

**Effectiveness of Modified Strength Training Using Rubber Bands In Improving
the Speed of Dollyo Chagi Kick**Annafi'u Zahra Rihhadatul Aisy^{1*}, Drastiana Siwi Maheswari²¹²Physical Education for Elementary School, Faculty of Sports Science, Universitas Negeri
Semarang, Indonesia**Keywords**Resistance Band;
training; kicking
speeds; dollyo chagi;
taekwondo**Abstract**

Dollyo chagi is one of the most commonly used techniques in taekwondo competitions that require physical ability, specifically speed. This study aims to determine the impact and effectiveness of modified strength training using rubber resistance bands on improving the speed of the dollyochagi kick among taekwondo athletes at the RTA Academy Dojang in Kendal Regency. This study employed an experimental method using a one-group pretest-posttest design. The study sample consisted of 20 athletes aged 12–17 years, selected using purposive sampling. The research instrument used a 10-second dollyochagi kicking speed test, measured in the number of kicks. The intervention was administered over 16 sessions, with a frequency of four times per week. Data analysis involved tests of normality, homogeneity, and hypothesis testing using a paired-sample t-test via the SPSS programme. The results of the study indicate that the data are normally distributed and homogeneous. The mean pretest score of 16.50 increased to 20.50 in the posttest. The results of the paired sample t-test showed a calculated t-value of -24.658 with a significance level of 0.000 ($p < 0.05$), indicating a significant difference between the pre-test and post-test results. It can therefore be concluded that training using modified rubber tyre resistance bands has a significant and effective impact on improving the speed of the dollyochagi kick in taekwondo athletes.

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INTRODUCTION

Taekwondo is a martial art that is growing rapidly in Indonesia and around the world. In kyorugi competitions, technical ability must be supported by optimal physical condition, particularly strength, speed and explosive power (Maheswari, Drastiana Siwi, 2023). One of the most commonly used kicking techniques to score points is the dollyo chagi, a circular kick using the instep combined with hip rotation and knee extension (Zulman et al., 2021). The effectiveness of this kick is greatly influenced by the speed of movement and the muscles' ability to generate force explosively (rate of force development) (Kurniawan et al., 2024). A fast kick is more difficult for opponents to anticipate and increases the chances of scoring points (Dewi, 2024).

One of the kicking techniques in taekwondo is the dollyochagi. Dollyochagi is a circular kick that uses the instep and requires speed, power, and good coordination between the legs, hips, and upper body. A common phenomenon observed in taekwondo matches is that many athletes are unable to execute the dollyochagi kick at optimal speed. This makes it easy for opponents to anticipate the attack and block or parry it, thereby reducing the chances of scoring points (Java, 2021). In fact, speed is a key factor in the effectiveness of a kick, as a kick executed at high speed is more difficult for opponents to predict and react to (Endrawan et al., 2023). This issue highlights the need to focus on improving kicking speed within athletes' training programmes. One training method that can be used to improve kicking speed is training with resistance bands (Riswanto & Hidayat, 2026). This type of training provides resistance that can help improve strength and the ability to contract muscles more rapidly, thereby potentially supporting an increase in the speed of the dollyochagi kick (Paulauskas et al., 2025).

Speed training in taekwondo is most effectively applied to athletes aged 12–17, as this age group is considered to be in adolescence, based on their physical, psychological and cognitive capabilities. Children aged 12–17 are still in a phase of physical growth and motor skill development, so training must: 1. Be tailored to their level of development (avoid excessive training); 2. Focus on mastering basic techniques, coordination, movement speed, and body flexibility; 3. Begin to introduce strength and speed training at a light intensity using safe methods, such as resistance bands (Linhares & Cordeiro, 2023).

However, many dojangs still focus on general speed training and have not specifically focused on developing speed skills in kicking techniques (Zhang et al., 2025). This is thought to be due to training methods that lack variety, as well as the absence of training aids specifically designed to enhance leg muscle strength and speed.

Based on observations and interviews with coaches, the training programme currently in use lacks variety and tends to be monotonous, causing athletes to become bored during training sessions. This situation results in suboptimal development of the athletes' kicking speed, particularly when facing match situations that require fast and explosive kicks. Furthermore, the limited use of modern training equipment is another factor preventing coaches from fully utilising resistance training to enhance the strength and speed of the athletes' leg muscles.

