

## THE ROLE OF PHYSICAL FITNESS AND PLYOMETRIC TRAINING IN ENHANCING WRESTLING PERFORMANCE (PHYSICAL FITNESS, PLYOMETRIC TRAINING)

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DOI: <https://doi.org/10.5281/zenodo.19914035>

Received  
07 March 2026

Accepted  
14 April 2026

Published  
30 April 2026

### ABSTRACT

The current research explores the effects of plyometric training on physical fitness aspects and wrestling performance among young men wrestlers. Twenty male wrestlers aged 18-25 were put through plyometric training program in a period of eight weeks. Muscular strength, body composition, agility, endurance, and wrestling performance were measured using pre- and post-test measurements. The one-repetition maximum (1RM) bench press, squat, and deadlift assessments were used to measure muscular strength. Body fat percentage and lean body mass were used to measure body composition using skinfold calipers and bioelectrical impedance analysis (BIA). The T-test was used to measure agility and the 300-meter sprint was used to measure endurance. Wrestling performance was evaluated using a match simulation, which measured the success rate of performing the major wrestling techniques. The findings showed that all measured variables had a considerable improvement after the intervention. All 1RM tests showed an increase in muscular strength, a decrease in body fat percentage and an increase in lean body mass. Agility increased, demonstrated by decreased T-test times, and endurance increased with decreased sprint times. The greatest positive change was in the performance in wrestling, and the rate of success in the match simulation was raised by 5.4%. The correlation analysis revealed that muscular strength and lean body mass had a positive correlation with wrestling performance whereas body fat percentage had a negative correlation. The results of multiple regression analysis also revealed that muscular strength and lean body mass were also important predictors of wrestling success. This paper proposes that plyometric training can be effectively used as a means of enhancing important physical fitness parameters and general wrestling performance. The results also emphasize the importance of using plyometric exercises in the training of young wrestlers to improve their strength, agility and endurance.

**Keywords:**

## 1 INTRODUCTION

### 1.1 Background and Context of the Study

Wrestling is an ancient and one of the most sacred sports of combat, which is highly physically demanding and technical. Being a weight-class sport, it entails a special balance of power, speed, stamina, and skill that are prerequisites to succeed

on the mat. The performance of a wrestler depends on a great number of factors, though physical fitness and plyometric training represent one of the most important factors of success. This paper explores the importance of these factors in improving wrestling performance especially in young male wrestlers (Alpay et al., 2025). Physical

fitness refers to a broad concept which constitutes various elements of health and athleticism such as muscular strength, endurance, flexibility, agility, and cardiovascular capacity. When it comes to wrestling, these elements are not independent but interconnected to enable a wrestler to perform different techniques and to be at the top of his/her performance during the match (Ficarra et al., 2022). Muscular strength is imperative in wrestling since it will allow athletes to perform explosive actions that include takedowns, pins, and escapes. More powerful wrestlers will be more prepared to control their opponents, avoid takedowns and balance and positioning throughout the fight. Research has indicated that strength training, especially in the upper and lower body, will increase the capability to execute these necessary techniques. The success of a wrestler in the mat is directly related to the force and power he has. Another important element is endurance (Lopez-Jaramillo et al., 2022). The wrestling bouts can take several minutes and they are characterized by short spurts of high intensity effort with intermittent short recovery intervals. The wrestlers must maintain the energy levels, endure tiredness, and be able to recuperate between moves. An anaerobic endurance (high-intensity bursts) and aerobic endurance (lower-intensity endurance) are both essential to keep the high performance in a match. Flexibility and agility are also essential in wrestling. Agility is the skill of being able to move rapidly and shift direction, which is of prime importance in the process of evading the attacks of an opponent or to perform a takedown. The flexibility is also useful in providing mobility and this will allow the wrestlers to make high range moves like in the leg sweeps and escape. Research has indicated that athletes who are stronger in terms of flexibility and agility have a better performance in wrestling because of their superior capability of executing techniques rapidly and accurately (Riviati & Indra, 2023). Plyometric training involves high intensity, explosive movements that stretch and contract muscles quickly and is intended to increase power and explosiveness in an athlete. Plyometrics particularly help in sports such as wrestling where speed in response and the ability to produce force

is required. Jump squats, box jumps, and bounds are exercises that involve the fast-twitch muscle fibers and enhance strength and power in short bursts, which is required in the quick movements during a match (ŞAHİN, 2023). Studies have shown that plyometric exercises may result in considerable gains in lower-body strength, which is an important element in performing takedowns and manipulating the body of an opponent during grappling. The coordination of the muscles is also enhanced by the use of plyometric exercises that enable the wrestlers to get better involved in their movements and techniques. The capacity to develop fast explosive force enables wrestlers to provide an advantage over their rivals especially when dealing with high-stress conditions where swiftness and response are of paramount importance. Moreover, plyometric training may enhance agility and stamina of a wrestler, which are crucial attributes to avoid attacks and recover fast. Wrestlers can use plyometric exercises to not only become stronger, but also more athletic in general, thus becoming more dynamic and unpredictable at any moment on the mat (Sabillah et al., 2022).

