delays in punch execution, lack of explosiveness, and are not optimal in directing punches to the target. Therefore, a more specific, varied form of training is needed, and is in accordance with the needs of karate punching movements. This study aims to determine the effect of rubber weight training on the speed of gyaku tsuki punches of karate athletes from the Bone Regency Branch of Akbar. The research method used is a quantitative experiment with a pre-test-post-test control group design. The research sample consisted of 20 athletes divided into two groups, namely 10 athletes in the rubber weight training group and 10 athletes in the control group. The research instrument was a gyaku tsuki punching speed test. The training program was given for 16 meetings. Data were analyzed using descriptive statistics, normality tests, homogeneity tests, paired sample t-tests, and independent sample t-tests using SPSS. The results showed that the rubber weight training group experienced an average increase from 16,100 to 23,200, a difference of 7,100 points. The control group increased from 15,600 to 17,200, a difference of 1,600 points. The t-test showed a significance value of 0.000 < 0.05, indicating a significant effect. Thus, rubber weight training was proven more effective than control training in increasing the punching speed of gyakutsuki karate athletes from the Bone Regency Akbar Branch.

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INTRODUCTION

Karate-do is a combat sport that requires the integration of technical mastery, physical conditioning, tactical awareness, and psychological readiness. In the structure of karate training, kihon functions as the technical foundation from which movements in kata and kumite are developed. Basic techniques such as punches (tsuki), kicks (geri), blocks (uke), and evasive movements are not merely introductory skills, but essential movement patterns that determine the effectiveness of athletes during competition. Among several punching techniques in karate, including oi-tsuki, kizami-tsuki,

ura-tsuki, kagi-tsuki, mawashi-tsuki, awase-tsuki, yama-tsuki, heiko-tsuki, and hasami-tsuki, the gyaku tsuki or reverse punch is widely recognized as one of the most frequently applied techniques in kumite because it allows athletes to attack quickly, safely, and directly toward the scoring target (Ikram Awalul, 2022; Hutabarat, 2021; Lesmana et al., 2022).

In competitive kumite, punching performance is strongly associated with speed, accuracy, timing, distance control, and the ability to execute explosive movement within a very short period. The World Karate Federation rules place straight punches and strikes as scoring techniques when they are delivered with correct form, control, timing, and target accuracy (World Karate Federation, 2024). Therefore, the effectiveness of gyaku tsuki does not depend only on technical correctness, but also on the athlete's capacity to produce rapid arm movement supported by lower-body drive, trunk rotation, shoulder stability, and neuromuscular coordination (Venkatraman & Nasiriavanaki, 2019; Csákvári et al., 2025). Speed is a crucial physical component because karate attacks often occur in fractions of a second, and athletes who are able to initiate and complete a punch faster have a greater opportunity to score before the opponent reacts (Matutu, 2019; Kadir et al., 2023; Syamsulrizal et al., 2022).

However, based on preliminary observation conducted at Akbar Karate Branch, Bone Regency, on April 28, 2024, several athletes still showed limitations in performing gyaku tsuki. The punches were often slow, less explosive, and not consistently directed toward the intended target. In addition, the training variation used by coaches was still relatively monotonous and did not sufficiently stimulate the specific speed-strength demands of gyaku tsuki. This condition indicates a practical problem in the training process: athletes need a specific, affordable, and applicable training method that can improve punching speed without separating physical conditioning from karate technique.

Recent studies in combat sports emphasize that high-level performance is influenced by speed, strength, power, reaction ability, coordination, agility, and technical efficiency (Cid-Calfucura et al., 2023; Gaweł et al., 2025; Güler & Ramazanoğlu, 2018). In karate, successful kumite athletes must be able to perform explosive attacks, recover quickly, and repeat high-intensity movements throughout the match. Technical-tactical analyses also show that punching techniques remain central in kumite because they are faster, more economical, and tactically safer than many kicking techniques in close and medium-distance exchanges (Seyedi et al., 2024; Vidranski et al., 2021).

The gyaku tsuki movement involves a kinetic chain that starts from the stance, continues through hip and trunk rotation, and ends with arm acceleration toward the target. Biomechanical research explains that an effective reverse punch requires synchronization between lower-limb support, pelvic rotation, trunk activation, shoulder movement, elbow extension, and wrist stabilization (Venkatraman & Nasiriavanaki, 2019; Csákvári et al., 2025). This means that training to improve gyaku tsuki speed should not focus only on repetitive punching, but should also provide resistance that stimulates the muscles involved in the punching pathway.

