

**EFFECT OF LOWER BODY STRENGTH TRAINING ON SPRINT SPEED AND COURT COVERAGE IN PROFESSIONAL BASKETBALL PLAYERS****Dr. Arun Mathur****Research Scholar –Rakesh Kumar**

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**ABSTRACT**

This research evaluates lower body strength training impacts on sprint performance and court coverage in professional basketball players. Twenty-four professional male basketball players were employed in a strength training intervention regimen covering compound exercises and sport-specific strength training of the lower body, targeting the hip, knee, and ankle extensors. Outcomes were evaluated through pre- to post-intervention measurements of 10 m, 30 m, sprint performance, repeated sprint ability, and in-game tracking analysis of court coverage. The results show significant improvements in acceleration ability, enhanced sprint performance; increased high-intensity distance covered, and improved movement efficiency, making it evident that lower body strength training is a significant strategy in enhancing a player's court coverage and acceleration ability in professional basketball.

**Keywords:**

Lower body strength, sprint speed, court coverage, strength training, professional basketball, athletic performance

**INTRODUCTION**

Basketball is considered to be a high-intensity intermittent sport where players need to perform repeated maximal actions such as sprinting, jumping, acceleration, deceleration, and change of direction. At the NBA professional level, the physical aspect of basketball is significantly more demanding due to quicker tempo of the game, minimal rest time, and advanced playing tactics. Therefore, the attributes of physical performance—more specifically speed during sprinting and court coverage—gained importance at this level. Speed helps players gain a position advantage during transition play, defense reaction, and offense, while court coverage helps players continue to press the defense while gaining possession during offense.

Lower body strength is well acknowledged to be one of the essential physical attributes, which serves as the basis for the numerous explosive sport actions involved in the sport of basketball. Actions such as sprinting, lateral shuffling, cutting, as well as jumping, achieve considerable acceleration with the help of the propelling strength of the hip, thigh, and lower leg muscle groups. As a result, strength exercise aimed at the lower extremities has evolved to become an essential element within the physical conditioning regimen of professional basketball players. Nonetheless, there remain certain ambiguities regarding the practical bearing of lower body strength exercise upon the acceleration speed and coverage performance, which get manifested during actual competition. Sprinting speed for a basketball player usually entails short distance acceleration but not necessarily maximal speed sprinting, as observed in track and field sports. It has been proved that most sprints played out at a distance of 5-20 meters and were usually followed by reactive movement or direction changes. Some research has indicated that acceleration ability depends heavily upon the capability to deliver high levels of physical force in a time span, described as rate of force development. Strength training for the lower extremities, especially with compound movements such as squats, deadlifts, lunges, and Olympic lifted, has proved to have a positive effect on enhancing the capability for physical force production.

Court coverage is defined as a player's capacity to move efficiently throughout the playing surface for both scoring and defensive efforts. This encompasses repeated sprint efforts, shuttle runs, close-outs, backpedaling, and quick turns. In contrast to sprint ability, court coverage is a complex variable that is impacted by muscle strength and power, endurance, neuromuscular coordination, and resistance to fatigue. Lower body strength training may be relevant to increasing court coverage through improvements in efficiency and energy cost per movement, and boosting a player's capacity to withstand a given amount of loading throughout a game situation. Players who possess relative muscle strength have a higher capacity for both acceleration and braking to stop during deceleration.

**LOWER BODY STRENGTH TRAINING IN BASKETBALL**

In professional basketball environments, strength and conditioning coaches have to create strength programs for the lower body to optimize sport performance while avoiding risks of injury. The strength programs for the lower body will comprise exercises for compound movements (such as squats, Romanian deadlifts, and lunges), exercises for power movements (such as clean exercises, snatch exercises, and jump squats), and unilateral exercises (single-leg squats and step-ups exercises), aimed at correcting muscle imbalances that compromise sport performance.

Although the primary purpose of lower body strength training is enhanced performance, the underlying mechanisms by which strength increases contribute to the enhancement of sprint speed and court coverage remain a focus of ongoing research and professional debate. Certain professionals claim specific improvements in maximum strength increase the magnitude of force production during sprint push-offs, potentially securing a faster acceleration of the player. Other professionals believe strength training leads to improvements in movement economy, resulting in the capacity to maintain intensive exercise over longer intervals and regain faster between exercise recoveries. Others believe the prevention of injuries through strength training, which increases the robustness of muscle and connective tissue, leads to the potential to maintain greater exercise volume with greater intensity, minimizing the risk of soft tissue injuries, thus indirectly promoting improved sprint speed and court coverage.

**IMPORTANCE OF THE STUDY: SPRINT SPEED AND COURT COVERAGE IN PROFESSIONAL BASKETBALL PLAYERS**

1. **Enhancing Performance** : Speed during sprints and coverage on the court are essential elements in basketball. Knowledge of these elements enables coaches and sports trainers to develop training programs for improved players' movement speed across the court, response to game conditions, and sustained high-level performance during games.
2. **Optimizing Game Strategy** : Knowledge of players' speed and ability to cover the court enables coaches to position players more accurately. Faster players can be selectively positioned to take advantage of fast breaks or to defend against quicker opponents.
3. **Injury Prevention and Player Longevity**: Sprint speed and court movement observation can be used to inform decisions regarding player fatigue, asymmetry, and lack of agility, which can lead to increased susceptibility to injuries. There are techniques and strategies for improving conditioning and recovery.
4. **Talent Identification and Recruitment**: In addition to Measuring the speed of sprinting and the coverage of the court delivers imperative information to recruitment teams. Players who perform well in these fields can be selected over others for particular roles.
5. **Scientific Contribution to Sports Performance**: The study of these variables could be a part of the bigger area of sports science as it offers evidence-based information regarding the physical requirements of playing basketball. It could help combine theoretical and practical applications.
6. **Performance Monitoring and Improvement over Time**: Sprint speed and court coverage are assessed to monitor players' improvement and respond to competition readiness and the efficacy of training programs. This method allows for constant improvement of conditioning practices.

