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## Importance of biomechanics in Basketball layup shot

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### Abstract

Biomechanics is the study of human movement, using principles of mechanics & applied anatomy. Biomechanics can effectively refine sports activities and promote athletes' scientific training. The theory teaching and practice of biomechanics are combined to promote the coordinated development of the athletes. In today's competitive Sport, the difference between winning and losing is getting slimmer by the day. The Biomechanics helps to achieve a competitive edge through analysis and identifying strengths and weakness of sportspersons and suggesting remedial measures to correct defects if any. Basketball is one of the most popular and widely viewed sports in the world. Points are scored by throwing the ball through the basket from above, the team with more points at the end of the game wins. For offensive side, achieving a fast break or finding an opening in a weak defense can result in a layup. For a player to improve their layup, improve accuracy, make the shot more efficient and speed up the run into the shot, it is important to look at a few biomechanical principals. These principals tell us how to move our body efficiently, improve our skills and rectify faulty actions. The knowledge of biomechanics helps the players, coaches and the related persons to enhance the basketball layup shot.

**Keywords:** Biomechanics, Basketball, Lay-up shot.

### Introduction

Biomechanics is the study of human motion. It is the branch of Kinesiology which deals with the precise information of human Movements with scientific method. In sports biomechanics is a quantitative based study and analysis of movements of professional athletes and sports activities in general. In biomechanics the laws of mechanics are applied in order to gain a greater understanding of athletic performance through mathematical modeling, computer simulation and measurement. Biomechanics can effectively refine sports activities and promote athletes' scientific training. The theory teaching and practice of biomechanics are combined to promote the coordinated development of the athletes. In today's competitive Sport, the difference between winning and losing is getting slimmer by the day. The Biomechanics helps to achieve a competitive edge through analysis and identifying strengths and weakness of sportspersons and suggesting remedial measures to correct defects if any. Biomechanics is the study of human movement, using principles of mechanics & applied anatomy. Its main role in sport is to reduce the risk of injury, to obliterate the unwanted physical actions and to improve the performance of the athletes by identifying and applying optimal technique. Biomechanical analysis is an on-going and continuous process in guiding sportspersons through their rigorous requirements to stay at their best physical and technical shape.

Basketball is one of the most popular and widely viewed sports in the world. Points are scored by throwing the ball through the basket from above, the team with more points at the end of the game wins. The ball can be advanced on the court by bouncing it or passing it between teammates. Disruptive physical contact is penalized and there are restrictions on how the ball can be handled. Through time, basketball has developed to involve common techniques of shooting, passing and dribbling, as well as player's positions and offensive and defensive structures. Typically, the tallest members of a team will play center or one of two forward positions, while shorter players or those who possess the best ball handling skills and speed, play the guard positions.

Basketball is a highly physical sport which requires a long period of high intensity physical activity and mastery over the skills. Players perform short sprints to intercept in defense or

dribble the ball to the goal in offence. For offensive side, achieving a fast break or finding an opening in a weak defense can result in a layup. A lay-up is a shot where the players have to lay the ball up on the backboard or over the rim and into the basket. It can be done forwards, backwards or sideways. In the layup shot the player runs towards the basket while dribbling the ball in their right hand, they then place their right foot followed by their left and take off, releasing the ball towards the basket by completely extending their shooting arm (Sandeep & Bhardwaj, 2011) <sup>[4]</sup>. The layup is considered one of the more basic shots in basketball. The main obstacle when performing a layup is getting near the baskets rim and avoiding the taller defenders blocks (Sandeep & Bhardwaj, 2011) <sup>[4]</sup>. The layup is made with one hand and from a position under or beside the basket (Sandeep & Bhardwaj, 2011) <sup>[4]</sup>.

#### **Importance of Biomechanics in Basketball Layup Shot:**

The layup shot in basketball for goal is most commonly used and most missed shot. It is also the highest percentage shot a player can possible take in basketball. Lay-ups are the backbone of any team offense. If a player is dribbling towards the basket and finds a gap in defense and also he can get around the defenders, he should definitely go for the layup shot. Without the threat of a lay-up, all other shots would become next to impossible. Its accuracy is also a cause for why it is so popular. For a player to improve their layup, improve accuracy, make the shot more efficient and speed up the run into the shot, it is important to look at a few biomechanical principals. These principles tell us how to move our body efficiently, improve our skills and rectify faulty actions. The knowledge of Biomechanics will help the players, coaches and the related persons to enhance the basketball layup shot in following ways.....