Elastic or rubber resistance training has become increasingly relevant in sport conditioning because it provides variable resistance, is easy to use, low-cost, portable, and can be adjusted to the athlete's ability level. Resistance bands can create external load during punching motion, forcing athletes to overcome elastic tension while maintaining correct technique. This method may improve muscular strength, explosive power, and movement speed because it combines overload, specificity, and neuromuscular adaptation (Putra Renaldi & Wisnu, 2020; Seguin et al., 2022; Gaamouri et al., 2023; Stanković et al., 2025). Studies on resistance training in combat sports also report positive effects on strength, power, and sport-specific striking performance (Makaruk et al., 2024; Liu et al., 2024; Cid-Calfucura et al., 2023).

Several Indonesian studies have further supported the relevance of rubber or resistance band training for martial arts performance. Same (2021) found that punching practice using rubber resistance improved average punching speed in karate. Oktavia et al. (2023) reported that rubber-based exercise had a significant effect on gyaku tsuki speed among karate practitioners. Seriannuari et al. (2024) also concluded that rubber training increased gyaku tsuki speed among Gokasi karate athletes, while Yuhatanza et al. (2025) showed that resistance band training significantly improved gyaku tsuki speed in karate athletes. These findings indicate that elastic resistance training is conceptually and empirically relevant for improving karate punching performance.

Sri Irmayana Tenriola[1A-E*], Reza Mahyuddin[2B-D], Nurul Musfira A.[3B-D]
iphonetenri@gmail.com[1*]

Although previous studies have examined the role of rubber training, resistance bands, and strength training in improving punching ability, several gaps remain. First, many existing studies focus on general punching performance, martial arts athletes in broad categories, or different dojo contexts, while specific evidence regarding gyaku tsuki speed among Akbar Karate Branch athletes in Bone Regency is still limited. Second, several studies have emphasized physical improvement, but fewer have clearly positioned rubber load training as a technique-specific method that links overload principles with the actual movement mechanics of gyaku tsuki. Third, local karate coaching still needs practical evidence that can be directly applied by trainers using simple equipment, especially in regional training environments with limited facilities.

Furthermore, the preliminary condition at Akbar Karate Branch shows a gap between the demands of modern kumite and the training methods currently used. Athletes are expected to perform fast, accurate, and explosive punches, yet the available training variation has not fully supported these demands. Therefore, this study is necessary to provide empirical evidence on whether rubber load training can significantly improve gyaku tsuki punching speed in this specific athlete population.

This study aims to determine the effect of rubber load training on the speed of gyaku tsuki punches among karate athletes of Akbar Branch, Bone Regency. The novelty of this study lies in its contextual and practical contribution. It applies elastic resistance training specifically to the gyaku tsuki movement, addresses a real coaching problem found in a local karate branch, and offers a low-cost training model that can be implemented by coaches without requiring complex equipment. Unlike general strength training, rubber load training allows athletes to practice punching movements under resistance while maintaining technical direction, target orientation, and movement specificity.

In conclusion, the development of gyaku tsuki speed is essential for improving karate athletes' competitive performance. Rubber load training is theoretically grounded in the principles of overload and specificity, and empirically supported by recent studies in karate and combat sports. Therefore, this research is expected to provide scientific and practical evidence for coaches, athletes, and sport education researchers regarding the use of rubber load training as an effective method to enhance gyaku tsuki punching speed among Akbar Karate Branch athletes in Bone Regency.

METHODS

This study employed a quantitative experimental approach using a one-group pre-test–post-test design to examine the effect of rubber load training on the speed of gyaku tsuki punches among karate student-athletes of Akbar Branch, Bone Regency. The experimental method was selected because it allows researchers to measure changes in performance before and after a structured training intervention, particularly in sport-specific skills that require speed, power, and neuromuscular coordination. This design is also consistent with recent studies on karate and combat-sport conditioning, where pre-test and post-test procedures are commonly used to evaluate the effectiveness of resistance-based training programs on punching performance (Cid-Calfucura et al., 2023; Makaruk et al., 2024; Sa'diah et al., 2024). Recent karate studies also show that gyaku tsuki performance can be improved through rubber or resistance band exercises because the movement provides specific overload along the punching pathway (Yuhatanza et al., 2025; Zaputra, 2025).

