



The Effect of Rubber Weight Training on Shooting Accuracy in Futsal

M. Gymnastiar Arma^{1A-E*}, Hikmad Hakim^{2B-D}, Jamaluddin^{3B-D}

^{1,2,3} Universitas Negeri Makassar, Sulawesi Selatan, Indonesia

mgymnastiararma@gmail.com^{1*}, hikmad.hamik@unm.ac.id², jamaluddin6036@unm.ac.id³

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ABSTRACT

Shooting accuracy is one of the most decisive technical components in futsal because it directly influences goal-scoring opportunities and team success. In practice, shooting performance is not only determined by technical mastery but also by lower-limb power, body balance, concentration, and neuromuscular coordination. This study aimed to determine the effect of rubber-load training on the shooting accuracy of FIKK UNM futsal players. This research used a quantitative pre-experimental method with a one-group pretest-posttest design. The sample consisted of 15 FIKK UNM futsal players. Data were collected through shooting accuracy tests conducted before and after the treatment program. The intervention used rubber-load training designed to strengthen lower-limb muscles, improve explosive power, and support movement stability during shooting execution. The results showed a clear improvement in shooting accuracy after the treatment. The pretest mean score was 6.4000 with a standard deviation of 4.43686, while the posttest mean score increased to 12.9333 with a standard deviation of 1.57963. The total score increased from 96.00 in the pretest to 194.00 in the posttest. Hypothesis testing showed that the t-observed value was -7.737, which was greater than the t-table value of 2.145 in absolute terms, with a significance value of $p = 0.000 < 0.05$. Therefore, rubber-load training had a significant effect on improving shooting accuracy. This study concludes that rubber-load training is an effective, practical, and sport-specific training method for improving futsal shooting accuracy among university-level players.

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INTRODUCTION

Futsal is a high-intensity invasion game that demands rapid technical execution, quick decision-making, explosive lower-limb actions, and efficient movement in a limited playing area. Although futsal shares several technical foundations with football, the smaller court, faster transition, limited space, and frequent one-versus-one situations make futsal more dependent on technical precision and physical efficiency (Naser et al., 2017; Spyrou et al., 2020). In this context, shooting is not merely a basic technical skill but a decisive performance indicator because it directly determines goal-scoring opportunities and competitive success. A player may possess good dribbling, passing, and ball control, yet the inability to shoot accurately under pressure will reduce the team's attacking effectiveness.



The main problem in futsal players at FIKK UNM is the need to improve shooting accuracy through a training method that is practical, measurable, and directly related to lower-limb power. Shooting requires coordination between concentration, balance, leg muscle strength, body stability, foot-eye coordination, and correct ball-contact mechanics (Alfian & Faruk, 2019; Yunita et al., 2022). In many futsal practices, shooting drills are often repeated technically, but the supporting physical component, especially leg muscle power, is not always trained systematically. This condition may cause players to shoot with sufficient effort but poor direction, unstable body control, or inconsistent ball placement. Therefore, training programs should not only emphasize repetition of shooting technique but also develop the neuromuscular capacity that supports powerful and accurate kicking actions (Suchomel et al., 2018; Lesinski et al., 2016).

Recent futsal literature emphasizes that successful players require a combination of aerobic capacity, anaerobic power, agility, repeated sprint ability, coordination, tactical awareness, and technical quality (Mendes et al., 2022; Barreira et al., 2025). Naser et al. (2017) explained that futsal players must perform repeated high-intensity efforts, including acceleration, deceleration, rapid directional changes, and explosive technical actions. Similarly, Spyrou et al. (2020) highlighted that futsal match-play demands are characterized by intermittent high-intensity movement patterns, which require players to maintain technical performance despite fatigue. These findings indicate that shooting accuracy should be viewed as a product of both technical mastery and physical readiness.

Empirical studies in Indonesia also show that shooting accuracy is strongly associated with leg muscle power, balance, concentration, and foot-eye coordination. Yunita et al. (2022) found that coordination, leg muscle strength, and balance contributed to futsal shooting ability. Defiyanida et al. (2023) reported that running speed, foot-eye coordination, and explosive leg power were significantly related to shooting accuracy among female futsal athletes. Imka et al. (2025) further confirmed that leg muscle power and eye-foot coordination were decisive determinants of students' futsal shooting accuracy. These studies support the assumption that shooting performance is not only influenced by technical repetition but also by the physical qualities that allow players to generate force, stabilize movement, and direct the ball precisely.