**Identify the proper skill:** Good technique in sport involves a well timed and coordinated sequence of muscle actions. Through the experience, adequate knowledge of biomechanics and the analysis provided by various research works, best techniques have been developed for many of the skills in sports. These techniques have evolved and been refined so that the movements involved produce the best performance and are least likely to cause injury. In the basketball layup shot various biomechanical parameters are involved. Like approach speed, take-off velocity, angular velocity, speed of ball release etc. Understanding of the exact implementation of those parameters will be beneficial for the players and coaches. Only the knowledge of biomechanics will help to achieve this.

**Improvement in technique:** The application of biomechanics to improve technique may occur in two ways: Teachers and coaches may use their knowledge of mechanics to correct actions of a student or athlete in order to improve the execution of a skill, or a biomechanics researcher may discover a new and more effective technique for performing a sport skill. One popular research of biomechanics that changed the sport of swimming was the study done by Ronald Brown and James "Doc" Counsilman in 1971. They indicated that the lift forces acting on one hand as it moved through the water is the key in propelling a swimmer through the water. Thus, instead of pulling the hand in a straight line backward, the swimmer should move his or her hand back and forth to produce propulsive lift and drag forces. This technique in swimming has dramatically improved the way swimmers

should swim through the water. Likewise, research workers in the field of biomechanics may develop a new and more effective technique for better execution of the basketball layup shot. This can improve the game and performance of the basketball players.

**Improve in training procedure:** Biomechanics can help to improve and modify the training procedure in two ways: By the analysis of mechanical values a coach defines such training conditions that may lead to threshold stimuli. We can use as an example the research project by Jandacka and Uchytíl (2011) who carried out mechanical analysis of bench press with various loads in elite footballers. The recommendation resulting from this research project was as follows: Soccer players should train maximal strength during the preparatory period for their competitive season along with training for speed and endurance. By the analysis of technical imperfections of a given athlete the coach/teacher identifies the type of training needed for this athlete to improve. In case of basketball lay-up shot the required abilities to execute the motor task is not easy to detect so, the biomechanical analysis must be used.

**Improvement of performance:** The science of improving our performance involves neuromuscular skills, physiological capabilities, cognitive abilities and anatomical factors. Of course, it is hard to go through all of these. In this case biomechanics offer a simplified understanding onto how we can improve our performance by understanding the science of our movements. According to Knudson (2007), biomechanics is most useful in improving the performance of an athlete through improving the technique rather than relying on physiological capacity and physical built. By the knowledge of biomechanics they will able to know about the right techniques, effective and result oriented posture of basketball layup shot to get more efficient results by applying minimum muscular force.

**Evaluation of performance:** To evaluate any performance the coaches or trainers are effectively need to compare the observed performances with some model of good form. However, as there is no general optimal performance model. We need a model that is appropriate for the performers being evaluated – the model needs 'individual specificity'. This clearly requires prior identification of critical features in the preparation stage. Furthermore, a ranking of the 'correctness' of the identified critical features on some scale or within some band of correctness can be very helpful. Research workers in the field of biomechanics may help to evaluate the technique of basketball layup shot and advice the proper technique for better execution of the basketball layup shot.

**Distinguish the biomechanical parameters:** Research works in the field of biomechanics will help to distinguish the biomechanical parameters necessary in layup shot from the different parts of the basketball field. The accurate Lay-up shot depends upon the physical fitness of the player, velocity of the ball, take off and height of release, the length and speed of first and second step etc. The proper knowledge of those parameters will help the basketball players to enhance their performance.

**Knowledge of safety principles:** Safety is in essence using good form when exercising, which, if we think about it, is applying correct biomechanical principles: if we are applying

good force, our form and movement will also be good, which greatly reduces the risk of injury. In basketball layup safety principles are required to ensure that the game is incorporated with improve facilities and equipments. By the help of biomechanics we will able to analyze different movements that can be harmful for the players. So, the trainers or coaches will try to reduce or remove those unnecessary and harmful movements which are involve in basketball lay-up shot.