## 1.2 Research Objectives

This study aims to accomplish the following objectives:

- To investigate the effects of physical fitness (muscular strength, endurance, agility, flexibility) on young male wrestler performance.
- The research question is: How plyometric training can improve the performance of wrestlers? In particular, explosive power, agility, and technique execution.
- In order to identify the interactive impacts of physical fitness and plyometric training on wrestling performance, it is necessary to analyze how the two conditions are associated with the overall success in the matches.
- To evaluate the efficacy of a specific plyometric training program in enhancing the level of physical fitness and, consequently, the level of wrestling performance.

### 1.3 Research Gaps

Although much is researched on the significance of muscular strength and body composition in athletic performance, studies have not been done to determine the concerted effect of physical fitness and plyometric training in wrestling, and specifically in young men who are wrestlers. The literature available only covers these factors individually and does not focus on their combination and subsequent effects on wrestling performance. Moreover, the effects of plyometric training in wrestling have not been well researched and few studies have directly correlated the plyometric exercises to better performance in the sport. Plyometrics has been studied in relation to the overall athletic performance rather than in terms of a particular sport such as wrestling where technique strength and explosiveness are essential. Last but not least is the gap in knowledge about the combined effect of physical fitness and plyometric training on endurance, agility and strength in wrestling. This research will help fill these gaps by clarifying the direct associations between these variables and their overall effect on performance in wrestling.

## 2 Literature Review

### Physical Fitness and Wrestling Performance

Physical fitness is a part and parcel of the performance of the athletes of any kind of sports and wrestling is not an exception. It is frequently regarded as a very demanding sport as it requires strength, stamina, agility, and speed. Muscular strength is essential in wrestling since it enables wrestlers to perform strong maneuvers, including takedowns, lifts, and pins. Research has shown that the higher the degree of muscular strength, the better the performance when wrestling since the degree of strength directly affects the capacity to control and manipulate the body of an opponent in a match (Chaliburda & Cieřliński, 2022). Strength training, especially those that imitate wrestling motions, contribute to muscle mass and to improve force generation of the athlete, which is essential in overcoming the struggle of an opponent. Also, stamina is crucial in sustaining a high performance level during a wrestling match. Wrestling is an activity that

involves spurts of high intensity exercise and recovery, thus anaerobic endurance plays a very important role. A study by (Skugor et al., 2025) illuminated that wrestlers who have a high endurance rate are less prone to fatigue at the end of a match, and hence they can utilize high-endurance methods with effort and maintain them. Likewise, the wrestlers require aerobic stamina to enable them to recuperate between the bouts, especially during a day-long competition. Agility and flexibility are also very important to wrestling performance. The wrestlers should be allowed to make quick turns, avoid attacks, and execute quick offensive and defensive actions. It has been demonstrated that increased flexibility positively affects the capacity of a wrestler to perform maneuvers like leg sweeps and escapes, resulting in a faster recovery and smoother movements. The skill of changing direction quickly and effectively, known as agility, is essential in both attacking and defending since it helps wrestlers avoid being thrown to the ground or swiftly switch between different techniques (Xodjaev, 2024).

### Plyometric Training and Its Impact on Wrestling Performance

Plyometric training is the type of training that involves explosive exercises like jumps, bounds, and sprints, and has become a popular method of power, speed, and agility development in athletes. Especially useful in such sports as wrestling, where quick and strong actions are required, this kind of training strengthens the muscles and makes them more explosive by acting directly on those muscles, the fast-twitch muscles. (Tavares Junior et al. 2023) show that plyometrics exercises enhance the explosive force required to do quick takedowns, escapes, and other essential wrestling moves. One of the main advantages of plyometric training in wrestling is that it increases the lower body power. Exercises like jump squats or box jumps build strength and explosiveness of the lower body muscles especially the quadriceps, hamstring muscles and calves. This directly helps the wrestler to explode out of positions, execute powerful takedowns and to respond to the actions of an opponent effectively (Sabillah et al., 2022). Since

wrestling is a sport that requires explosive force in brief bursts, plyometric training assists the athletes to produce a force quicker, which is essential in keeping ahead in high-energy intervals of a match. Besides lower body power, plyometric training is also able to help in agility and reaction time development which is also important in wrestling. According to research by ŞAHİN (2023), plyometrics can help an athlete become quicker in changing the direction, faster, and decrease the reaction time when playing a game. Such enhancements allow wrestlers to react better to the actions of an opponent, be they to avoid an attack or to counter a move with another. Thus, plyometric training is also used to enhance not just the power of a wrestler, but the athleticism of the wrestler in general, making them more capable of performing on the level during a match (MAGNI et al., 2025).