The population of this study consisted of karate athletes registered at Inkanas Akbar Branch, Bone Regency. The research sample included 100 student-athletes who were selected using random sampling to provide equal opportunity for each member of the population to participate. The independent variable in this study was rubber load training, while the dependent variable was the speed of gyaku tsuki punches. The use of rubber load training was based on the principle of training specificity, because the elastic resistance directly challenges the punching muscles while athletes maintain the technical pattern of gyaku tsuki. Biomechanical literature explains that gyaku tsuki requires coordinated force transfer from the lower body, trunk rotation, shoulder movement, elbow extension, and wrist stabilization; therefore, resistance training that follows the same movement direction is considered relevant for improving punching speed (Venkatraman & Nasiriavanaki, 2019; Hernández-Martínez et al., 2024).

Sri Irmayana Tenriola[1A-E*], Reza Mahyuddin[2B-D], Nurul Musfira A.[3B-D]
iphonetenri@gmail.com[1*]

Data were collected through a gyaku tsuki punching speed test administered before and after the intervention. The pre-test was conducted to determine the initial punching speed of the athletes before receiving rubber load training. After the pre-test, participants followed a structured rubber load training program for 16 sessions. The exercises were performed using elastic rubber resistance, either from training bands or modified rubber materials, with controlled tension, correct stance, target direction, and punching mechanics. The training emphasized repetition quality, explosive arm extension, body rotation, and recovery between sets. Similar protocols have been reported in previous Indonesian karate studies, where rubber band or resistance band training significantly improved gyaku tsuki speed and punching ability (Ikram, 2022; Pranata et al., 2019; Seriannuari et al., 2024; Sihotang et al., 2026).

After completing the 16 training sessions, a post-test was conducted using the same test procedure as the pre-test to ensure measurement consistency. The collected data were analyzed using SPSS. Descriptive statistics were used to calculate the mean, standard deviation, minimum score, maximum score, and improvement score. Before hypothesis testing, normality and homogeneity tests were conducted to determine whether the data met parametric assumptions. If the data were normally distributed, a paired sample t-test was used to compare pre-test and post-test scores at a significance level of 0.05. The hypothesis was accepted if the significance value was lower than 0.05, indicating that rubber load training had a statistically significant effect on the speed of gyaku tsuki punches among karate student-athletes of Akbar Branch, Bone Regency.

RESULTS AND DISCUSSION

Result

This section presents the research findings on the effect of rubber load training on the speed of *gyaku tsuki* punches among karate athletes of Akbar Branch, Bone Regency. The data analysis was conducted in several stages, namely descriptive statistical analysis, prerequisite testing consisting of normality and homogeneity tests, and hypothesis testing using paired sample t-test and independent sample t-test. The descriptive analysis was used to provide an initial overview of the pre-test and post-test scores in both the experimental group and the control group.

Descriptive Statistical Analysis

The descriptive statistics of *gyaku tsuki* punch speed are presented in Table 4.1. The analysis includes the number of samples, total score, mean score, standard deviation, range, minimum score, and maximum score.

Table 1.
Descriptive Statistics of Gyaku Tsuki Punch Speed

Group	N	Sum	Mean	Std. Dev.	Range	Minimum	Maximum
Pre-test rubber load training	10	161.00	16.100	1.663	4.00	14.00	18.00
Post-test rubber load training	10	232.00	23.200	1.619	4.00	21.00	25.00
Pre-test control group	10	156.00	15.600	1.430	4.00	14.00	18.00
Post-test control group	10	172.00	17.200	1.033	3.00	16.00	19.00

Based on Table 1, the experimental group that received rubber load training showed a clear increase in *gyaku tsuki* punch speed. The pre-test mean score was 16.100, while the post-test mean score increased to 23.200. This indicates an improvement of 7.100 points after the training program. The minimum score increased from 14.00 to 21.00, while the maximum score increased from 18.00 to 25.00. These results suggest that the athletes performed faster and more consistently after completing the rubber load training intervention.

In the control group, the pre-test mean score was 15.600 and increased to 17.200 in the post-test, with a mean difference of 1.600 points. Although there was an increase, the improvement was much smaller than that of the experimental group. This indicates that regular training or control activity may contribute to minor progress, but it did not produce the same level of improvement as rubber load training.

Normality Test

Before conducting hypothesis testing, a normality test was performed to determine whether the data were normally distributed. The normality test used Kolmogorov-Smirnov and Shapiro-Wilk tests at a significance level of 0.05.