Resistance band training has gained attention as a flexible and economical method to improve strength, power, balance, and movement control. Elastic resistance allows athletes to train with progressive tension, multidirectional movement, and functional patterns similar to sport-specific actions (Gaamouri et al., 2023; Sousa et al., 2025). A recent meta-analysis by Stanković et al. (2025) showed that elastic band training significantly improves lower-limb explosive power, sprint performance, and change-of-direction ability in team-sport athletes. In the futsal context, Rizki and Abdulaziz (2025) found that resistance band training improved shooting accuracy among female futsal extracurricular players, while Saputra et al. (2026) concluded that resistance band exercises enhanced shooting accuracy through improved lower-limb strength, motor control, and body stability. These findings strengthen the scientific basis for using rubber-load or resistance-band training to improve futsal shooting performance.

Although previous studies have examined the relationship between leg power and shooting accuracy, several gaps remain. First, many futsal studies still focus on correlation, such as the relationship between leg muscle strength, balance, coordination, and shooting ability, rather than testing a specific intervention model (Mahendra et al., 2022; Imka et al., 2025). Second, studies on resistance band training in futsal are still limited compared with conventional strength training, plyometric training, or shooting drill interventions (Pane et al., 2023; Mahyuddin et al., 2024). Third, existing research tends to involve school extracurricular participants, female futsal players, or general student athletes, while empirical evidence involving FIKK UNM futsal players remains limited. This local context is important because university-level players generally have different training experiences, physical maturity, and technical demands compared with school-level athletes.

Furthermore, resistance band training has often been discussed as a general strength method, but its direct contribution to shooting accuracy in futsal still requires stronger empirical support. International literature confirms the benefit of resistance training for sport-specific performance (Makaruk et al., 2024), youth athletic development (Moran et al., 2018), and neuromuscular control (Williams et al., 2021). However, the application of rubber-load training as a specific intervention for futsal shooting accuracy needs to be tested in a structured experimental framework. This gap provides a strong rationale for conducting research that links elastic resistance training, lower-limb power, and shooting accuracy in a futsal-specific setting.

This study aims to determine whether rubber-load training has a significant effect on shooting accuracy among FIKK UNM futsal players. Conceptually, this study is based on the view that accurate shooting depends on the integration of technical skill, lower-limb power, balance, concentration, coordination, and movement stability. Empirically, this research seeks to provide evidence on whether a structured resistance-band training program can improve the quality of shooting direction and scoring effectiveness in futsal players.

The novelty of this study lies in its specific focus on rubber-load training as a practical, low-cost, and functional intervention for improving shooting accuracy in university-level futsal players at FIKK UNM. Unlike conventional shooting drills that mainly emphasize technical repetition, this intervention is expected to strengthen the neuromuscular foundation of shooting performance by improving force production, postural control, and movement consistency. Therefore, this study contributes not only to futsal coaching practice but also to the development of evidence-based physical training models in sports coaching education.

Based on the theoretical and empirical evidence, shooting accuracy in futsal should be understood as a multidimensional skill influenced by technical, physical, and psychological components. The development of leg muscle power through rubber-load training is assumed to support more stable, powerful, and accurate shooting execution. Therefore, this study is important because it examines a relevant training intervention for improving futsal shooting accuracy among FIKK UNM players and offers practical implications for coaches, lecturers, and sports practitioners who seek to design efficient and evidence-based futsal training programs.

METHODS

This study employed a quantitative pre-experimental method using a one-group pretest–posttest design. This design was selected because the main objective of the study was to examine the effect of rubber-load training on the shooting accuracy of FIKK UNM futsal players by comparing their performance before and after the intervention. Pre-experimental designs are commonly used in sport training research when researchers aim to evaluate the practical effect of a specific treatment in a controlled training setting, although the absence of a control group requires careful interpretation of the findings. In line with recent sport performance studies, training intervention research should be supported by valid testing procedures, systematic treatment implementation, and measurable performance outcomes (Naser et al., 2017; Spyrou et al., 2020; Sekulic et al., 2021).

