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Lower Limb Strength Training as an Intervention and Its Effects on Kicking Distance and Three Pointer Conversion Accuracy in Rugby Players

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ABSTRACT

Rugby is a high-intensity sport requiring endurance, agility, strength, and power, places significant demands on players' lower limbs, particularly for activities such as kicking, sprinting, and tackling. Kicking, crucial for scoring in rugby, involves both distance and accuracy, which are largely influenced by lower limb strength. This study investigates the impact of lower limb strength training on kicking distance and three-point conversion accuracy in rugby players. An 8-week lower limb strength training program, combining resistance and plyometric exercises, was conducted with male rugby players aged 18-30 years, each having at least two years of rugby playing experience. The research employed a quasi-experimental design, with pre- and post-intervention tests measuring kicking distance (place and punt kicks) and conversion accuracy (three-point conversion kicks). The results showed significant improvements in both kicking distance and accuracy, with the mean kicking distance for place kicks increasing from 31.5 meters to 41.1 meters, and punt kicks from 43.0 meters to 51.6 meters. Additionally, conversion accuracy improved from 61.2% to 79.2%. These improvements highlight the effectiveness of lower limb strength training in enhancing both the distance and accuracy of rugby kicks. The findings suggest that strengthening the lower limbs through targeted resistance and plyometric exercises significantly boosts performance, particularly in key rugby skills like kicking. This research emphasizes the importance of incorporating lower limb strength training into rugby players' training regimens to enhance overall performance and provide valuable insights for optimizing strength training programs in rugby.

Keywords: *Rugby, Lower Limb Strength, Kicking Distance, Conversion Accuracy, Plyometrics, Strength Training, Sports Performance.*

INTRODUCTION

Rugby is a high-intensity, physically demanding team sport with deep roots in history, originating in England in the early 19th century. It is a game that revolves around carrying, passing, and kicking the ball, with the ultimate goal of scoring more points than the opposing team (Ratulomai, 2023). The sport is played in multiple formats, including Rugby Union, Rugby League, and Sevens, each with its own rules, but all sharing similar fundamental principles. Rugby Union, the most widely practiced form globally, players engage in a mix of running, tackling, and strategic ball handling (Ross et al., 2014).

One of the most crucial aspects of the game is the kicking ability, which serves both offensive and defensive purposes. Kicking is not only used for gaining territory, but also for scoring points in the form of conversions, penalty kicks, and drop goals. These kicking actions can decisively influence the outcome of a match, making them a key component of rugby strategy (Gonzalez-Rodenas et al., 2017).

A conversion occurs after a try is scored, where the player attempts to kick the ball between the goalposts and above the crossbar to earn additional points. Penalty kicks are awarded after a foul committed by the opposition, and the team has the option of attempting a goal from the spot of the infringement. Long-distance kicks are used strategically for territorial advantage, aiming to either push the ball deep into the opponent's half or clear the ball from the defensive zone (Blecker, 2018).

The distance and accuracy of a kick in rugby can determine a game's momentum, and it is often the difference between winning and losing. Therefore, players with strong kicking skills, especially those with the ability to score long-range penalty kicks and accurate conversions, are highly valued (Quarrie & Hopkins, 2015). Rugby places significant physical demands on players, combining a mix of endurance, strength, agility, and mental toughness. A typical rugby match lasts for 80 minutes and is played in two halves, with teams competing to outscore one another. During these 80 minutes, players constantly switch between phases of high-intensity effort (such as sprinting, tackling, and jumping) and brief recovery periods (Vachon et al., 2022).

Endurance: Rugby players need to maintain a high level of cardiovascular fitness, given the repeated sprints, tackles, and running during the game. The ability to maintain energy levels over the course of 80 minutes is crucial, and conditioning programs often focus on building aerobic and anaerobic endurance. Rugby requires both maximal strength (the ability to exert maximum force against resistance) and strength endurance (the ability to sustain force output over time) (Jones et al., 2016).

Players must have enough strength to break tackles, carry the ball through defenders, and support rucking and scrumming. Explosive power is fundamental in rugby for actions such as sprinting, tackling, jumping, and, of course, kicking (Green, 2016). Kicking requires a rapid generation of force, and the power to push the body forward in sprinting requires explosive leg strength and coordination. Agility allows players to change direction rapidly, evade tackles, and position themselves effectively on the field. This is vital for both offensive and defensive play (Dos' Santos et al., 2022).

Rugby players rely on lower body strength for explosive movements, kicking distance and accuracy, yet the specific impact of strength training on kicking distance and accuracy performance remains underexplored (Baker & Newton, 2008). This study aims to investigate how lower limb strength training influences kicking distance and conversion accuracy in rugby players. The findings could provide valuable insights for optimizing strength training programs to improve kicking performance in rugby.

Lower Limb Strength and Rugby Performance

Lower limb strength is essential for enhancing overall rugby performance. Rugby requires dynamic movements such as sprinting, tackling, jumping, and kicking, all of which rely on the power and explosiveness generated by the muscles in the lower body (Watkins, 2021). Strong muscles in the quadriceps, hamstrings, calves, glutes, and hip flexors are key to optimizing these actions. For sprinting, strong lower limbs allow players to accelerate quickly, with the quadriceps extending the knee and the hamstrings controlling the leg's deceleration. The calves provide the push-off for speed, while the glutes contribute to hip extension, helping with rapid acceleration and quick direction changes (Wilson et al., 2020).

Similarly, agility relies on these muscles to absorb force and generate power when changing direction. In tackling, lower limb strength is crucial for driving through opponents. The glutes, quadriceps, and hamstrings enable the necessary power and force, ensuring that players can make strong, controlled tackles. The lower body is also vital for jumping, whether for lineouts or aerial tackles (Monajati, 2017).

Impact of Lower Limb Strength on Kicking Distance

Lower limb strength plays a crucial role in the ability of rugby players to generate the force required for powerful kicks. Stronger muscles in the legs, particularly the quadriceps, hamstrings, calves, and glutes, contribute to a higher level of explosive power, which directly affects the distance a player can kick the ball (Gadev & Peev, 2022). Studies have shown that a strong lower body allows players to achieve greater control and distance when executing place kicks, punts, and drop kicks (Peacock et al., 2017). Training programs that focus on developing strength through exercises such as squats, lunges, and deadlifts are beneficial in enhancing the power output of these muscles, resulting in improved kicking distance.