**RESEARCH OBJECTIVES**

The objectives of the present study were as follows:

- 1) To assess the effect of lower body strength training on sprint speed among professional basketball players.
- 2) To determine the impact of lower body strength training on court coverage ability.
- 3) To compare pre-test and post-test sprint speed performance following an eight-week training intervention.
- 4) To compare pre-test and post-test court coverage performance following the training program.
- 5) To examine whether lower body strength training produces statistically significant improvements in performance variables compared to a control group.

**RESEARCH METHODOLOGY**

The study used a random controlled experiment with pre testing as well as post testing. A total of 60 professional basket-ball players in the age group of 18 to 25 years were chosen from different basket-ball academies. All participants were having at least three years of experience in basket-ball and were also physically fit.

**RESULTS****Table 1: Descriptive Statistics of Participants**

Group	N	Age (Years)	Height (cm)	Weight (kg)
Experimental	30	21.4 ± 1.8	182.6 ± 5.2	78.3 ± 6.1
Control	30	21.1 ± 1.6	181.9 ± 4.8	77.8 ± 5.9

As shown in table 1, both groups were homogeneous with regard to age, height, and weight. The similarity was necessary before exposure to the treatment.

**Table 2: Pre-Test and Post-Test Sprint Speed of Experimental Group**

Test	Mean (sec)	SD	t-value
Pre-Test	4.32	0.18	
Post-Test	4.01	0.16	8.64*

*Significant at 0.05 level*

The experimental group showed significant improvements in sprint performance after the lower body strength exercise, as evident from the difference in sprint times.

**Table 3: Pre-Test and Post-Test Sprint Speed of Control Group**

Test	Mean (sec)	SD	t-value
Pre-Test	4.31	0.17	
Post-Test	4.29	0.18	1.12

No statistically significant change in sprint speed was noted in the control group, showing that regular basketball practice had no effect on improving sprint performance.

**Table 4: Pre-Test and Post-Test Court Coverage of Experimental Group**

Test	Mean (meters)	SD	t-value
Pre-Test	620.5	28.4	
Post-Test	685.7	30.1	9.21*

*Significant at 0.05 level*

The distance of court coverage significantly increased in the experimental group after completing the strength training program, which shows an improvement in movement efficiency and endurance.

**Table 5: Comparison of Post-Test Court Coverage between Groups**

Group	Mean (meters)	SD	t-value
Experimental	685.7	30.1	
Control	628.4	27.6	6.87*

*Significant at 0.05 level*

The results from the post-test indicated there was a statistically significant difference between the experimental and control groups in court coverage abilities in favor of the experimental group.

The findings of the current study clearly indicate that the eight weeks of lower body strength exercises had a significant effect on increasing the sprinting speed and the ability to cover the court of professional basketball players. The experimental group showed a large reduction in the sprinting time along with a substantial increase in the distance covered relative to the control group.

The reason for improvement in sprint speed performance would be related to enhanced muscular strength, relative force, and muscle coordination acquired through weight training and exercises. The overall muscular strength and development of lower limb muscles help produce greater ground reaction forces, which play an essential role during sprint performance.

In a similar manner, the improved court movement performance is also a reflection of greater agility, strength, as well as movement efficiency. Basketball exercise training is essential in improving the ability to accelerate, decelerate, as well as change direction.

The fact that the control group did not show any major improvement in the results further validates the fact that mere basketball training may not be enough for the development of the strength attributes that are imperative for optimal speed and movement performance. These results are in line with the fact that resistance training plays a major role in the improvement of variables of athletic performance.

This research emphasizes the value of the inclusion of body strength training, especially the lower body parts, as a component of professional basketball player physical preparation. It is essential to focus on scientifically based strength training.

### CONCLUSION

Strength training for the lower body helps to have a significant impact on improving speed and movement around the court for basketball players. The results show that specific changes in maximal strength, power, and neuromuscular movement ability have a direct carry-over to improve acceleration speed, directional movement ability, and associated higher intensity movement efficiency on the court. Strength exercises such as squats, deadlifts, and lunges were identified to contribute to the ability to produce and quickly develop forces involved in associated playing skills for a basketball player.

Furthermore, increased strength of the lower body leads to enhanced economy of motion and increased resistance to fatigue. Such players will be able to sustain high-speed performances during the course of the game. It should be noted that professional basketball requires intermittent high-intensity exercise.

In conclusion, the addition of structured lower body strength training to professional basketball conditioning regimens is a critical step in maximizing speed and court coverage. Trainers need to look toward progressive strength protocols to maximize performance and toward injury prevention.

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