The study involved two main variables: rubber-load training as the independent variable and shooting accuracy as the dependent variable. Data were collected through tests and measurements. The pretest was conducted in the first week to determine the initial shooting accuracy of the players before receiving treatment. The treatment consisted of structured rubber-load training designed to improve lower-limb strength, explosive power, balance, and movement control, which are important physical components in futsal shooting performance. Resistance-band and variable-resistance training have been reported to improve lower-limb power, sprint ability, change-of-direction performance, and functional strength in team-sport athletes (Slimani et al., 2018; Chaabene et al., 2020; Stanković et al., 2025; Xu et al., 2026). Empirical studies in futsal and football contexts also indicate that leg muscle strength, balance, coordination, and rubber-band-based training are associated with better kicking and shooting performance (Aiman, 2025; Anggraini, 2025; Munar, 2026).

The posttest was administered in the fourth week after the completion of the treatment program using the same shooting accuracy test procedure as the pretest. Participants were ranked based on their initial test results, and matching pairing was used to organize balanced training pairs during the treatment process. The data were analyzed by comparing pretest and posttest scores to determine whether rubber-load training produced a meaningful improvement in futsal shooting accuracy among FIKK UNM players.

RESULTS AND DISCUSSION

Result

The results of this study describe the effect of rubber-load training on the improvement of shooting accuracy among FIKK UNM futsal players. The analysis was conducted through descriptive statistics, frequency distribution, and hypothesis testing using the pretest and posttest scores. The total sample consisted of 15 futsal players. The pretest was administered before the treatment, while the posttest was conducted after the rubber-load training program had been implemented.

Descriptive Statistical Analysis

Table 1.
Descriptive Statistics of Shooting Accuracy

Variable	Statistic	Pretest	Posttest
Rubber-load training	N	15	15
	Sum	96.00	194.00
	Mean	6.4000	12.9333
	Standard Deviation	4.43686	1.57963
	Range	14.00	5.00
	Minimum	1.00	10.00
	Maximum	15.00	15.00

Based on Table 1, the descriptive analysis shows a clear improvement in shooting accuracy after the rubber-load training treatment. In the pretest, the 15 futsal players obtained a total score of 96.00, with a mean score of 6.4000 and a standard deviation of 4.43686. The score range was 14.00, with the lowest score of 1.00 and the highest score of 15.00. These results indicate that, before treatment, the players' shooting accuracy was still varied and relatively inconsistent.

In the posttest, the total score increased to 194.00, with a mean score of 12.9333 and a standard deviation of 1.57963. The range decreased to 5.00, with a minimum score of 10.00 and a maximum score of 15.00. This finding indicates that after receiving rubber-load training, the players demonstrated better and more consistent shooting accuracy. The increase in the mean score from 6.4000 to 12.9333 shows an improvement of 6.5333 points. Conceptually, this improvement suggests that rubber-load training contributed to better lower-limb power, movement control, body stability, and shooting execution.

Frequency Distribution of Pretest Scores

Table 2.
Frequency Distribution of Pretest Shooting Accuracy Scores

Class Interval	Absolute Frequency	Relative Frequency (%)
1 – 3.8	6	40.00
3.9 – 6.6	1	6.67
6.7 – 9.4	4	26.67
9.5 – 12.2	2	13.33
12.3 – 15	2	13.33
Total	15	100.00

Table 2 shows that the highest number of players in the pretest was found in the 1–3.8 interval, with 6 players or 40.00%. This indicates that most players had low shooting accuracy before receiving the treatment. Only 2 players, or 13.33%, reached the highest interval of 12.3–15. These results confirm that the initial shooting accuracy of FIKK UNM futsal players still needed improvement through a more structured and specific training program.

Frequency Distribution of Posttest Scores

Table 3.
Frequency Distribution of Posttest Shooting Accuracy Scores

Class Interval	Absolute Frequency	Relative Frequency (%)
10 – 11	3	20.00
11.1 – 12	3	20.00
12.1 – 13	3	20.00
13.1 – 14	3	20.00
14.1 – 15	3	20.00
Total	15	100.00

Table 3 demonstrates that the posttest scores were more evenly distributed across the higher score intervals. Each class interval consisted of 3 players, or 20.00%. Importantly, the lowest posttest score was 10.00, while the highest score reached 15.00. Compared with the pretest distribution, this result indicates that

the rubber-load training program did not only increase the average shooting accuracy but also reduced performance disparity among players.