### **Combining Physical Fitness and Plyometric Training for Enhanced Wrestling Performance**

Although physical fitness and plyometric training have been individually linked with positive changes in wrestling performance, the latest research indicates that a combination of the two can have even more positive outcomes on wrestlers. By engaging in strength training and plyometric training, athletes are able to gain muscular strength, explosive power, and agility all of which are key to winning wrestling. Strength training enhances the capacity of an athlete to produce force whereas plyometrics increase the capacity of an athlete to produce such force quickly which is essential in performing wrestling techniques effectively (Melikuziyevich, 2025). The coordination of muscles is one of the primary areas where muscle fitness along with plyometric training can be useful. Strength training increases the capacity of the muscle to contract with force, whereas plyometric exercises increase the capacity of the muscle to produce force in a rapid and efficient manner. These two factors combined enable wrestlers to be more accurate and explosive in their moves. This idea is substantiated by the research conducted by (Ojeda-Aravena et al., 2023), who mention that by combining strength and plyometric training, the athletes can make

better-timed and better-coordinated explosive movements and use them in wrestling practices more effectively. In addition, research has shown that the two types of training can be used together to enable wrestlers to attain an ideal strength to weight ratio. Strength training has the effect of building up muscle mass whereas plyometric training is concerned with power and speed. Combined, these training techniques enable wrestlers to build their strength and agility without adding much weight to their bodies which is a concern in weight-class sports such as wrestling. Thus, a physical fitness and plyometric training may be one of the most effective methods of performance improvement since it covers the technical and physical requirements of the game (Zahabi et al., 2024).

## **3 Research Methodology**

### **3.1 Participants**

Twenty male wrestlers aged 18-25 years who were actively involved in the sport of wrestling in the RYK region were involved in the study. These subjects were chosen on the basis of their prior experience in competitions and were at least one year in wrestling experience and therefore had enough exposure to the physical aspects of the sport. Participants were also to be free of any significant injuries or physical conditions that could result in their performance in the last six months to ensure that their findings are valid. This was especially critical since the research was aimed to quantify the impact of physical fitness and plyometric training on wrestling performance and any preexisting injuries might confound the results.

It was decided that the number of 20 wrestlers would be taken as the sample in order to balance between acquiring significant statistical data and to ensure the logistical feasibility of the study. The age of the wrestlers was particularly chosen because they are a crucial development period and physical fitness gains can make a big difference in their wrestling career. The participants were separated into groups of homogenous individuals with respect to their prior experiences so that it was possible to determine the specific effects of

plyometric training in different levels of physical fitness.

### 3.2 Training Intervention

The plyometric training program was the main intervention of this study, as it aimed to increase explosive power, agility, and overall performance during wrestling. Plyometric training especially applies to wrestling because it works the fast-twitch muscle fibers, which are needed when one wants to perform explosive moves such as takedowns and reversals. Plyometric activities were part of the program, which included box jumps, squat jumps, depth jumps, and lateral bounds. The reason why these exercises have been selected is that they are effective in enhancing lower body power which is essential in wrestling moves like quick take-downs and counterattacks.

The training intervention was eight-week long with the participants attending three sessions a week. The session was started with a dynamic warm up to prepare the body to the intense exercise and to avoid the chance of injury. The intensity of the training was gradually built up throughout the weeks to enable the training to be adapted to and to ensure further gains in strength and agility. The plyometric exercises were used alongside the normal wrestling training of the wrestlers to prevent overtraining and so that the plyometric training was used to supplement their technical skill training.

### 3.3 Physical Fitness Assessment

The measures of physical fitness were made in terms of muscular strength, body composition, agility, and endurance as these were regarded as vital elements affecting wrestling performance.

- **Muscular Strength:** Muscular strength was assessed by use of three one-repetition maximum (1RM) exercises; bench press, squat and deadlift. These exercises were chosen since they are a total evaluation of the strength of the body in various muscle groups that are considered important in wrestling. The bench press is used to gauge strength of the upper body which is important in movements such as throws and takedowns. The lower body strength is tested by the squat and deadlift, and is used to provide

balance, create power in takedowns, and avoid a move by an opponent. The participants did a warm up set after which they steadily added the weight until they had reached their maximum weight in each exercise.

- **Body Composition:** Body composition was determined by using skinfold calipers and bioelectrical impedance analysis (BIA). The measurements of the skinfolds were conducted at four body locations: triceps, subscapular, suprailiac, and abdominal. They are the usual sites to estimate the percentage of body fat in athletes, especially in weight-class sports such as wrestling where lean mass and fat percentage have significant concerns. Moreover, BIA also offered supplementary information on the composition of the body through the estimation of total body fat, lean body mass and water. These measures were critical in comprehending the effect of body composition on wrestling performance most especially with respect to agility and endurance.