Influence of Lower Limb Strength on Conversion Accuracy

Rugby, conversion accuracy is essential for scoring after a try and plays a vital role in determining the outcome of a match. Lower limb strength directly influences the accuracy of conversion kicks, as it affects the stability and control of the kicking leg during the follow-through (Blair, 2019). Stronger muscles in the legs, including the quadriceps, hamstrings, and calves, allow for better control over the trajectory of the ball, leading to more accurate kicks (Atack et al., 2024). Additionally, the power generated by the lower limbs assists in maintaining the proper angle and velocity needed for a successful conversion. It has been suggested that a combination of strength training and technique refinement can lead to improved consistency and accuracy in conversion kicks (Dos' Santos et al., 2018).

Strength Training Modalities in Rugby

Strength training is an essential component of a rugby player's development, as it enhances physical performance, reduces injury risk, and improves overall athletic ability. Different strength training modalities, including resistance training and plyometrics, are utilized to target specific physical qualities required in rugby, such as power, speed, strength, and endurance (Jones et al., 2016). These training techniques improve players' abilities in crucial areas like sprinting, tackling, and kicking.

Resistance Training Techniques for Rugby Players

Resistance training is fundamental for building maximal strength and muscle endurance, two key attributes needed for rugby performance. Exercises like squats, deadlifts, lunges, and step-ups target the major lower body muscles, including the quadriceps, hamstrings, glutes, and calves (Ali et al., 2022). These exercises increase the ability to generate force and improve performance in activities such as tackling, sprinting, and scrummaging. Additionally, upper body resistance training with exercises like bench presses, pull-ups, and overhead presses is essential for improving strength in actions such as rucking, lifting in the lineout, and making powerful passes. The principle of progressive overload is applied to ensure continuous strength gains, gradually increasing the resistance over time to promote muscle growth and increase strength.

Plyometric Training for Kicking Performance

Plyometric training, which involves explosive exercises like box jumps, bounding, and jump squats, is vital for developing the rate of force development (RFD) and explosive power, especially in the lower body.

Plyometric train muscles to exert maximum force in minimal time, improving the explosiveness required for actions like kicking and sprinting. For rugby players, plyometric training enhances the power of the kicking leg, enabling stronger and more controlled kicks (Watkins, 2021). Plyometric exercises also improve coordination, timing, and neuromuscular efficiency, all of which contribute to more accurate and powerful kicking performance. The ability to rapidly generate force is crucial for both long-distance kicks and quick, precise conversion attempts. By incorporating plyometric into their training regimen, rugby players can significantly enhance their kicking distance and accuracy, two crucial components for successful performance in the game (Slimani et al., 2016).

Biomechanics of Kicking

The biomechanics of kicking in rugby involves a complex series of movements and muscle activations that work together to generate the necessary power, accuracy, and control for effective kicks. Understanding the mechanics of kicking and how different muscles are activated is essential for optimizing kicking performance, reducing injury risks, and improving consistency in both distance and accuracy (Lombard, 2018).

Kicking Mechanics in Rugby

Kicking in rugby is a dynamic motion that requires precise coordination between the lower body muscles and proper body alignment. The kicking motion starts with the approach phase, where the player positions themselves relative to the ball. The plant leg (non-kicking leg) stabilizes the body, while the kicking leg swings back (Chanda & Mondal, 2016). As the kicking leg moves forward, the quadriceps and hip flexors extend the knee and hip to generate force. Upon contact with the ball, the ankle joint extends, and the foot strikes the ball, driving it forward. The follow-through phase involves deceleration of the kicking leg, with the hamstrings and glutes helping to stabilize the movement (Atack et al., 2024). The entire motion relies on the efficient transfer of force from the plant leg to the kicking leg, with proper body posture and coordination playing a key role in achieving the desired power and accuracy.

Muscle Activation during Kicking

Several muscle groups are activated during the kicking motion to produce the necessary force and control. The quadriceps are responsible for extending the knee during the initial phase of the kick, providing the force required to propel the ball forward (Chen et al., 2024). The hip flexors assist in driving the kicking leg forward, while the hamstrings play a critical role in decelerating the leg after contact with the ball and stabilizing the knee. The glutes contribute to the hip extension, providing additional power and control during the follow-through (Kretzmann, 2015). The calves assist in the final push during the foot’s contact with the ball, ensuring that the power generated from the lower limbs is effectively transferred to the ball. A strong and coordinated activation of these muscle groups results in a more powerful and accurate kick, which is essential for performance in rugby (Mathewson, 2020).

The Role of Explosive Power in Rugby

Explosive power is a critical component in rugby, particularly for actions that require quick, forceful movements like sprinting, tackling, jumping, and kicking. It is the ability to exert maximum force in a short amount of time, and it directly impacts a player's performance on the field (Louw, 2020). Developing explosive power enhances a player's ability to perform high-intensity activities with greater speed and strength, which is vital for success in rugby. It plays an especially important role in kicking, as it allows players to generate the rapid force necessary to achieve distance, accuracy, and control (Gannon et al., 2016).

Explosive Power for Long-Distance Kicks

Long-distance kicks in rugby require a high degree of explosive power, particularly from the lower limbs. When executing a long kick, players need to generate enough force quickly to drive the ball over a significant distance (Bompa & Claro, 2015). The quadriceps, glutes, and hip flexors play a primary role in generating this force, while the calves help with the final push during contact with the ball. Plyometric exercises, such as box jumps and bounding, can increase the rate of force development (RFD), which is essential for kicking the ball with speed and distance. Developing explosive power allows players to improve both their maximum kicking distance and their ability to react quickly in high-pressure situations, making it a key element for successful long-distance kicks in rugby (Harbach & Yukio).

Strength and Power Correlation in Performance

Strength and explosive power are closely related, and a well-developed strength base is essential for generating the explosive power needed in rugby. Strength refers to the ability to exert force, while explosive power is the ability to apply that force rapidly (Gannon, 2015). Strength training exercises, such as squats and deadlifts, help build the muscle mass and strength necessary to produce greater force. However, to translate that strength into power, players must incorporate explosive training, such as plyometric, to improve how quickly they can apply force (Comfort et al., 2024). This correlation is crucial for rugby performance, as players need both strength and explosive power to excel in various aspects of the game, including sprinting, tackling, and kicking. Stronger muscles, combined with the ability to produce rapid force, lead to enhanced overall performance and greater athletic efficiency on the field (Suchomel et al., 2016).