Hypothesis Testing

Table 4.
Results of Hypothesis Testing

Test	Mean	t-observed	t-table	p-value	α	Interpretation
Pretest	6.4000	-7.737	2.145	0.000	0.05	Significant
Posttest	12.9333					

Based on Table 4, the hypothesis testing result shows that the observed t-value was -7.737, while the t-table value was 2.145 at the 0.05 significance level. The probability value was 0.000, which is lower than $\alpha = 0.05$. Therefore, the alternative hypothesis is accepted. This means that rubber-load training had a significant effect on improving shooting accuracy among FIKK UNM futsal players. The mean score of the posttest was higher than the mean score of the pretest, or $6.4000 < 12.9333$. This empirical evidence confirms that the shooting accuracy of the players improved after participating in the rubber-load training program. From a conceptual perspective, this improvement can be explained by the role of rubber-load training in developing lower-limb strength, explosive power, balance, and neuromuscular coordination. These physical components are essential in supporting accurate shooting execution in futsal, especially because shooting requires force production, body control, concentration, and precise ball direction. Thus, it can be concluded that rubber-load training significantly improves the shooting accuracy of FIKK UNM futsal players. The findings support the use of rubber-load training as an effective, practical, and sport-specific training method for futsal coaching programs.

Discussion

The findings of this study demonstrate that rubber-load training had a significant effect on improving shooting accuracy among FIKK UNM futsal players. Descriptively, the mean pretest score was 6.4000, while the mean posttest score increased to 12.9333. This indicates an improvement of 6.5333 points after the treatment program. The total score also increased from 96.00 in the pretest to 194.00 in the posttest. In addition, the standard deviation decreased from 4.43686 to 1.57963, showing that the players' shooting accuracy became not only higher but also more consistent after participating in the rubber-load training program. This result is empirically important because futsal performance is strongly determined by the ability to execute technical actions quickly and accurately in limited space (Naser et al., 2017; Spyrou et al., 2020; Sarmiento et al., 2016; Travassos et al., 2016).

The increase in shooting accuracy can be explained through the specific physical demands of futsal. Futsal is played five against five, with rapid transitions, frequent acceleration and deceleration, and repeated explosive actions. Therefore, winning or losing is closely related to the team's ability to create and finish goal-scoring opportunities efficiently. Shooting is one of the most decisive technical skills because it requires concentration, body balance, eye-foot coordination, lower-limb power, and precise ball contact. Studies on futsal match-play show that futsal players must maintain high-intensity technical performance under fatigue and pressure, making physical qualities such as strength, power, agility, and neuromuscular coordination essential for technical success (Spyrou et al., 2020; Spyrou et al., 2023; Barreira et al., 2025; Nam et al., 2025).

The hypothesis test further supports the descriptive findings. The t-observed value was -7.737, while the t-table value was 2.145, with a significance value of $p = 0.000$ at $\alpha = 0.05$. Although the t-value is negative due to the direction of score subtraction, the absolute value is greater than the t-table value. Thus, the alternative hypothesis is accepted. This means that rubber-load training significantly improved the shooting accuracy of FIKK UNM futsal players. The result is consistent with previous studies showing that lower-limb strength, balance, and explosive power are closely associated with shooting accuracy in futsal and football (Adityatama, 2017; Alfian & Faruk, 2019; Mahanani & Indriarsa, 2021; Defiyanida et al., 2023; Aiman & Darmanto, 2025; Imka et al., 2025). Recent Indonesian studies also confirm that leg muscle power contributes strongly to futsal shooting accuracy, while balance and eye-foot coordination support ball direction and movement stability.