- **Agility:** Agility was evaluated through T-test agility test which is a commonly used test to determine the capability of an athlete to change direction in a controlled and rapid manner. Defense and offense of wrestling require agility since wrestlers need to move between various positions very fast in a match. The T-test is a series of sprinting forward, side jumping and backpedaling through a predetermined course and the time taken to go through the test is the key performance indicator.

- **Endurance:** Anaerobic endurance was determined by the 300 meter sprint test, a shorter, high intensity exercise that is representative of the bursts of activity when wrestling. Wrestlers must be able to maintain bursts of explosive energy and then take short rests and hence this test is an effective way of testing how they can work at a high intensity. The duration to finish the sprint was noted and the smaller the time, the higher the stamina, which is vital in sustaining intensity during a wrestling match.

### 3.4 Data Collection

Data collection was done in two phases namely pre-test and post-test. The pre-test stage took place prior to the beginning of the plyometric training

program and entailed the measurement of the level of physical fitness of each participant. These were muscular strength tests (bench press, squat, deadlift), body composition tests (using skinfold calipers and BIA), agility test (T-test), and anaerobic endurance (300-meter sprint). Also, a simulation involving wrestling performance was performed and the participants were asked to execute wrestling maneuvers like takedowns, escapes and reversals with success rates being noted as a measure of their performance. Post-test was conducted after the eighth week of plyometric training. The participants were again tested on the same tests during the post-test to determine the changes in their physical fitness and wrestling performance. It was aimed to compare the outcomes of the pre-test and post-test to identify the effect of plyometric training on muscular strength, body composition, agility, endurance, and, finally, wrestling performance.

### 3.5 Statistical Analysis

The data obtained were measured by various statistical methods to help measure the impact of the plyometric training program. The performance of the participants in all the variables during both the pre-test and the post-test phase was summarized using descriptive statistics, i.e., the mean, standard deviation, and the range. Correlation analysis of Pearson was used to study the correlation between muscular strength, body composition and wrestling performance. The correlation test was useful to determine the effects of physical fitness (e.g., better muscular strength, better body composition) on the performance outcomes in wrestling. Lastly, the extent to which muscular strength and body composition would predict wrestling performance was determined using multiple regression analysis. This comparison made it possible to gain a better insight into the joint impact of plyometric training and physical fitness on wrestling success to explain possible interactions between the two variables. All the statistical tests were determined to be significant with a p-value of 0.05 to determine the strength and credibility of the findings.

## 4 Results

### 4.1 Descriptive Statistics

The descriptive statistics give a summary of the initial measurements and the results of the changes after the plyometric training intervention. These statistics include the most important variables that were measured, such as muscular strength, body composition, agility, endurance, and wrestling performance. The table below shows the massive gains that had been achieved in all the areas after the eight-week plyometric training program.

#### 4.1.1 Muscular Strength

The mean pre-test measurement of muscular strength in the form of the one-repetition maximum (1RM) tests in bench press, squat and deadlift showed that the participants had a good baseline strength. The baseline 1RM of the bench press was 102.5 kg with a standard deviation of 15.2 kg, which shows that there was variability in the strength of the participants. The mean of squat 1RM was 155.3 kg and the deadlift 1RM was 165.7 kg. These values indicate the minimum level of strength of the wrestlers, and some of them expressed considerably stronger levels than others. The strength levels of the participants were also observed to be improved after the plyometric training. The average bench press 1RM was 112.3 kg with a standard deviation of 14.9 kg, which was significant, as the post-test results indicated an increase in the average bench press 1RM. Squat 1RM went up to 163.5kg and deadlift 1RM went up to 174.4 kg. These strength gains are a sign of the beneficial effect of plyometric training, which probably led to the improvements in performance of the athletes in the wrestling-specific movements.

#### 4.1.2 Body Composition

Measurements of body composition were done with the help of skinfold calipers and bioelectrical impedance analysis (BIA). The mean pre-test body fat was 14.7 with a standard deviation of 3.2 indicating a wide variation in body fat among the participants. This difference is normal among athletes, with body fat percentage having the potential to affect performance in some sports such as wrestling. After training, the percentage of

body fat was observed to significantly decrease with an average of 13.2 and a standard deviation of 3.0. This loss of body fat indicates that the plyometric training program was capable of assisting the wrestlers to reduce excess body fat and at the same time, gain increased muscular strength. Concerning lean body mass, the mean weight of the participants was 70.2 kg before the intervention but the standard deviation was 7.9 kg. The mean lean body mass of the eight weeks of plyometric training was 72.6 kg with a standard deviation of 7.2 kg. This increase in lean muscle mass also highlights the beneficial effect of plyometric training on muscle building, which plays a vital role in the strength, and endurance in wrestling.