Table 2.
Normality Test Results

Variable	Kolmogorov-Smirnov		Shapiro-Wilk		α	Interpretation
	Statistic	Sig.	Statistic	Sig.		
Rubber load training	0.246	0.088	0.842	0.057	0.05	Normal
Control group	0.168	0.200	0.895	0.191	0.05	Normal

Table 2 shows that the rubber load training group obtained a Kolmogorov-Smirnov significance value of 0.088 and a Shapiro-Wilk significance value of 0.057. Both values are greater than 0.05, indicating that the data were normally distributed. The control group also showed normal distribution, with a Kolmogorov-Smirnov significance value of 0.200 and a Shapiro-Wilk significance value of 0.191. Therefore, the data from both groups met the assumption of normality, and parametric statistical analysis could be used.

Homogeneity Test

The homogeneity test was conducted using Levene's test to determine whether the variances of the two groups were equal.

Table 3.
Homogeneity Test Results

Groups Compared	Levene Statistic	Sig.	α	Interpretation
Rubber load training and control group	2.361	0.088	0.05	Homogeneous

Based on Table 3, the Levene Statistic value was 2.361 with a significance value of 0.088. Since the significance value was greater than 0.05, the data from the experimental and control groups were considered homogeneous. This means that both groups had comparable variance and were appropriate for further parametric hypothesis testing.

Paired Sample T-Test of the Experimental Group

The paired sample t-test was used to determine whether there was a significant difference between the pre-test and post-test scores of the group that received rubber load training.

Table 4.
Paired Sample T-Test of the Rubber Load Training Group

Group	Test	Mean	Mean Difference	t-count	df	Sig. (2-tailed)	t-table
Experimental group	Post-test Pre-test	23.200 16.100	7.100	71.000	9	0.000	1.833

Table 4. shows that the t-count value was 71.000, which was higher than the t-table value of 1.833. The significance value was 0.000, which was lower than 0.05. Therefore, the null hypothesis was rejected and the alternative hypothesis was accepted. This means that rubber load training had a significant effect on increasing the speed of *gyaku tsuki* punches among karate athletes of Akbar Branch, Bone Regency. The mean improvement of 7.100 points indicates that the training intervention produced a strong practical effect on punching speed.

Paired Sample T-Test of the Control Group

The paired sample t-test was also conducted for the control group to examine the difference between its pre-test and post-test scores.

Table 5.
Paired Sample T-Test of the Control Group

Group	Test	Mean	Mean Difference	t-count	df	Sig. (2-tailed)	t-table
Control group	Post-test Pre-test	17.200 15.600	1.600	9.798	9	0.000	1.833

Based on Table 5, the t-count value was 9.798, which was higher than the t-table value of 1.833. The significance value was 0.000, which was lower than 0.05. This result indicates that there was also a significant improvement in the control group. However, the mean difference was only 1.600 points, which was much lower than the improvement achieved by the rubber load training group. This finding suggests that although the control group improved, its improvement was limited and not as substantial as the experimental group.

Independent Sample T-Test Between the Experimental and Control Groups

An independent sample t-test was conducted to determine whether there was a significant difference between the post-test results of the rubber load training group and the control group.

Table 6.

Independent Sample T-Test of Post-Test Scores

Variable	Group	Mean	Mean Difference	t-count	df	Sig. (2-tailed)	t-table
Gyaku tsuki punch speed	Rubber load training	23.200	6.000	9.672	18	0.000	1.734
	Control group	17.200					

Table 6 shows that the post-test mean score of the rubber load training group was 23.200, while the post-test mean score of the control group was 17.200. The mean difference between the two groups was 6.000 points. The t-count value was 9.672, which was greater than the t-table value of 1.734, and the significance value was 0.000, which was lower than 0.05. Therefore, there was a significant difference between the rubber load training group and the control group.

These findings confirm that rubber load training was more effective than the control training in improving the speed of *gyaku tsuki* punches. The elastic resistance provided during the training process likely stimulated the athletes' arm acceleration, shoulder strength, trunk rotation, and explosive punching movement. Therefore, the results support the hypothesis that rubber load training has a significant effect on improving *gyaku tsuki* punch speed among karate athletes of Akbar Branch, Bone Regency.

