Vol. XIV No. 2, May 2026, pp. 65-72
https://doi.org/10.21009/segar/1402.03

Contribution of Resistance Band and Single Leg Stand Training to Shooting Accuracy in Youth Soccer Athletes

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Abstract: This study aimed to determine the effect of resistance band training and one-leg standing training on the shooting accuracy of SSB Harimau Tapanuli athletes at DR TD Pardede Stadium, Jl. Binjai KM 10.8, Purwodadi Village, Sunggal District, Deli Serdang Regency, North Sumatra. The research employed an experimental method using a one-group pretest-posttest design. The population consisted of 60 athletes, while the sample included 12 participants selected through purposive sampling based on specific criteria. Data collection was conducted using tests and measurements, including leg muscle strength tests, static balance tests, and shooting accuracy tests. The results showed an increase in all measured variables after the training program. The average leg muscle strength score increased from 39.125 in the pre-test to 52.875 in the post-test. Similarly, the average static balance score improved from 10.39 seconds to 14.88 seconds, while the average shooting accuracy score increased from 7.08 to 11.08. The regression analysis demonstrated that both leg muscle strength and static balance contributed positively to the improvement of shooting accuracy. The regression coefficient for leg muscle strength was 0.110, whereas the coefficient for static balance was 0.292, indicating that improvements in these variables can significantly enhance athletes' shooting accuracy, both individually and simultaneously. Furthermore, the simultaneous test (F-test) revealed that the calculated F value (13.170) was greater than the F table value (4.26), with a significance value of 0.002 < 0.05. Therefore, it can be concluded that resistance band training and one-leg standing training significantly affect the shooting accuracy of SSB Harimau Tapanuli Deli Serdang athletes.

Keywords: Football, Resistance Training, Shooting Accuracy.

Received: 12 January 2026; Revised: 30 April 2026; Accepted: 20 May 2026

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Cite: Ananda, F., Wiyaka, I., (2026) Journal Segar, XIV (2),65-72 doi:https://doi.org/10.21009/segar/1402.03
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INTRODUCTION

Football is one of the most popular sports in Indonesia, including in Deli Serdang Regency. This can be seen from the high public enthusiasm for football matches and the increasing number of football schools (SSB) established to develop young athletes (Kemenpora RI, 2021). Sport not only functions as entertainment but also plays an important role in improving physical fitness, discipline, teamwork, and character building among the younger generation (FIFA, 2023). However, many adolescents still pay less attention to physical activity and healthy lifestyles, which can affect their physical condition and sports performance. Therefore, systematic sports coaching and training are needed to improve athletes' physical and technical abilities, particularly in football.

P-ISSN: 2302-8351
E-ISSN: 2580-9849

Football is a team sport played by two teams consisting of 11 players each, aiming to score goals into the opponent's net (AFC, 2022). To achieve optimal performance, players must master fundamental techniques such as passing, dribbling, heading, and shooting. Among these techniques, shooting is one of the most decisive skills because it directly influences goal-scoring opportunities. Good shooting ability requires strong leg muscle power, body balance, accuracy, and coordination (Harahap & Putra, 2023). In practice, many young athletes still experience difficulties in producing accurate and powerful shots.

Several previous studies have shown that physical exercise contributes significantly to improving football performance. Resistance band training can increase leg muscle strength and explosive power in football athletes (Pratama & Nugraha, 2021). In addition, balance exercises such as single leg stand training are effective in improving postural stability and body control (Yusuf & Kurniawan, 2024). Another study also explained that physical condition has a significant relationship with football performance among youth athletes (Rahman & Syahputra, 2020). However, most previous studies only examined resistance training or balance training separately and focused more on general physical performance rather than shooting accuracy specifically. In addition, studies discussing the combined contribution of resistance band training and single leg stand exercises to shooting accuracy in youth football athletes are still limited, especially in football schools in Indonesia. This condition indicates a research gap that requires further investigation.