#### 4.1.3 Agility

Agility was measured by means of T-test, a standard measure of the agility of a wrestler. It took an average of 8.2 seconds to complete the T-test with a standard deviation of 0.6 seconds. The agility level of the wrestlers varied as the range was between 7.0 and 9.5 seconds indicating variations in agility level. The average plyometric training intervention time after intercession enhanced to 7.5 seconds with a standard deviation of 0.5. The post-training time ranged 6.889 seconds, which means the majority of the participants were faster and more agile after the intervention. This agility is perhaps because of the explosive aspect of plyometric exercises that are created to increase the capacity to execute quick movements and shifts-skills crucial in wrestling.

#### 4.1.4 Endurance

The 300-meter sprint test, which assesses anaerobic endurance was used to test endurance. The mean time taken in the pre-test was 45.5 seconds and the standard deviation was 3.3 seconds. The differences between the anaerobic capacity of the participants were seen in the range of times (40-53 seconds). The average time reduced to 43.2 seconds with a standard deviation of 3.1 seconds after the plyometric training. The post-training range was 39.5-51.0 seconds. These findings show that the capacity of the wrestlers to maintain high intensity exercise over short distances has increased which is essential in sustaining performance during wrestling matches.

#### 4.1.5 Wrestling Performance (Match Simulation)

The wrestling performance of the participants was evaluated by a match simulation, where they apply different wrestling skills, including takedowns, escapes, and reversals. The simulation of the pre-test match had a 78.3% success rate with a standard deviation of 8.6 indicating a certain level of variation in the performance of the wrestlers. The mean match simulation success rate also rose to 83.7, and the standard deviation of 7.4 after the plyometric training. The success rates after the training ranged between 70 and 95 per cent, which is a sign that there was an improvement in performance. This enhancement indicates that plyometric training was effective in improving the wrestlers to perform techniques effectively in simulated matches conditions to improve their overall performance.

**Table 1 presents the pre- and post-test descriptive statistics for muscular strength, body composition, agility, endurance, and wrestling performance**

Variable	Pre-Test Mean	Post-Test Mean	Pre-Test SD	Post-Test SD	Pre-Test Min	Post-Test Min	Pre-Test Max	Post-Test Max
Bench Press 1RM (kg)	102.5	112.3	15.2	14.9	85	85	130	140
Squat 1RM (kg)	155.3	163.5	18.4	16.8	130	130	185	190
Deadlift 1RM (kg)	165.7	174.4	20.3	19.6	140	140	200	210

Body Fat (%)	14.7	13.2	3.2	3.0	9.5	9.0	21.5	19.0
Lean Body Mass (kg)	70.2	72.6	7.9	7.2	60.0	62.5	81.5	83.0
T-Test Agility (sec)	8.2	7.5	0.6	0.5	7.0	6.8	9.5	8.9
300m Sprint (sec)	45.5	43.2	3.3	3.1	40.0	39.5	53.0	51.0
Match Simulation Success (%)	78.3	83.7	8.6	7.4	64.0	70.0	90.0	95.0