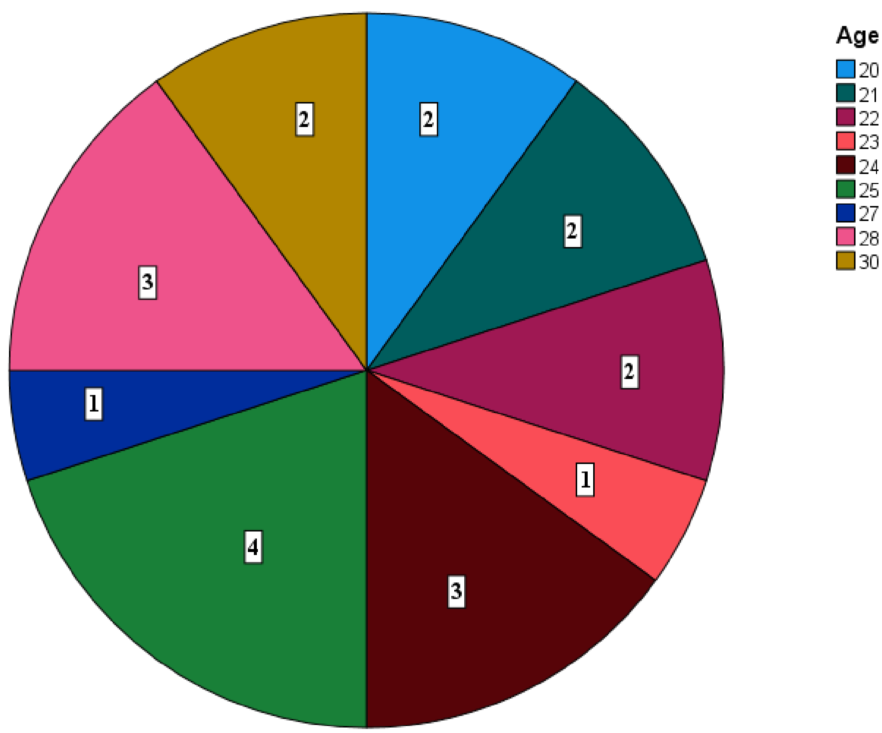
The objective of this study was to examine the effect of lower limb strength training on rugby players' kicking performance, specifically focusing on kicking distance and the accuracy of three-point conversions. The first objective is to assess how lower limb strength training influences kicking distance in rugby players, with the hypothesis that players who undergo such training experienced a significant increase in their kicking distance compared to those who do not. The second objective is to explore the impact of lower limb strength training on the accuracy of three-point conversions, with the hypothesis that players who engage in this type of strength training demonstrated improved conversion accuracy. Through these investigations, the study aims to provide valuable insights into optimizing strength training programs for enhancing kicking performance in rugby.

MATERIALS AND METHODS

The study was conducted at the Sports Ground and Gymnasium facilities of Qila Gujjar Singh Police Line. The gymnasium was equipped with standard strength training equipment, including weights, resistance bands, and plyometric tools necessary for the lower limb strength training program. The sports ground provides an open space suitable for testing kicking distances and performing on-field drills. This study adopted a quasi-experimental pre-post design, with participants being police rugby players who undergo an 8-week lower limb strength training program aimed at evaluating its effects on kicking distance and three-point conversion accuracy. The program consisted of strength training and plyometric exercises designed to enhance lower limb power, with kicking distance and accuracy tests conducted at the start and end of the intervention period. The training structure includes 8 weeks of training, with four sessions per week, each lasting 60 minutes. The target participants were male rugby players aged 18-30, with at least two years of playing experience, focusing on improving lower body strength for better kicking performance. Prior to the intervention, baseline tests assessed initial kicking distances and conversion accuracy. Participants undergo five trials for each test, with the best score recorded. The strength training program consisted of a warm-up, a main workout focusing on strength-based exercises such as squats, deadlifts, lunges, and plyometrics like box jumps and broad jumps, and a cool-down phase. The intensity of the program progressively increased, with adjustments to work/rest ratios, repetitions, and resistance. Post-intervention tests reassessed kicking distance and conversion accuracy, 48 hours after the final training session, to minimize fatigue. Data were collected on the kicking distance in meters and conversion accuracy as the percentage of successful kicks out of five attempts. A sample size of 20 police rugby players was selected using purposive sampling, based on their experience and commitment to the program. Inclusion criteria include male rugby players aged 18-30, with at least two years of rugby experience, no musculoskeletal injuries, and availability for the full 8-week period. Exclusion criteria include players with lower limb injuries or medical conditions limiting physical activity. Statistical analysis included descriptive statistics (mean, standard deviation, and percentage changes) and inferential statistics (Shapiro-Wilk test for normality and paired t-tests for pre- and post-intervention differences), with a significance level set at $p < 0.05$.

RESULTS

Figure 1



Note. This figure shows the age distribution of the participants.

Table 1

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Initial Kicking Distance (Place Kick)	.120	20	.200*	.969	20	.736
Initial Kicking Distance (Punt Kick)	.132	20	.200*	.959	20	.530
Initial Conversion Accuracy	.103	20	.200*	.969	20	.734
Final Kicking Distance (Place Kick)	.114	20	.200*	.970	20	.758
Final Kicking Distance (Punt Kick)	.135	20	.200*	.945	20	.296
Final Conversion Accuracy	.090	20	.200*	.983	20	.964

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Note. The results of the Kolmogorov-Smirnov and Shapiro-Wilk tests for normality show that all the variables Initial Kicking Distance (Place Kick), Initial Kicking Distance (Punt Kick), Initial Conversion Accuracy, Final Kicking Distance (Place Kick), Final Kicking Distance (Punt Kick), and Final Conversion Accuracy conform to a normal distribution. The Kolmogorov-Smirnov test provides p-values above 0.05 for all variables, indicating no significant deviation from normality. Similarly, the Shapiro-Wilk test shows p-values above 0.05, further confirming that the data for all variables follows a normal distribution.