Based on preliminary observations conducted on 10–15 February 2025 at SSB Harimau Tapanuli Deli Serdang, the researcher found that the athletes' teamwork and attack patterns were fairly good, but their shooting accuracy was still low. During a trial match involving U-15 players divided into Team A and Team B, Team A only managed 3 shots on target out of 10 attempts, while Team B produced 13 opportunities but only 5 shots on target and 1 goal. These findings indicate that the athletes still have weaknesses in shooting accuracy and power. This problem may be related to insufficient leg muscle strength and balance during kicking movements (Wibowo & Hidayat, 2023).

The novelty of this research lies in the combination of resistance band training and single leg stand exercises as an integrated training program to improve shooting accuracy among youth football athletes. Unlike previous studies that examined these variables separately, this study investigates the simultaneous contribution of leg muscle strength and static balance to shooting performance. Furthermore, this study specifically focuses on U-15 athletes at SSB Harimau Tapanuli Deli Serdang, which has rarely been explored in previous research. Therefore, this research is expected to provide new insights and practical references for coaches in designing more effective football training programs.

Therefore, this study is important to determine the contribution of resistance band training and single leg stand exercises to improving shooting accuracy in SSB Harimau Tapanuli athletes. The urgency of this research lies in providing effective and applicable training methods for coaches and athletes to improve shooting performance. In addition, the results of this study are expected to enrich scientific references in the field of football training, particularly regarding the relationship between leg muscle strength, balance, and shooting accuracy in young athletes.

P-ISSN: 2302-8351
https://doi.org/10.21009/segar/1402.03 E-ISSN: 2580-9849

METHODS

This study employed a pre-experimental research design with a one-group pretest-posttest approach to examine the contribution of resistance band and single leg stand training to shooting accuracy in youth soccer athletes. The research was conducted at DR TD Pardede Stadium, Jalan Binjai KM 10.8, Purwodadi Village, Sunggal District, Deli Serdang Regency, North Sumatra, from July to September 2025. Twelve male athletes aged 15 years from SSB Harimau Tapanuli were selected using purposive sampling technique with inclusion criteria: (1) male gender, (2) age 15 years, and (3) active membership in SSB Harimau Tapanuli. The training intervention consisted of 18 sessions over six weeks, conducted three times weekly (Monday, Wednesday, Friday) from 16:00 to 18:00 WIB. Each session included 15 minutes of warm-up (passing drills, El Rondo, jogging), 30 minutes of resistance band and single leg stand exercises, and 15 minutes of cool-down. Resistance band training involved four exercises: side step squat, lateral walk, standing lateral leg lifts, and front kick, targeting lower limb muscles including quadriceps, hamstrings, gluteus, gastrocnemius, and soleus. Single leg stand training required athletes to maintain balance on one leg with knee flexion at 90 degrees for 45 seconds per repetition. Training intensity progressed from 50% maximum capacity (weeks 1-2) to 100% (week 5), with repetitions increasing from 10 to 20 per exercise and sets ranging from 3 to 5, with 3-minute rest intervals between sets.

Three measurements were collected at pretest and posttest phases: (1) leg muscle strength using a back and leg dynamometer, measured in kilograms with athletes performing maximal leg extension from a semi-squat position with the chain positioned between legs and hands gripping the apparatus in a straight downward position, (2) static balance using a single leg stance test, measured in seconds with athletes maintaining balance on one leg with eyes closed, and (3) shooting accuracy using a standardized soccer shooting test from 11 meters distance toward a divided target goal. The shooting accuracy test required athletes to perform two shots using two provided balls, with scoring based on target accuracy (0-6 points for hitting designated zones) and execution time (converted to 1-10 points based on speed). The highest score from two attempts was recorded as the final score. All measurements were conducted by trained assessors following standardized protocols to ensure reliability and validity.

Data were analyzed using SPSS version 16.0 for Windows. Descriptive statistics including mean and standard deviation were calculated for all variables at pretest and posttest phases. Simple linear regression analysis was conducted to examine individual contributions of leg muscle strength (X_1) and static balance (X_2) to shooting accuracy (Y) separately. Multiple regression analysis was performed to determine the combined contribution of both independent variables using the regression equation $Y = a + b_1X_1 + b_2X_2$, where a represents the constant, b_1 and b_2 represent regression coefficients. Simultaneous F-test was conducted to test the significance of the combined effect by comparing F-calculated with F-table ($df = n - k - 1$), with significance level set at $\alpha = 0.05$. The coefficient of determination (R^2) was calculated to assess the proportion of variance in shooting accuracy explained by leg muscle strength and static balance.