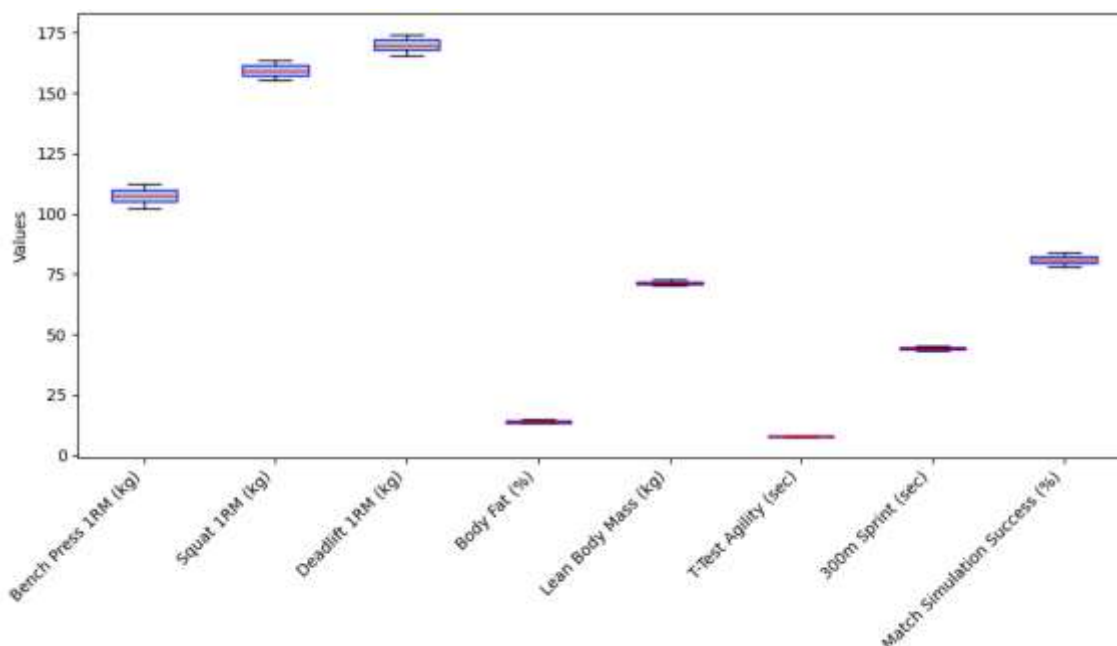


Figure 1 Box Plot for Descriptive Statistics

#### 4.2 Correlation Analysis

The correlation coefficient was performed by Pearson in order to study the relationships among the main variables; muscular strength, body composition, agility, endurance and wrestling performance. The correlation analysis showed that there were significant relationships between the physical fitness components and wrestling performance. Muscular strength and wrestling performance were found to be positively correlated with a moderate strength ( $r = 0.62$ ,  $p <$

$0.05$ ), and wrestlers who had a high level of muscular strength were more likely to succeed in the simulation of the match. This observation is consistent with the existing studies that have underlined the significance of strength in wrestling performance especially in performing strong moves like takedowns. Lean body mass and wrestling performance were also positively correlated with each other ( $r = 0.55$ ,  $p < 0.05$ ). More muscular wrestlers were more likely to

perform better indicating that muscle growth improves strength and endurance, which helps in improving wrestling performance. Conversely, there was a negative relationship between body fat percentage and wrestling performance ( $r = -0.48$ ,  $p < 0.05$ ). The wrestlers who had smaller body fat percentages tended to perform better and this

indicated that lean body weight was more pertinent in agility, stamina and overall efficiency of wrestling. This observation highlights the applicability of body composition in sports such as wrestling, in which strength and weight management are important factors.

Table 2 shows the Pearson correlation coefficients between muscular strength, body composition, and wrestling performance

Variable	Wrestling Performance	Muscular Strength (1RM)	Body Composition (Lean Mass)	Body Composition (Body Fat %)
Wrestling Performance	1.0	0.62	0.55	-0.48
Muscular Strength (1RM)	0.62	1.0	0.71	-0.45
Body Composition (Lean Mass)	0.55	0.71	1.0	-0.35
Body Composition (Body Fat %)	-0.48	-0.45	-0.35	1.0