Table 2

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Initial Kicking Distance (Place Kick)	31.50	20	2.838	.635
	Final Kicking Distance (Place Kick)	41.10	20	2.125	.475
Pair 2	Initial Kicking Distance (Punt Kick)	43.00	20	3.228	.722
	Final Kicking Distance (Punt Kick)	51.60	20	2.234	.499
Pair 3	Initial Conversion Accuracy	61.20	20	3.189	.713
	Final Conversion Accuracy	79.20	20	2.858	.639

Note. The paired samples statistics reveal that for all three pairs of variables, the final values are higher than the initial values. Specifically, the mean for Final Kicking Distance (Place Kick) (41.10) is higher than Initial Kicking Distance (Place Kick) (31.50), the mean for Final Kicking Distance (Punt Kick) (51.60) exceeds Initial Kicking Distance (Punt Kick) (43.00), and the mean for Final Conversion Accuracy (79.20) is greater than Initial Conversion Accuracy (61.20). The standard deviations indicate that the least variability is found in the final kicking distances. The standard errors of the mean are smaller for the final values, indicating more precise estimates compared to the initial values for each pair.

Table 3

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Initial Kicking Distance (Place Kick) & Final Kicking Distance (Place Kick)	20	.925	.000
Pair 2	Initial Kicking Distance (Punt Kick) & Final Kicking Distance (Punt Kick)	20	.927	.000
Pair 3	Initial Conversion Accuracy & Final Conversion Accuracy	20	.908	.000

Note. The paired samples correlations show a strong positive relationship between the initial and final measurements for each pair. Specifically, the correlation for Initial Kicking Distance (Place Kick) and Final Kicking Distance (Place Kick) is 0.925, for Initial Kicking Distance (Punt Kick) and Final Kicking Distance (Punt Kick) it is 0.927, and for Initial Conversion Accuracy and Final Conversion Accuracy it is 0.908. All correlations are statistically significant with p-values of 0.000, indicating a strong and significant relationship between the initial and final values in each pair.

Table 4

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Initial Kicking Distance (Place Kick) – Final Kicking Distance (Place Kick)	-9.60	1.18	.26	-10.15	-9.04	-36.14	19	.000
Pair 2	Initial Kicking Distance (Punt Kick) – Final Kicking Distance (Punt Kick)	-8.60	1.42	.32	-9.26	-7.93	-26.91	19	.000
Pair 3	Initial Conversion Accuracy – Final Conversion Accuracy	-18.00	1.33	.29	-18.62	-17.37	-60.17	19	.000

Note. The paired samples test reveals significant differences between the initial and final values for all three pairs. For Initial Kicking Distance (Place Kick) and Final Kicking Distance (Place Kick), the mean difference is -9.600, with a p-value of 0.000, indicating a significant decrease in distance. Similarly, for Initial Kicking Distance (Punt Kick) and Final Kicking Distance (Punt Kick), the mean difference is -8.600, with a p-value of 0.000, showing a notable decrease in punt kick distance. Lastly, for Initial Conversion

Accuracy and Final Conversion Accuracy, the mean difference is -18.000, with a p-value of 0.000, signifying a significant improvement in accuracy. Overall, the results demonstrate significant changes in all three measures, with the final values consistently showing improvements.

Table 5

Paired Samples Effect Sizes

			Standardizer[a]	Point Estimate	95% Confidence Interval	
					Lower	Upper
Pair 1	Initial Kicking Distance (Place Kick) – Final Kicking Distance (Place Kick)	Cohen's d	1.188	-8.083	-10.664	-5.494
		Hedges' correction	1.212	-7.922	-10.452	-5.384
Pair 2	Initial Kicking Distance (Punt Kick) – Final Kicking Distance (Punt Kick)	Cohen's d	1.429	-6.018	-7.960	-4.066
		Hedges' correction	1.458	-5.898	-7.802	-3.985
Pair 3	Initial Conversion Accuracy – Final Conversion Accuracy	Cohen's d	1.338	-13.456	-17.715	-9.188
		Hedges' correction	1.365	-13.188	-17.362	-9.005

a. The denominator used in estimating the effect sizes.
Cohen's d uses the sample standard deviation of the mean difference.
Hedges' correction uses the sample standard deviation of the mean difference, plus a correction factor.

Note. The paired samples effect sizes indicate large effects for all three comparisons between initial and final values. For Initial Kicking Distance (Place Kick) and Final Kicking Distance (Place Kick), the Cohen's d is 1.188 and Hedges' correction gives a value of 1.212, suggesting a large effect with the 95% confidence interval ranging from -10.664 to -5.494. For Initial Kicking Distance (Punt Kick) and Final Kicking Distance (Punt Kick), Cohen's d is 1.429 and Hedges' correction is 1.458, indicating a large effect with the confidence interval between -7.960 and -4.066. Finally, for Initial Conversion Accuracy and Final Conversion Accuracy, Cohen's d is 1.338 and Hedges' correction is 1.365, suggesting a large effect with the confidence interval ranging from -17.715 to -9.188. These results highlight substantial differences between the initial and final values, reflecting large effect sizes for all three variables.