Conceptually, rubber-load training is effective because it provides elastic resistance that challenges the muscles throughout the movement range. Unlike static or purely conventional loading, elastic resistance

increases tension as the band is stretched, allowing athletes to develop force gradually and dynamically. This mechanism is relevant to shooting because the kicking motion requires a coordinated sequence of hip flexion, knee extension, ankle stabilization, trunk control, and follow-through. When the lower-limb muscles become stronger and more responsive, the player can produce greater kicking force with better control, resulting in more accurate shooting. This explanation aligns with strength and conditioning literature showing that resistance training can improve force production, rate of force development, neuromuscular recruitment, and sport-specific movement efficiency (Suchomel et al., 2018; Haff & Nimphius, 2018; Lesinski et al., 2016; Moran et al., 2018; Chaabene et al., 2020).

The present finding is also supported by systematic reviews and meta-analyses on elastic band training. Stanković et al. (2025) reported that elastic band training significantly improves lower-limb explosive power, sprint performance, and change-of-direction ability in team-sport athletes. Gaamouri et al. (2023) found that elastic band training improved change of direction, jumping ability, repeated sprint ability, muscular strength, and power among adolescent team-sport athletes. These findings are relevant to futsal because shooting accuracy is not only a technical outcome but also a product of explosive force, dynamic balance, and coordinated lower-limb control.

The reduction in score variation from pretest to posttest is another important empirical indicator. In the pretest, the range was 14.00, with scores spreading from 1.00 to 15.00. After the intervention, the range decreased to 5.00, with the lowest score increasing to 10.00. This means that rubber-load training helped weaker players improve substantially, while better players maintained or enhanced their performance. In coaching practice, this is valuable because a training program is considered effective not only when it improves average performance but also when it reduces performance gaps among players. Similar conclusions have been reported in sport training studies emphasizing that structured resistance training can improve consistency, movement quality, and technical execution in young and university athletes (Beato et al., 2017; Loturco et al., 2020; Makaruk et al., 2024; Xu et al., 2026; Meng et al., 2025).

From a practical perspective, rubber-load training can be recommended for futsal coaches because it is simple, economical, portable, and adaptable to sport-specific movement patterns. Coaches can integrate this method into warm-up, strength development, technical shooting drills, or functional lower-limb conditioning. However, the training must be programmed progressively by considering resistance level, movement quality, repetition volume, recovery time, and technical transfer to shooting practice. If resistance is too light, the adaptation may be limited; if it is too heavy, shooting mechanics may be disrupted. Therefore, rubber-load training should be combined with shooting drills, coordination exercises, balance training, and tactical finishing situations to produce stronger transfer to real futsal performance (Slimani et al., 2018; Clemente et al., 2019; Ribeiro et al., 2020; Sekulic et al., 2021; Mendes et al., 2022).

Overall, the results of this study confirm that rubber-load training significantly improves shooting accuracy among FIKK UNM futsal players. The empirical increase from 6.4000 to 12.9333, supported by a significant t-test result, proves that this training model has a meaningful contribution to futsal performance. Conceptually, the improvement occurred because rubber-load training strengthens the lower-limb muscles, increases explosive power, improves body stability, and supports better coordination during the shooting movement. Therefore, rubber-load training can be considered an effective evidence-based training method for improving futsal shooting accuracy, particularly in university-level players.

CONCLUSION

Based on the results of the study, it can be concluded that rubber-load training has a significant effect on improving shooting accuracy among FIKK UNM futsal players. Empirically, the descriptive analysis showed a clear increase in shooting performance after the treatment. The pretest mean score was 6.4000, while the posttest mean score increased to 12.9333, indicating an improvement of 6.5333 points. The total score also increased from 96.00 in the pretest to 194.00 in the posttest. In addition, the standard deviation decreased from 4.43686 to 1.57963, which means that the players' shooting accuracy became more consistent after participating in the rubber-load training program.

The hypothesis testing result also confirmed this improvement. The t-observed value was -7.737, which was greater than the t-table value of 2.145 in absolute terms, with a significance value of $p = 0.000 < 0.05$.

Therefore, the alternative hypothesis was accepted. Conceptually, rubber-load training contributed to the improvement of shooting accuracy by strengthening lower-limb muscles, increasing explosive power, improving balance, and enhancing neuromuscular coordination during the shooting movement. Thus, rubber-load training can be recommended as an effective, practical, and sport-specific training method to improve futsal shooting accuracy, particularly for university-level futsal players.

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