Although the speed of the dollyo chagi kick is a crucial factor in taekwondo competitions, in practice, training programmes aimed at improving kicking speed are often not optimally implemented. Training programmes in many dojangs still focus primarily on repeating basic techniques without providing physical training stimuli specifically designed to enhance the speed of the kicking motion. In fact (Ateş & Aybüke Yılmaz, 2025), kick speed is influenced not only by technical mastery, but also by several physical components such as lower limb muscle strength, power, movement coordination, hip joint flexibility, and muscle contraction speed. If these components are not trained in a specific and structured manner, the resulting improvement in kick speed is likely to be less than optimal (Rasyid et al., 2025).

Furthermore, the limited availability of training facilities is another factor contributing to the suboptimal development of kicking speed. Several effective training methods for improving kicking speed and power such as resistance training using specialised equipment have not been widely implemented due to a lack of equipment and cost constraints (Stankovi, 2025). Consequently, the variety of exercises provided to athletes is limited and fails to provide

sufficient stimulus for the development of neuromuscular abilities that play a key role in producing fast and explosive kicking movements (Fajar et al., 2023).

Given these circumstances, there is a need for innovative training methods capable of developing both strength and speed in the lower limb muscles in a simpler and more easily implementable way. One alternative training method that can be used is training with resistance bands modified using rubber tyres. Training with this elastic resistance provides resistance when the athlete performs kicking movements, forcing the muscles to work harder and faster. Through repeated training, the muscles' ability to generate force rapidly can improve, thereby allowing the speed of the dollyo chagi kick to develop more effectively (Hartono & Abdulaziz, 2025).

According to (Effect et al., 2025), the dollyo chagi kick is a fundamental technique and the most frequently used for scoring points; this kick is the most dominant and effective technique in taekwondo competitions. The performance of the dollyo chagi kick depends on a combination of muscle strength, coordination, and the angular velocity of the hip and knee joints. The researchers state that this technique is excellent for measuring an athlete's biomechanical efficiency.

Based on the above, the researcher is interested in conducting a study entitled: "The Effectiveness of Modified Strength Training Using Inner Tubes in Improving Dollyo Chagi Kick Speed in Taekwondo." It is hoped that this study will contribute to the development of effective, economical, and innovative training methods to improve the performance of taekwondo athletes, particularly in terms of kicking speed.

To address this issue, modified exercises utilising old tyre rubber can serve as an innovative solution, using simple equipment to provide a more varied and creative form of resistance training. This method has several advantages, such as flexibility in adjusting the training load, safety during use, and the ability to reduce boredom during the training process. Thus, this method has the potential to effectively improve the speed of the dollyo chagi kick in taekwondo athletes. This tool works by providing constant resistance to the muscles, thereby allowing for more specific muscle training and helping to increase explosive power. Previous studies have also shown that the use of resistance bands has a positive impact on improving power and kicking speed in taekwondo athletes across various training settings. However, research specifically examining the effect of this method on the speed of the dollyo chagi kick at the RTA Academy Dojang in Kendal Regency has yet to be extensively conducted.

This study is expected to make a tangible contribution to the development of training methods at the RTA Academy Dojang. Through this study, it is hoped that athletes will gain access to more effective and innovative training programmes, thereby improving their Dollyo Chagi kicking speed and supporting the achievement of better results in the future. Based on the above, the researcher is interested in conducting further research on "The Effectiveness of Inner Tyres in Improving the Speed of the Dollyo Chagi Kick in the Sport of Taekwondo". Furthermore, coaches have not utilised simple training equipment such as resistance bands made from rubber tyres, which could potentially serve as an alternative training method to improve athletes' kicking speed.

METHODS

Research Design.

The research method used in this study was the experimental method, which is an approach to analysing the effect of a treatment on other variables under controlled conditions. This study involved the application of a treatment in the form of training using resistance bands as the independent variable, with the aim of determining its effect on improving the speed of the dollyo chagi kick in taekwondo. The research design used was a one-group pretest posttest design, in which the pretest was conducted before the treatment to determine the initial condition, whilst the posttest was conducted after the treatment to measure the changes that occurred. The instrument used in this study was a 10-second dollyo chagi kick speed test, conducted at the RTA Academy Dojang, Kendal Regency, to measure the number of kicks an athlete could perform within that time frame.