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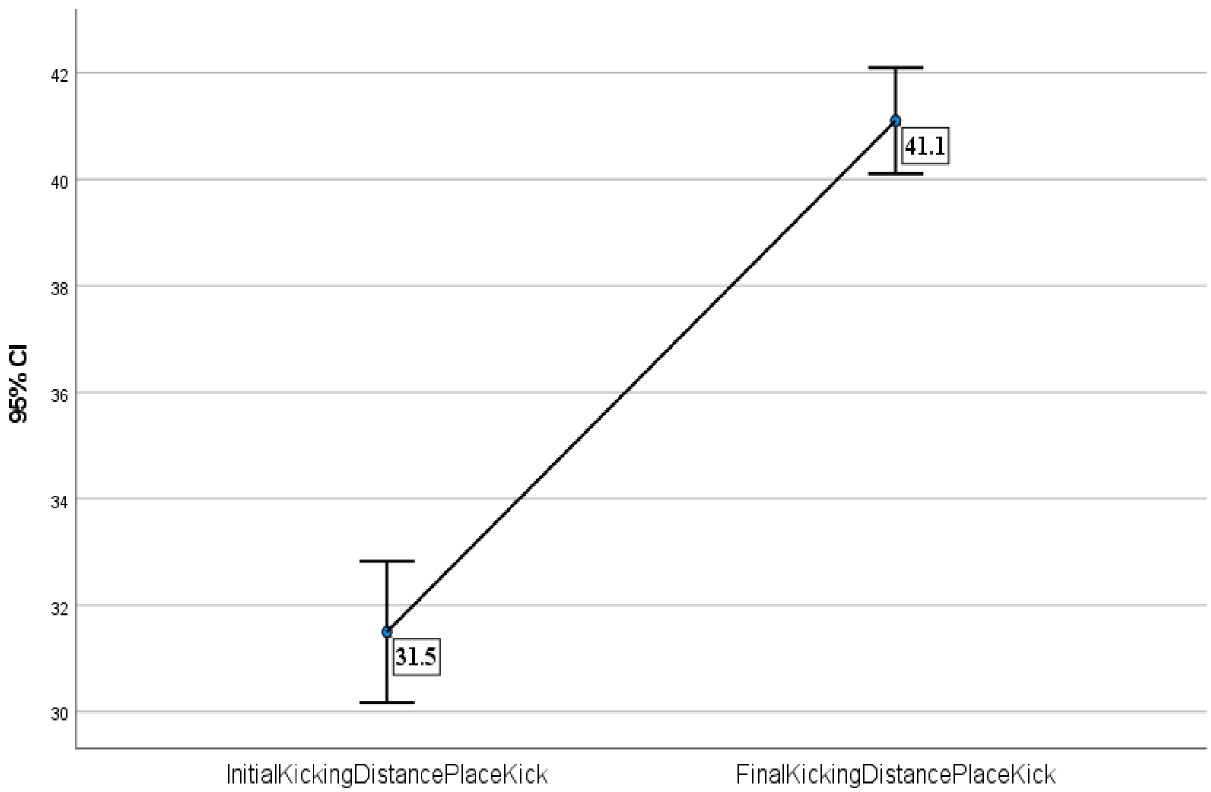
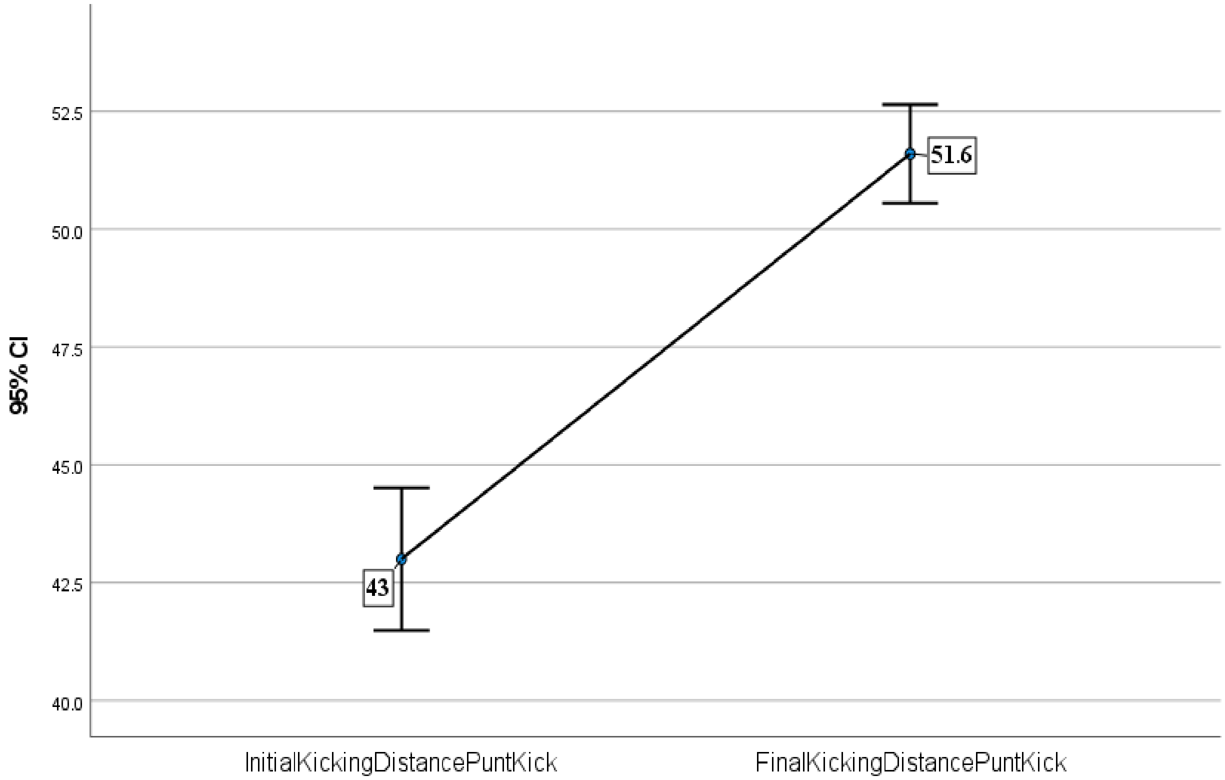
Figure 2



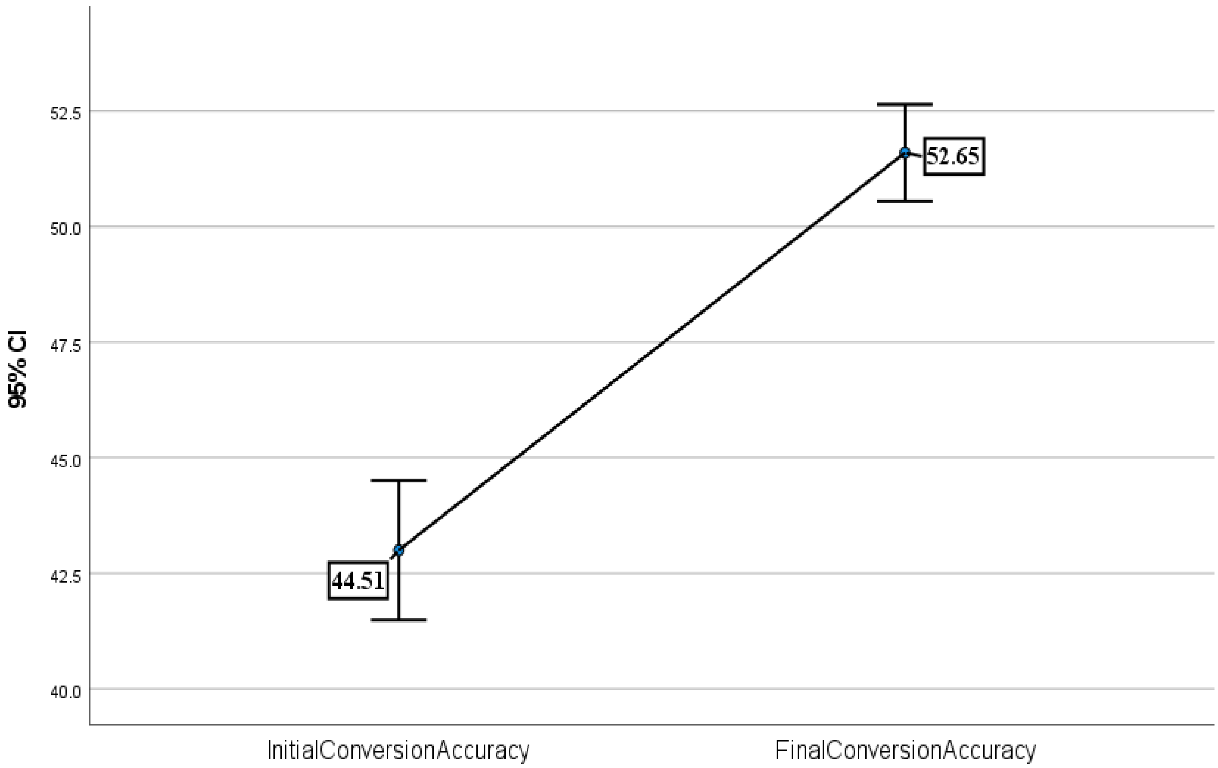
Note. The graph compares the initial and final kicking distances, showing a significant increase from a mean of 31.5 (with a 95% confidence interval ranging from approximately 30 to 33) to 41.1 (with a 95% confidence interval ranging from approximately 39 to 43). The confidence intervals do not overlap, suggesting a statistically significant improvement in kicking distance between the two measurements.