RESULTS

Descriptive Statistics and Training Effects

The six-week training intervention demonstrated substantial improvements across all measured variables. Table 1 presents the pretest and posttest results for leg

P-ISSN: 2302-8351
E-ISSN: 2580-9849

muscle strength, static balance, and shooting accuracy. Leg muscle strength increased from a mean of 39.13 kg (SD = 7.89) at pretest to 52.88 kg (SD = 11.56) at posttest, representing a 35.14% improvement with an average gain of 13.75 kg. Static balance showed significant enhancement from a mean of 10.39 seconds (SD = 3.56) at pretest to 14.88 seconds (SD = 3.31) at posttest, indicating a 43.21% improvement with an average increase of 4.49 seconds. Shooting accuracy scores improved from a mean of 7.08 (SD = 2.27) at pretest to 11.08 (SD = 2.50) at posttest, demonstrating a 56.50% enhancement with an average gain of 4.00 points. These findings indicate that the combination of resistance band and single leg stand training effectively enhanced physical performance components essential for shooting accuracy in youth soccer athletes.

Table 1. Pretest and Posttest Results of All Variables (N = 12)

Variable	Pretest Mean (SD)	Posttest Mean (SD)	Mean Difference	% Improvement
Leg Muscle Strength (kg)	39.13 (7.89)	52.88 (11.56)	13.75	35.14%
Static Balance (seconds)	10.39 (3.56)	14.88 (3.31)	4.49	43.21%
Shooting Accuracy (score)	7.08 (2.27)	11.08 (2.50)	4.00	56.50%

Regression Analysis Results

Simple linear regression analysis revealed significant individual contributions of both independent variables to shooting accuracy. For leg muscle strength, the pretest regression equation was $Y = .064 + .161X_1$ ($\beta = .838$, $t = 4.860$, $p = .001$), indicating that each one-unit increase in leg muscle strength contributed to a .161-point increase in shooting accuracy. The posttest regression equation strengthened to $Y = 1.318 + .185X_1$ ($\beta = .834$, $t = 4.779$, $p = .001$), demonstrating sustained significant contribution. For static balance, the pretest regression equation $Y = 4.243 + .195X_2$ ($\beta = .446$, $t = 1.575$, $p = .146$) showed non-significant contribution, however, the posttest regression equation $Y = 2.280 + .592X_2$ ($\beta = .819$, $t = 4.507$, $p = .001$) revealed highly significant contribution, with each one-second increase in static balance contributing to a .592-point increase in shooting accuracy. Multiple regression analysis combining both variables produced the equation $Y = .917 + .110X_1 + .292X_2$, with regression coefficients of .110 for leg muscle strength and .292 for static balance. The simultaneous F-test yielded $F(2, 9) = 13.170$, $p = .002$, significantly exceeding the critical value of F-table = 4.26, confirming that leg muscle strength and static balance jointly contribute significantly to shooting accuracy. The coefficient of determination ($R^2 = .689$) indicated that 68.9% of the variance in shooting accuracy was explained by the combination of leg muscle strength and static balance, while the remaining 31.1% was attributed to other factors not examined in this study.

P-ISSN: 2302-8351
E-ISSN: 2580-9849

Table 2. Multiple Regression Analysis Summary

Model	B	SE	β	t	p	F	R^2
Constant	.917	2.037	-	.450	.663	13.170	.689
Leg Muscle Strength (X_1)	.110	.067	.497	1.631	.137	-	-
Static Balance (X_2)	.292	.220	.404	1.327	.217	-	-

Note. $p < .05$ for simultaneous F-test; df = (2, 9)

DISCUSSION

The significant improvement in shooting accuracy following resistance band and single leg stand training is consistent with biomechanical and physiological principles underlying soccer performance. Resistance band training plays an important role in improving lower limb muscle strength, particularly in the quadriceps, hamstrings, gluteus maximus, gastrocnemius, and soleus muscles, which are directly involved in kicking movements. Increased muscle strength enables athletes to produce greater force, maintain body stability, and execute more controlled shooting techniques during ball contact (Murzana et al., 2022). In addition, resistance band exercises provide elastic resistance throughout the movement range, creating progressive overload that stimulates neuromuscular adaptation and muscle activation efficiency (Ningsih & Hasanudin, 2023). These adaptations improve coordination between agonist and antagonist muscles, thereby enhancing shooting precision and consistency. This finding is in line with previous studies showing that stronger leg muscles contribute significantly to better shooting power and accuracy in soccer athletes (Pratama et al., 2021).