Discussion

The findings of this study demonstrate that rubber load training had a significant effect on increasing the speed of gyaku tsuki punches among karate athletes of Akbar Branch, Bone Regency. The descriptive data showed that the experimental group improved from a pre-test mean score of 16.100 to a post-test mean score of 23.200, with an average increase of 7.100 points. In contrast, the control group only improved from 15.600 to 17.200, with an average increase of 1.600 points. This difference indicates that rubber load training produced a stronger training adaptation than ordinary or control training. The prerequisite tests also showed that the data were normally distributed and homogeneous, which means that the statistical assumptions for parametric testing were fulfilled. Therefore, the use of paired sample t-test and independent sample t-test was appropriate for testing the research hypotheses.

The first finding confirms that rubber load training significantly improved the speed of gyaku tsuki punches. The paired sample t-test in the experimental group showed a significance value of 0.000 < 0.05, with the calculated t-value higher than the t-table value. This means that the null hypothesis was rejected and the alternative hypothesis was accepted. In practical terms, this result shows that structured training using rubber resistance can increase the athlete's ability to execute faster reverse punches. This finding is consistent with Kartika and Wijono (2023), who found that resistance band training significantly increased gyaku tsuki punch speed among karate athletes, and with Yuhatanza et al. (2025), who reported that resistance band training was effective in improving gyaku tsuki speed among Dojo Hikari karate athletes. Similar findings were also reported by Putri, Padli, Alnedral, and Yenes (2022), Same et al. (2022), Seriannuari et al. (2024), Zaputra (2025), Aryanti (2026), Nata (2026), and Sihotang et al. (2026), all of whom emphasized that elastic resistance training is relevant for improving karate punching performance.

The increase in punch speed can be explained through the principles of overload and specificity. Rubber load training provides external resistance during the punching movement, forcing the athlete to activate the shoulder, arm, trunk, and lower-body muscles more strongly while still maintaining the

movement pattern of gyaku tsuki. Unlike general strength training, elastic resistance follows the direction of the punching movement and allows athletes to practice strength and technique at the same time. This is important because gyaku tsuki is not merely an arm movement; it involves a kinetic chain from the stance, lower-limb drive, hip rotation, trunk rotation, shoulder acceleration, elbow extension, and wrist stabilization. Biomechanical studies by Rinaldi et al. (2018), Venkatraman and Nasiriavanaki (2019), Camomilla et al. (2020), Cesari and Bertucco (2018), and Sbriccoli et al. (2020) show that effective karate punching depends on coordination between body segments, force transfer, and rapid acceleration toward the target. Therefore, the improvement found in this study is reasonable because rubber load training strengthens the same movement pathway used during gyaku tsuki.

The second finding shows that the control group also experienced a significant improvement, although the increase was much smaller than the experimental group. The control group improved by 1.600 points, and the paired sample t-test showed a significance value of 0.000 < 0.05. This improvement may have occurred because the athletes continued to participate in regular karate training, repeated basic punching movements, and became more familiar with the testing procedure. In motor learning theory, repeated practice can improve movement efficiency, confidence, rhythm, and technical consistency, even without a special resistance-based intervention. However, the small magnitude of improvement indicates that routine training alone was not sufficient to produce optimal punching-speed development. This interpretation is in line with studies by Yudhistira et al. (2023), Kabadayı et al. (2022), Przybylski et al. (2021), Heazlewood and Keshishian (2018), and Gaweł, Drozd, and Zając (2025), which show that karate performance depends on the interaction of strength, power, agility, balance, coordination, and sport-specific conditioning, not merely technical repetition.

The third finding indicates that there was a significant difference between the experimental and control groups after the intervention. The independent sample t-test showed a significance value of 0.000 < 0.05, with the post-test mean score of the rubber load training group reaching 23.200, while the control group reached only 17.200. The mean difference between the two groups was 6.000 points. This result proves that rubber load training was more effective than control training in improving gyaku tsuki punch speed. The higher post-test score in the experimental group suggests that elastic resistance created a stronger neuromuscular stimulus. When the athlete performs repeated punching against rubber tension, the muscles responsible for arm extension, shoulder flexion, scapular stabilization, trunk rotation, and hip drive adapt to produce faster and more coordinated movement. This explanation supports the findings of Cid-Calfucura et al. (2023), Makaruk et al. (2024), Liu et al. (2024), and Uthoff et al. (2023), who emphasized that strength and power training in combat sports can improve explosive actions when the training method is specific to competitive movement demands.