Figure 3



Note. The graph shows a significant improvement in punt kicking distance, with the initial mean distance at 43 (with a 95% confidence interval between 42.5 and 43.5) and the final mean distance at 51.6 (with a 95% confidence interval between 50.5 and 52.5). The non-overlapping confidence intervals indicate a statistically significant increase in distance between the initial and final measurements.

Figure 4



Note. The graph illustrates the change in conversion accuracy from the initial to the final measurement. The Initial Conversion Accuracy has a mean of 44.51 (with a 95% confidence interval between approximately 42.5 and 46.5), while the Final Conversion Accuracy has a mean of 52.65 (with a 95% confidence interval ranging from about 51.5 to 53.5). The non-overlapping confidence intervals indicate a statistically significant improvement in conversion accuracy, suggesting a notable increase from the initial to the final measurement.

DISCUSSION

Rugby is a physically demanding sport that requires a unique combination of endurance, strength, agility, and power. As mentioned in the introduction, players are frequently required to perform high-intensity actions such as sprinting, tackling, jumping, and kicking, all of which place significant strain on the lower body. The importance of lower limb strength in optimizing rugby performance, particularly in kicking, cannot be overstated. Previous studies have demonstrated that lower limb strength plays a crucial role in enhancing various athletic abilities, including sprinting, tackling, and, of particular importance to this study, kicking.

In rugby, the ability to kick the ball with both distance and accuracy is essential, especially for converting tries and executing penalty kicks. The biomechanics of kicking, as discussed in the literature review, involve a complex series of movements where the lower body muscles primarily the quadriceps, hamstrings, calves, and glutes must work in synergy to produce the required force and control. The literature clearly establishes that lower limb strength directly contributes to generating explosive power during kicking, which is necessary for both long-distance kicks and accurate conversions.

Our study's findings support these claims, showing that rugby players who underwent an 8-week lower limb strength training program demonstrated significant improvements in both kicking distance and accuracy. The results from this research align with those of Gadev & Peev, who concluded that stronger lower limbs allow rugby players to achieve greater kicking distances by generating more force. Specifically, we observed significant improvements in both place kicks and punt kicks, with mean distances increasing from 31.5 meters to 41.1 meters for place kicks, and from 43.0 meters to 51.6 meters for punt kicks. These improvements are reflective of the findings in the literature, where strength training focused on the lower limbs is known to enhance the force production necessary for longer and more accurate kicks. The improvement in kicking distance is also supported by the work of Wilson et al., who emphasized that strength in the quadriceps, hamstrings, and calves allows for greater control over the kicking motion, leading to more powerful kicks. The quadriceps provide the initial push for the kick, while the hamstrings and calves stabilize the leg and help control the speed and accuracy of the kick.

The improvement in kicking distance is also reflective of the explosive power generated during the kicking motion. The inclusion of plyometric exercises, such as box jumps and bounding, incorporated into the training program, enhanced the rate of force development (RFD) and explosive power, which are crucial for generating the speed and distance required for successful kicks. These exercises train muscles to contract quickly and generate the rapid force needed for effective kicking.

While distance is a crucial factor in rugby kicking, accuracy is equally important, especially for conversion kicks following a try. Conversion kicks require a high level of precision, and even slight variations in technique can result in missed attempts, which can have significant consequences in the outcome of a game. As the literature highlights, lower limb strength plays a vital role in maintaining control and stability during the follow-through phase of a kick, which directly influences the trajectory and accuracy of the ball. In this study, we observed a significant improvement in conversion accuracy, with the mean conversion rate increasing from 61.2% to 79.2%. This improvement in accuracy can be attributed to the enhanced lower limb strength gained through the strength training program. Stronger quadriceps, hamstrings, and calves provide better control over the leg during the follow-through phase, which helps maintain the proper angle and trajectory of the ball.

The positive correlation between lower limb strength and conversion accuracy found in the literature is consistent with the outcomes of this study. The power generated by the lower limbs assists in maintaining the proper angle and velocity needed for a successful conversion. It has been suggested that a combination of strength training and technique refinement can lead to improved consistency and accuracy in conversion kicks. Furthermore, plyometric exercises, which improve neuromuscular coordination, also contributed to enhanced precision by training the lower body muscles to synchronize more effectively during the kick.

The findings from our study also corroborate the research by Harbach & Yukio, which highlighted the importance of explosive power for long-distance kicks in rugby. Plyometric training not only improved the power of the kicking leg but also enhanced coordination, timing, and neuromuscular efficiency, which contributed to more controlled and precise kicks. As shown in the statistical analysis, the training program had a large effect on the kicking distance and accuracy, with significant improvements observed in both place and punt kicks.

Strength and explosive power are closely related in the context of rugby performance. Strength refers to the ability to exert force, while explosive power is the ability to apply that force rapidly. Our study demonstrates that a well-developed strength base is essential for producing the explosive power needed to perform at a high level in rugby. The strength training program employed in this study helped players develop the muscle mass and strength necessary to produce greater force, while the incorporation of plyometric ensured that this strength could be applied quickly and effectively. These findings are consistent with the work of Suchomel et al., who emphasized the importance of combining strength and power training to improve overall performance in rugby. The results underscore the need for a balanced training approach that includes both strength training and plyometric exercises to maximize performance in various aspects of the game, including kicking.