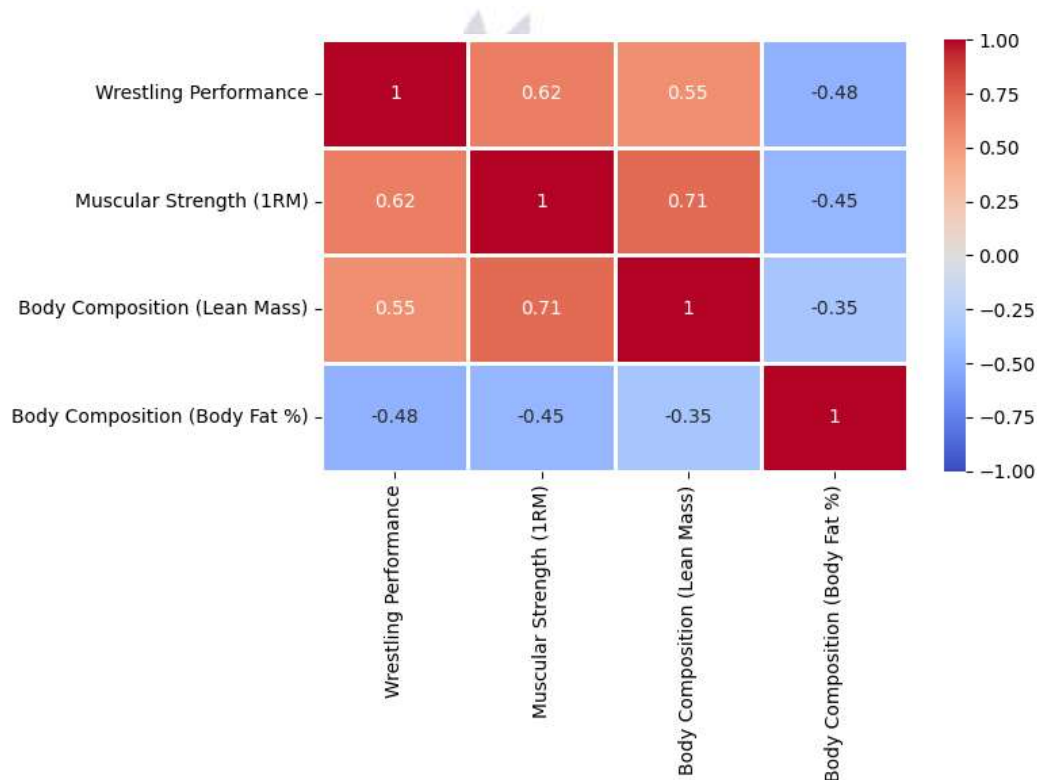


Figure 2 Heatmap for Correlation Analysis

### 4.3 Multiple Regression Analysis

To establish the level to which muscular strength and body composition would predict wrestling performance, it was analyzed by multiple regression. The results indicated that lean body mass and muscular strength were found to explain 55.3 percent of the variation in the wrestling performance ( $R^2 = 0.553$ ,  $p < 0.05$ ), which showed that there was a strong predictive relationship. The regression outcome indicated that muscular strength was the strongest predictor of wrestling performance and the beta coefficient of 0.47 was significant ( $p = 0.0001$ ). This implies that level of

strength contributed significantly to the enhancement of performance in wrestling techniques. Lean body mass was also positively correlated with wrestling performance with a beta coefficient of 0.34 ( $p=0.002$ ). Here the significance of muscle mass in increasing endurance, power, and performance of technique is demonstrated. Nonetheless, the body fat percentage did not come out as a major predictor of wrestling performance (beta = -0.19,  $p = 0.13$ ) and this means that body fat percentage did not affect performance as much as the muscular strength and lean body mass.

Table 3 displays the multiple regression analysis results, showing the predictive impact of muscular strength, lean body mass, and body fat percentage on wrestling performance

Predictor Variable	Beta Coefficient	Standard Error	t-value	p-value
Muscular Strength (1RM)	0.47	0.08	5.88	0.0001
Lean Body Mass (kg)	0.34	0.09	3.78	0.002
Body Fat Percentage (%)	-0.19	0.12	-1.58	0.13

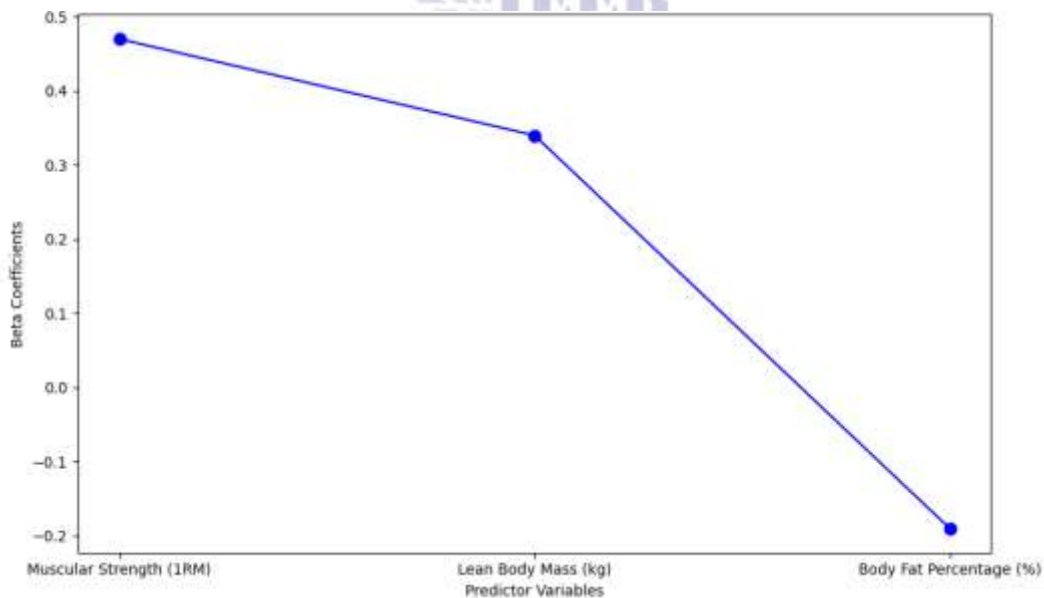


Figure 3 Regression Line for Multiple Regression Analysis

### 5 Discussions

The results of this research highlight the great influence of plyometric training on physical fitness

and wrestling performances among young male wrestlers. The findings revealed significant changes in muscle strength, body composition,

agility, endurance and performance in wrestling. The muscular strength was measured with 1RM tests (bench press, squat, and deadlift), and significant post-training results were found in the eight-week plyometric training program. This correlates with the earlier studies, which have emphasized the importance of strength in wrestling, especially in performing strong moves like takedowns and escapes (Baić et al., 2022). The fact that muscular strength is positively correlated with wrestling performance ( $r = 0.62$ ) shows that the stronger the wrestlers, the better the wrestlers will perform on the mat as the stronger wrestlers will be able to apply more force on their opponents and keep them under control. This resultant rise in muscular strength could be explained by the presence of resistance and explosive movement during plyometric training that not only improves power, but also helps improve the performance of the technique (Tavares Junior et al., 2023).