From a karate performance perspective, the results are highly relevant because gyaku tsuki is one of the most frequently used techniques in kumite. A fast gyaku tsuki allows athletes to attack before the opponent responds, counterattack effectively, and score points with better timing. According to the current trend in WKF karate, kumite athletes require explosive movement, rapid technical execution, quick decision-making, and efficient recovery between attacking actions. Gaweł et al. (2025), Piepiora et al. (2025), Cinarli et al. (2025), and Chaabène et al. (2018) emphasize that elite karate performance is closely related to speed, anaerobic power, strength endurance, and technical-tactical efficiency. Therefore, the present study contributes to the practical understanding that rubber load training can be used as a simple but effective conditioning method for regional karate athletes, particularly when training facilities are limited. The effectiveness of rubber load training in this study also supports previous Indonesian research in karate and martial arts. Wahyudi (2025) found that resistance band training improved the strength of gyaku tsuki punches among INKAI karate athletes in Bangkalan. Sari, Sugiharto, Sulaiman, and Pramono (2023) reported that resistance band training improved gyaku tsuki ability among FORKI karate athletes in Palembang. Pranata (2019) also showed that tire-rubber training increased gyaku tsuki speed among INKANAS athletes in Bengkulu, while Putra and Wisnu (2020) showed that tire-rubber media could improve gyaku tsuki learning outcomes among extracurricular karate students. These studies strengthen the argument that rubber-based resistance is not only useful for elite conditioning, but also applicable in local clubs, school-based karate programs, and regional athlete development systems.

Theoretically, the results of this study can be understood through neuromuscular adaptation. Rubber load training increases the demand for rapid force production. During the concentric phase of the punch, athletes must overcome elastic resistance; during the return phase, they must control the recoil. This dual demand trains acceleration and deceleration control, both of which are important in karate because punches must be fast but also controlled according to competition rules. The repeated use of rubber resistance may improve motor-unit recruitment, intermuscular coordination, elastic strength, and movement timing. Fadhila et al. (2024), Seguin et al. (2022), Gaamouri et al. (2023), Stanković et al. (2025), and Suyoko (2025) also noted that resistance-based and body-weight-based training can improve combat-sport performance when applied progressively and specifically to the movement structure.

In practical coaching terms, this study provides an important recommendation for karate coaches at Akbar Branch, Bone Regency. Rubber load training should be integrated into regular kihon and kumite preparation, especially for improving gyaku tsuki speed. Coaches can vary the resistance level, training volume, punching direction, stance position, target distance, and execution tempo to avoid monotony and maintain athlete motivation. However, the training must be controlled carefully. If the resistance is too heavy, athletes may lose technical accuracy, shoulder relaxation, hip rotation, and correct punching trajectory. Therefore, the use of rubber load should follow progressive overload, proper warm-up, technical supervision, and adequate recovery.

Overall, the findings prove that rubber load training has a significant and superior effect on the speed of gyaku tsuki punches compared with control training. The experimental group showed a much larger improvement than the control group, and the statistical results confirmed significant differences within and between groups. This means that rubber load training is empirically effective, theoretically relevant, and practically applicable for improving karate punching performance. Therefore, the hypothesis stating that rubber load training affects the speed of gyaku tsuki punches among karate athletes of Akbar Branch, Bone Regency, is accepted.

CONCLUSION

Based on the results of the study, it can be concluded that rubber load training has a significant effect on increasing the speed of gyaku tsuki punches among karate athletes of Akbar Branch, Bone Regency. The descriptive analysis showed that the experimental group experienced a clear improvement after being given rubber load training. The mean score increased from 16.100 in the pre-test to 23.200 in the post-test, with an average improvement of 7.100 points. This increase indicates that the training program provided a meaningful contribution to the athletes' punching speed, especially in developing explosive arm movement, body coordination, and technical execution of gyaku tsuki.

The control group also showed improvement, with the mean score increasing from 15.600 in the pre-test to 17.200 in the post-test. However, the improvement was only 1.600 points, which was much lower than the experimental group. The normality and homogeneity tests showed that the data were normally distributed and homogeneous, so the hypothesis testing could be continued using parametric statistics. The paired sample t-test showed a significant difference between the pre-test and post-test scores in the rubber load training group, with a significance value of $0.000 < 0.05$.

Furthermore, the independent sample t-test showed a significant difference between the post-test results of the experimental group and the control group, with a significance value of $0.000 < 0.05$ and a mean difference of 6.000 points. Therefore, rubber load training is more effective than regular training in improving gyaku tsuki punch speed. This training model can be recommended as a practical, affordable, and sport-specific method for karate coaches to improve athletes' punching performance.

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