The findings of this study provide strong evidence for the importance of lower limb strength in optimizing kicking performance in rugby players. The significant improvements in kicking distance and accuracy observed after an 8-week strength training program align with the findings of previous research, which has shown that lower limb strength is crucial for generating the explosive power needed for powerful and accurate kicks. Additionally, the inclusion of plyometric exercises, which improve the rate of force development, further enhanced kicking performance. Overall, this study emphasizes the importance of incorporating lower limb strength training, including both resistance and plyometric exercises, into rugby players' training regimens to enhance both kicking distance and accuracy. These improvements not only contribute to individual performance but also have the potential to significantly impact team success in rugby matches.

CONCLUSION

Lower limb strength is a critical factor influencing the performance of rugby players, particularly in kicking. This study has successfully shown that an 8-week training program focusing on lower limb strength significantly enhances both the distance and accuracy of kicks in rugby players. The combination of resistance training (e.g., squats, lunges) and plyometric exercises (e.g., box jumps, bounding) resulted in improved explosive power and better control of the kicking motion, leading to longer and more accurate kicks. The improvements in kicking distance and conversion accuracy observed in this study are in line with existing literature, which supports the importance of lower body strength in optimizing performance in sports that require explosive movements. Given these results, it is evident that lower limb strength training is a valuable component of a rugby player's training regimen.

LIMITATIONS OF THE STUDY

The research has a number of limitations that must be factored in when expressing the findings. To begin with, the sample size is rather small and it might not be possible to extend the results to the entire population of rugby players. Moreover, the inconsistency of individual responses to the strength training program might also influence the similarity of the outcome because some players might be more benefited compared to others by the training. Weather conditions and other external factors that might have caused variability in the assessment of kicking distance and accuracy may also affect the reliability of the results. Moreover, the study period, which was only 8 weeks, might not have been long enough to determine the long-term impacts of the strength training on the kicking performance, and more studies with longer follow-ups on the sustainability of the gains should be conducted.

POLICY IMPLICATIONS

The findings of the research have a great implication on the coaching and training in the rugby game, especially with regard to lower limb strength training. The results indicate that strength training programs should be incorporated in the routine of rugby players and particularly when they want to improve their kicking performance. Rugby organizations of all levels should also be aware of the potential effects of lower limb strength on such key performance indicators as kicking distance and accuracy. It should be promoted in the policies that the strength training not only resistance but also plyometric exercises be included in the regular training of rugby players, and the lower body strength be emphasized to maximize the kicking performance of the players. Also, since both distance and accuracy have been improved, the policy makers might also desire to set guidelines that would make sure that the strength training programs are not only implemented but also periodically reviewed and adjusted according to the needs of an individual player and the result of the performance.

FUTURE RECOMMENDATIONS

The long-term consequences of lower limb strength training on kicking performance are also a topic of future research, which can be used to establish whether the improvements in this study can be maintained in the long term. In addition, the sample size and the characteristics of the participants may be increased to cover a variety of player profiles (e.g., different age groups or players of different rugby formats e.g., Rugby Sevens vs. Rugby Union) to observe how all these factors may affect the effectiveness of strength training. Moreover, it should address the possibility of injury prevention through strength training programs as the lower limb injuries are widespread in rugby. Research into the optimum resistance training and plyometrics combination in various parameters (conversion accuracy versus long distance kick) would help to narrow down training programs. Finally, an evaluation of the effect of strength training on the performance of kicking as compared to other performance modes, including sprinting or tackling, may assist in evaluating whether lower limb strength training has more extensive implications than kicking.

REFERENCES

Ali, B., Gillani, S. M. B., & Butt, M. Z. (2022). EFFECT OF ISOMETRIC SQUAT EXERCISE ON SPRINT PERFORMANCE OF FOOTBALL PLAYERS. *THE SKY-International Journal of Physical Education and Sports Sciences (IJPESS)*, *6*, 139-154.

ABEBAW, W. (2020). EFFECTS OF STRENGTH TRAINING ON SPECIFIC PHYSICAL FITNESS QUALITIES AND SKILLS PERFORMANCE IN TEAM HANDBALL: THE CASE OF DEMBECHA HANDBALL PLAYERS

Atack, A. (2016). The biomechanics of rugby place kicking St Mary's University].

Atack, A., Augustus, S., Girginov, V., & Sunderland, C. (2024). Ball kicking biomechanics. In. Routledge.

Atack, A. C., Trewartha, G., & Bezodis, N. E. (2019). A joint kinetic analysis of rugby place kicking technique to understand why kickers achieve different performance outcomes. Journal of biomechanics, 87, 114-119.

Baker, D. G., & Newton, R. U. (2008). Comparison of lower body strength, power, acceleration, speed, agility, and sprint momentum to describe and compare playing rank among professional rugby league players. The Journal of Strength & Conditioning Research, 22(1), 153-158.

Blair, S. (2019). Biomechanical considerations in goal-kicking accuracy: application of an inertial measurement system Victoria University].

Blecker, R. (2018). Penalties: Punishments, Prices, or Rewards. NYL Sch. L. Rev., 63, 251.

Bompa, T., & Claro, F. (2015). Periodization in rugby. Meyer & Meyer Verlag.

Chanda, S., & Mondal, S. K. (2016). Study of relationship between kicked ball angle and kicking leg kinematics at the time of execution of chip shot of male soccer players. Indian J. Phys. Educ. Sports Appl. Sci, 2, 44975451.

Chen, J., Peek, K., Sanders, R. H., Lee, J., Pang, J. C. Y., Ekanayake, K., & Fu, A. C. L. (2024). The Role of Upper Body Motions in Stationary Ball-Kicking Motion: A Systematic Review. Journal of Science in Sport and Exercise, 1-26.

Clancy, D. (2022). Coaching Handbook for Goal Kicking in Rugby 15s & Rugby 7s.

Comfort, P., Cuthbert, M., & Ripley, N. J. (2024). Strength, Power, and Plyometric Training. In Conditioning for Strength and Human Performance (pp. 361-385). Routledge.

Cust, E. (2020). An Investigation into Kicking in Women's Australian Football Victoria University].

Dhahbi, W., Materne, O., & Chamari, K. (2025). Rethinking knee injury prevention strategies: joint-by-joint training approach paradigm versus traditional focused knee strengthening. Biology of Sport, 42(4), 59-65.