Participants

The sample used in this study consisted of 20 participants from the existing population. The sample comprised research subjects (respondents), who were selected as data sources through sampling techniques (sampling methods). This study employed a non-probability sampling technique using purposive sampling. The criteria that the samples used in this study had to meet were as follows:

1. Male and female athletes
2. Active athletes at the RTA Academy dojang
3. Athletes aged 12–17
4. Athletes in good physical condition with no balance issues whatsoever
5. Athletes holding at least a green belt

Data collection methods

Data collection is a crucial step in research, as it aims to obtain valid and reliable data. In this study, data were collected to measure the speed of the dollyo chagi kick before and after the training intervention at the RTA Academy Dojang. The data collection techniques employed are as follows:

a) Tes (Pretest and Posttest):

The pretest was conducted before the training intervention to determine the athletes' initial kicking speed, while the posttest was conducted after the completion of the training program to measure improvement.

The test procedure was as follows: the athlete stood in front of a target in a kicking stance (ap seogi). Upon the command “go”, the athlete performed as many dollyo chagi kicks as possible within 10 seconds. The target height was adjusted to the level of the solar plexus. The total number of successful kicks was recorded as the test score.

b) Treatment:

The treatment carried out is as follows:

1. Lie on your back and perform a cycling motion with your legs
2. Lie on your back and lift your legs up and then lower them back down
3. Lie on your back and perform sit-ups using a rubber band around the soles of your feet, with both hands holding the ends of the band
4. Perform a 45° forward leg swing using a rubber band
5. Perform a 45° side leg swing using a rubber band
6. Perform a leg swing movement forwards to at least 90° using a rubber band
7. Perform a sideways leg swing of at least 90° using a resistance band
8. Perform a slow single-leg knee lift with a resistance band
9. Perform a fast single-leg knee lift with a resistance band, slightly bending the supporting leg
10. Perform alternating right and left knee lifts with a resistance band
11. Perform the dollyo chagi kick using a resistance band, but do not lower the kicking leg. Perform the movement slowly
12. Perform the dollyo chagi kick using a resistance band slowly
13. Perform the dollyo chagi kick using a resistance band as quickly as possible

Data analysis in this study was conducted using statistical analysis with the aid of SPSS. The data were obtained from the results of pre-tests and post-tests of the speed of the dollyo chagi kick. The analysis began with descriptive statistics to determine the mean values. Subsequently, prerequisite tests were carried out, namely normality and homogeneity tests. If the data met the criteria (Sig. > 0.05), the analysis proceeded to hypothesis testing using a paired sample t-test to determine the difference between the pretest and posttest. A significance level (Sig. 2-tailed) < 0.05 indicates a significant effect of the training intervention.

Data processing techniques

The data analysis technique employed was an experimental analysis focusing on the mean value. The data consisted of test scores taken before and after resistance band training

for the dollyo chagi kick. A hypothesis test was then conducted using statistical analysis with the SPSS programme to describe the data and draw conclusions from the results obtained.

1. Normality Test

The normality test aims to determine whether the collected data follow a normal distribution or not. Data that are suitable for use in a normality test are those that do not deviate from a normal distribution.

2. Homogeneity Test

The homogeneity test is used to determine whether the data has the same or different levels of variance, meaning whether the data is homogeneous or not. If the data is normally distributed and homogeneous, then the data analysis process uses parametric statistics

3. Paired Sample t-Test

Based on the results of the normality and homogeneity tests, if the data obtained is normally distributed and homogeneous, then the hypothesis test uses a parametric test with the paired sample t-test.

RESULTS AND DISCUSSION

Normality Test

This study aims to determine the effect and effectiveness of training using modified rubber tyre resistance bands on improving the speed of the dollyo chagi kick. Data analysis was carried out using SPSS software, involving tests for normality, homogeneity, and hypothesis testing.

Table 1. Result of the Normality Test for Pretest and Posttest Data

	Tests of Normality					
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Posttest	.135	20	.200*	.940	20	.238

Test of Homogeneity of Variances

Table 2. Result of the Test of Homogeneity of Variances (posttest)

	Levene Statistic	df1	df2	Sig.
Based on Mean	.040	3	16	.989
Based on Median	.000	3	16	1.000
Based on Median and with adjusted df	.000	3	10.000	1.000
Based on trimmed mean	.052	3	16	.984

The homogeneity test using Levene's test yielded a p-value of 0.989 ($p > 0.05$), indicating that the data are homogeneous. Consequently, the analysis can proceed using the parametric paired-sample t-test.