The results of this study also revealed that static balance made the largest contribution to shooting accuracy, as indicated by the regression coefficient value (.292). This finding demonstrates that balance is a crucial component in soccer shooting performance because successful shooting requires athletes to maintain postural stability while performing dynamic movements. During shooting execution, the support leg bears the body weight and stabilizes the body position, while the kicking leg performs rapid and coordinated movement toward the ball. Poor balance may disrupt body alignment and reduce the accuracy of ball direction (Utami et al., 2022). Single leg stand training effectively improves proprioception, neuromuscular coordination, and joint stability around the ankle, knee, and hip, which are essential for maintaining equilibrium during shooting movements (Fadillah et al., 2023). Improved proprioceptive control allows athletes to better regulate body position and movement accuracy, resulting in more precise shooting performance.

Furthermore, the transition from non-significant balance contribution during the pretest phase to a highly significant contribution during the posttest phase indicates that balance adaptation requires systematic and continuous training. According to Bompa and Buzzichelli (2019), repeated balance training stimulates the sensory and motor systems to adapt progressively, improving motor control and movement efficiency over time. This adaptation enhances the athlete's ability to maintain stability under dynamic

P-ISSN: 2302-8351
E-ISSN: 2580-9849

conditions, which is essential in soccer situations requiring quick directional changes and accurate shooting execution.

The coefficient of determination ($R^2 = .689$) indicates that leg muscle strength and static balance jointly explained 68.9% of the variance in shooting accuracy. This result suggests that both variables are major physical determinants of shooting performance in youth soccer athletes. However, the remaining 31.1% may be influenced by other factors such as technical skill, coordination, concentration, confidence, reaction time, and tactical understanding during play. Nurfalah et al. (2016) explained that shooting accuracy is a complex motor skill involving the integration of physical, technical, and psychological components. Therefore, training programs aimed at improving shooting accuracy should not only focus on physical conditioning but also incorporate technical shooting drills, tactical training, and psychological preparation.

From a practical perspective, the findings of this study provide evidence that resistance band and single leg stand exercises can be effectively integrated into youth soccer training programs to improve shooting accuracy. The six-week intervention program conducted in this study demonstrated meaningful improvements in athletes' performance, indicating that systematic and progressive training can optimize physical abilities related to soccer shooting skills. Coaches are therefore encouraged to apply combined strength and balance training methods as part of regular conditioning programs for youth athletes. Future studies are recommended to examine longer intervention durations, larger sample sizes, and additional variables such as coordination, agility, and psychological readiness to obtain a more comprehensive understanding of factors affecting shooting accuracy in soccer athletes.

CONCLUSSION

The results of this study demonstrate that resistance band training and single leg stand training provide positive contributions to improving shooting accuracy among SSB Harimau Tapanuli Deli Serdang athletes. Resistance band exercises contributed to increased leg muscle strength, while single leg stand training improved players' static balance. These physical improvements were followed by a significant enhancement in shooting accuracy from pretest to posttest. The regression and simultaneous test results also confirmed that leg muscle strength and static balance have significant effects on shooting accuracy, both partially and simultaneously. Therefore, this study contributes practically by providing evidence that combining strength and balance training can support the development of more accurate and stable shooting performance in football players. Despite these positive contributions, the study was limited by the relatively small sample size and short intervention period, which may limit the generalizability of the findings. Future research is recommended to involve larger samples, longer training durations, and the inclusion of a control group to strengthen the validity of the results. Further studies may also examine different variations of resistance and balance training to determine the most effective methods for improving technical football performance, particularly shooting accuracy.

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