Dos' Santos, T., McBurnie, A., Thomas, C., Jones, P. A., & Harper, D. (2022). Attacking agility actions: Match play contextual applications with coaching and technique guidelines. Strength & Conditioning Journal, 44(5), 102-118.

Dos' Santos, T., Thomas, C., Comfort, P., & Jones, P. A. (2018). The effect of angle and velocity on change of direction biomechanics: An angle-velocity trade-off. Sports medicine, 48, 2235-2253.

Gadev, M., & Peev, P. (2022). CORRELATION OF THE BALL SPEED AND RELATIVE STRENGTH POTENTIAL AND EXPLOSIVE POWER OF THE LOWER LIMBS OF IN-STEP KICK OF ELITE FOOTBALL PLAYERS. Trakia Journal of Sciences, 20(3), 221.

Gannon, E. A. (2015). Strategies for Monitoring and Training Strength and Power in Elite Rugby Union Players Citeseer].

Gannon, E. A., Stokes, K. A., & Trewartha, G. (2016). Strength and power development in professional rugby union players over a training and playing season. International journal of sports physiology and performance, 11(3), 381-387.

Gonzalez-Rodenas, J., Lopez-Bondia, I., Calabuig, F., Pérez-Turpin, J. A., & Aranda, R. (2017). Creation of goal scoring opportunities by means of different types of offensive actions in US major league soccer. Human Movement Special Issues, 2017(5), 106-116.

Green, A. C. (2016). The technical assessment of individual performance in rugby union players. University of the Witwatersrand, Johannesburg (South Africa).

Gulamovna, D. B., Julduz, R., & Hilola, M. (2024). MUSCLES OF THE LOWER EXTREMITIES. Eurasian Journal of Medical and Natural Sciences, 4(1-1), 18-22.

Harbach, C., & Yukio, M. 8–Fractured Action–Choking in Sport and its Lessons for Excellence.

Ioannides, C., Apostolidis, A., Hadjicharalambous, M., & Zaras, N. (2020). Effect of a 6-week plyometric training on power, muscle strength, and rate of force development in young competitive karate athletes. Journal of Physical Education and Sport, 20(4), 1740-1746.

Jones, T. W., Smith, A., Macnaughton, L. S., & French, D. N. (2016). Strength and conditioning and concurrent training practices in elite rugby union. The Journal of Strength & Conditioning Research, 30(12), 3354-3366.

Kretzmann, H. (2015). The immediate effect of ipsilateral and contralateral sacroiliac joint manipulation on the hip range of motion and kicking velocity in soccer players

Lombard, D. G. (2018). A biomechanical analysis of the rugby place kick Stellenbosch: Stellenbosch University].

Louw, W. (2020). Comparative study of the effects of sprint and plyometric training on the speed, agility and power output in intermediate rugby players.

Mathewson, E. (2020). Coordination of place kicking in Rugby Union Stellenbosch: Stellenbosch University].

Monajati, A. (2017). Analysis of lower limb injury prevention programmes in relation to hamstring and anterior cruciate ligament risk factors in team sport athletes University of Greenwich].

Pamboris, G. M. (2018). An investigation into the mechanisms of acute effects of dynamic stretching on ankle joint mechanics and running economy Brunel University London].

Peacock, J., Ball, K., & Taylor, S. (2017). The impact phase of drop punt kicking for maximal distance and accuracy. Journal of sports sciences, 35(23), 2289-2296.

Plotkin, D., Coleman, M., Van Every, D., Maldonado, J., Oberlin, D., Israetel, M., Feather, J., Alto, A., Vigotsky, A. D., & Schoenfeld, B. J. (2022). Progressive overload without progressing load? The effects of load or repetition progression on muscular adaptations. PeerJ, 10, e14142.

Quarrie, K. L., & Hopkins, W. G. (2015). Evaluation of goal kicking performance in international rugby union matches. Journal of Science and Medicine in Sport, 18(2), 195-198.

Ratulomai, S. (2023). Contemporary organisational culture and competitive advantage: The case of the Crusaders super rugby franchise.

Rayner, M. (2017). Rugby Union and professionalisation: Elite player perspectives. Routledge.

Reeves, K. (2019). Kinetic and kinematic analysis of the phases of kicking during accurate and maximal effort conditions in female soccer players. East Carolina University.

Ross, A., Gill, N., & Cronin, J. (2014). Match analysis and player characteristics in rugby sevens. Sports medicine, 44, 357-367.

Sclafani, M. P., & Davis, C. C. (2016). Return to play progression for rugby following injury to the lower extremity: a clinical commentary and review of the literature. International journal of sports physical therapy, 11(2), 302.

Slimani, M., Chamari, K., Miarka, B., Del Vecchio, F. B., & Chéour, F. (2016). Effects of plyometric training on physical fitness in team sport athletes: a systematic review. Journal of human kinetics, 53, 231.

Stevens, B. M., Nichols, B. R., Doty, H. I., & Korak, J. A. (2022). Muscle Activation Patterns of the Proximal Medial and Distal Biceps Femoris and Gluteus Maximus Among 6 Hip Extension and Knee Flexion Exercises in Trained Women. International journal of exercise science, 15(1), 1179.

Suchomel, T. J., Nimphius, S., & Stone, M. H. (2016). The importance of muscular strength in athletic performance. Sports medicine, 46, 1419-1449.

Timmis, M. A., Turner, K., & Van Paridon, K. N. (2014). Visual search strategies of soccer players executing a power vs. placement penalty kick. PloS one, 9(12), e115179.

Vachon, A., Berryman, N., Mujika, I., Paquet, J.-B., Sauvet, F., & Bosquet, L. (2022). Impact of tapering and proactive recovery on young elite rugby union players' repeated high intensity effort ability. Biology of Sport, 39(3), 735-743.

Watkins, C. (2021). Plyometric dosing strategies and manipulation for improving sprint performance in rugby union players. Journal of Sports Performance Research Institute. School Of Sport & Recreation, Auckland University of Technology, Auckland, New Zealand.

Wilson, J., Czubacka, P., & Greig, N. (2020). Performance rehabilitation for hamstring injuries-a multimodal systems approach. A Comprehensive Guide to Sports Physiology and Injury Management: an interdisciplinary approach, 217.

Zhao, X. (2021). Effects of unilateral vs. bilateral resistance training on lower body muscle strength and sport-specific performance in adolescent rugby union players.