Besides strength, the research revealed considerable body composition changes. The decreased body fat percentage and growth in lean body mass after training is indicative that the plyometric exercises, a form of exercise focused on the fast-twitch muscle fibers, may assist an athlete in decreasing the excess fat and increasing lean body mass. It is essential to wrestlers because the optimal proportion of power to weight is significant in terms of power and agility (Rodríguez et al., 2024). The fact that body fat (14.7% to 13.2%) and lean body mass (70.2 kg to 72.6 kg) decreased and increased, respectively, shows that plyometric training has a dual effect on the body composition that can enhance the ability of a wrestler to be more agile, fast, and overall more efficient in the wrestling game. This adverse relationship between body fat percentage and wrestling performance ( $r = -0.48$ ) also highlights the fact that a lean body structure is an important aspect in terms of agility and needless resistance during movements that are essential in a weight-class sport such as wrestling. Agility and endurance gains were also very impressive, as T-test agility times dropped to 7.5 seconds and 300-meter sprint times dropped to 43.2 seconds. These developments are an indication of the greater

capability to make quick movements and maintain high intensity activities during a game. In wrestling, agility is a necessity both in defensive actions and offensive actions, including performing quick reversals or evading a takedown. The results are in line with the results of ŞAHİN (2023), who observed that plyometric exercises can enhance the reaction time and muscle coordination, and the ability of an athlete to change direction rapidly and efficiently. Plyometric training is also aimed at the lower-body strength and agility, which are also fundamental in executing dynamic movement in wrestling. Equally, the increase in anaerobic endurance, namely, the 300 meter sprint, indicates that plyometric training can also contribute to the fact that a wrestler would continue performing at a high level in response to intense and short-duration events, which is similar to the nature of a wrestling match (Tavares Junior et al., 2023). Most significantly, the wrestling performance, quantified by the match simulation, went up by a considerable margin, 78.3 per cent success rate to 83.7. This enhancement is a direct result of the physical benefits in strength, body composition, agility, and endurance. This research proves the results of Coletta et al. (2025) who highlighted that the ultimate combination of power and strength (both of which are boosted through plyometric training) leads to better sport performance, particularly in dynamic and high-intensity sports such as wrestling. This is further supported by the correlation analysis which revealed moderate positive correlation between muscular strength and wrestling performance ( $r = 0.62$ ), lean body mass and performance ( $r = 0.55$ ). These findings indicate that physical fitness, especially strength and body composition are important in the efficiency of the techniques applied by a wrestler. The favorable impacts of plyometric training on performance outcomes underscores the need to ensure explosive motions are incorporated in the training programs of young wrestlers. Plyometric exercises do not only increase muscular strength and body composition, but also agility and endurance, which are key to wrestling success. This research fits into the increasing literature that suggests incorporation of

plyometric training in combat sport, especially wrestling which needs power and agility. Future studies should examine how plyometric training might have a lasting impact on wrestling performance in various age and skill levels and also determine whether there is any advantage to using plyometric training in conjunction with other conditioning methods to achieve ideal athletic performance.

### Conclusion

To conclude, this research offers meaningful evidence that plyometric training has a great influence on the important physical fitness factors, including muscular strength, body composition, agility, endurance, and wrestling performance in young male wrestlers. The eight weeks plyometric training program resulted in body strength manifested in the bench press, squat, and deadlift 1RM values, body fat percentage, and an increase in lean body mass. These have been especially significant in wrestling, which is a weight-class sport, where strength, agility, and body composition are vital performance factors. The research also found plyometric training to have positive effects on agility indicated by a reduction in T-test time and endurance indicated by a reduction in 300-meter sprint time. These modifications imply that the plyometric exercises, based on explosive movements, increase the capability of the wrestler to make quick movements and maintain high-intensity activities during a game. Significantly, the gains in wrestling performance, quantified using match simulation, highlight the practical value of plyometric training on improving wrestling-specific skills. The results indicate that plyometric training can be regarded as a worthwhile complement to wrestling training programs because it does not only lead to strength improvement, but also to agility and endurance, which are paramount to success in the sport. The potential consequences of plyometric training on wrestling performance over extended periods of time should be investigated in future studies at various levels of competition and age. On the whole, the present research demonstrates the efficiency of plyometric training to build an overall

physical fitness of wrestlers that is essential to achieve maximum performance on the mat.

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