Paired t-Test

Table 3. Result of the Paired Sample t-test

Paired Differences		
t	Df	Sig. (2-tailed)
-24.658	19	.000

The results of the paired-sample t-test show a calculated t-value of -24.658 with a significance level of 0.000 ($p < 0.05$). This value indicates a highly significant difference between the pre-test and post-test results. Consequently, the alternative hypothesis (H_1) is accepted and the null hypothesis (H_0) is rejected.

The results of this study indicate that training using resistance bands modified with inner tube rubber has a significant effect on improving the speed of the dollyo chagi kick among taekwondo athletes at the RTA Academy Dojang in Kendal Regency. This finding is substantiated by the results of a paired sample t-test, which revealed a statistically significant difference between pre-test and post-test scores following the athletes' participation in the training programme. This improvement indicates that training with elastic resistance provides an effective training stimulus for enhancing athletes' kicking speed performance.

The increase in the speed of the dollyo chagi kick following the training programme can be explained by the use of elastic resistance training, which provides additional resistance when the athlete performs the kicking movement. The resistance generated by the rubber band causes the leg muscles to work more intensively, thereby stimulating an increase in muscle strength, explosive power, and muscle contraction speed related to the concept of rate of force development (RFD), which is the ability of muscles to generate force rapidly (Hocalar & Kahraman, 2024). Furthermore, training with elastic resistance also plays a role in improving the coordination of movements between hip rotation, leg swing, and body balance required for the execution of the dollyo chagi technique (Jia et al., 2024)(Wąsik et al., 2021). The neuromuscular adaptations that occur during the training process enable key muscle groups such as the gluteus maximus, quadriceps femoris, hamstrings, as well as the gastrocnemius and soleus to work in a more coordinated manner to generate acceleration of the leg movement towards the target (Huang et al., 2025). Consequently, when the training resistance is removed, kicking movements can be performed more quickly, explosively, and efficiently (Paulauskas et al., 2025).

The findings of this study are consistent with several previous studies indicating that training with resistance bands can improve athletes' physical performance, particularly in terms of strength and movement speed. Research by (Fajar et al., 2023) demonstrated that training with resistance bands has a significant effect on increasing lower-body power in taekwondo athletes. Furthermore, a study by Ilahi et al. (2023) also found that training with elastic bands was able to improve kicking speed in adolescent martial arts athletes. These results reinforce the findings of this study that training with elastic resistance can improve the explosive movement capabilities that are essential for taekwondo kicking techniques. The consistent improvement in test results following the intervention also demonstrates that training using modified rubber tyre resistance bands is capable of providing an effective training stimulus for athletes of varying ability levels. Athletes with lower initial ability levels still experienced an increase in kicking speed because the training was conducted in a gradual and repetitive manner. A structured training programme allows the muscles to adapt to the training load, resulting in a progressive improvement in physical performance.

In terms of training practice, the use of tyre rubber as a substitute for resistance bands offers several advantages. Tyre rubber is highly elastic, durable and readily available at a relatively low cost. (Stankovi, 2025) This makes tyre rubber an economical yet effective alternative training tool for providing resistance. Furthermore, the use of tyre rubber also allows trainers to adjust the level of resistance according to the athletes' needs and abilities.

Based on the results of the study and discussion, training using resistance bands modified with inner tube rubber is effective in improving the speed of the dollyo chagi kick in taekwondo athletes. This is demonstrated by the results of statistical tests, which show a significant increase between pre-test and post-test scores following the implementation of the training programme. Training with elastic resistance provides a movement stimulus that supports improvements in strength, power, coordination, and lower-body movement control, all of which play a crucial role in executing the dollyo chagi kick. This training method not only helps to improve lower limb muscle strength and power but also enhances movement coordination and the biomechanical efficiency of the kick. Consequently, training using inner tube rubber can be considered a simple, economical, and practical alternative training method to improve kicking performance in taekwondo athletes.

CONCLUSION

This study concluded that training using resistance bands made from modified inner tubes effectively increased the speed of the dollyo chagi kick among taekwondo athletes at the RTA Academy Dojang in Kendal Regency. This was demonstrated by the results of statistical tests, which showed a significant increase between pre-test and post-test scores following the implementation of the training programme. Training with elastic resistance provides a movement stimulus that supports improvements in strength, explosive power, coordination, and lower-body movement control—all of which play a crucial role in executing the dollyo chagi kick. Consequently, modified inner tube resistance band training can serve as an effective, simple, and cost-effective training method to help enhance the kicking performance of taekwondo athletes.

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