**Reduce and prevent injuries:** By injury prevention it is meant an attempt to prevent or to limit the seriousness of injuries before they are actually incurred. The concept of injury prevention is part of public health and its goal is to improve the general health of the population and thus to increase the quality of life. Biomechanics is a tool that can be used in sport medicine to identify forces and mechanical energy that cause injuries. It helps to understand how injuries originate, how to avoid them during sport performance, and how to identify exercise suitable for injury prevention and rehabilitation. Biomechanics offers possibilities to create alternative techniques of executing specific movements, using new equipment, and carrying out more effective training methods, which also contributes to injury prevention. Good examples of how biomechanics helps reduce the prevalence of injuries can be found in volleyball. Zahradník and Jandacka (2011) examined whether it is possible to adapt the landing after a volleyball blocking to reduce impact reaction forces acting on knee joints. They found that it is better for volleyball players to make one step back after blocking as opposed to staying on the landing spot and absorbing the relevant forces there. The basketball lay-up shot is a very injury prone skill. The knowledge of biomechanics will help to find out the factors or the forces that can lead to the injuries during the game situation. It also helps in reducing the sports injuries. Biomechanics offers possibilities to create alternative techniques of executing specific movements, using new equipment, and carrying out more effective movements, which also contributes to injury prevention.

**For better rehabilitation:** Rehabilitation from the injury is currently a very important goal of research in the field of games and sports. A study conducted by Kornelia Kulig and Judith M. Burnfield in 2008 shows the role of biomechanics in orthopedics, musculoskeletal and neurological rehabilitation. Specifically, their paper discusses selected examples, ranging from the tissue to whole body biomechanics level, that highlight how scientific evidence from the theoretical and applied sciences have merged to address common and sometimes unique clinical problems. The knowledge of biomechanics will help to understand how injuries originate, how to avoid them during the layup shot in basketball, and how to identify exercise suitable for injury prevention and rehabilitation.

**Development of improved sports equipment:** Use of biomechanics can also lead to a better look and better function in 2g of sport equipment. For example ski boots can have a real impact on sport performance. Sophisticated sport equipment gives advantage to both elite and recreational athletes. An introduction of the new vaulting equipment (vaulting table) after the 2000 Olympics represents the most substantial transition in the development of gymnastics equipment in the last decades. New vaulting equipment allows gymnasts to produce bigger angular momentum and thus to execute more complex vaults with multiple rotations

around horizontal and vertical axes (Farana and Vaverka, 2010). Like that the knowledge of biomechanics will be used to modify and improve the equipment needed in basketball game as well as in the practice sessions, (like tee shirts, shoes etc.) to boost the performance.

**Conducting new research work:** Research is essential to find out which techniques work better for the layup shot in basketball. It plays an important role in discovering new processes, and making sure that we use existing techniques in the best possible ways. Research can find answers to things that are unknown, filling gaps in knowledge and changing the way that sports professionals work. Research works in biomechanics will also open the door of new possibilities by which the researchers will find new ways to improve the basketball game. Some of the common aims for conducting research studies in basketball layup shot are to - Diagnose problems in layup shot, prevent the development of wrong techniques and reduce the number of mistakes, improve the quality of basketball layup shot. Etc.

**Increases the popularity of Basketball:** Applying the knowledge of biomechanics, the basketball game may be getting more popularity by improving technique or skill, enhancing performance, reducing mistakes, eliminating risks of injuries etc. Research works in biomechanics will helps to promote the basketball game in the world.

## References

1. Bartlett R. Introduction to sports biomechanics. (1 Ed.). New York, NY: Routledge, 1997, 304.
2. Rojas FJ, Cepero M, Ona A, Gutierrez M. "Kinematic Adjustments in the Basketball Layup Shot Against an Opponent." *Ergonomics*, 2000; 43(10): 1651-1660.
3. Blazevich AJ. *Sports Biomechanics: The basics optimising human performance.* (2<sup>nd</sup> ed.). London A&C Black.
4. Sandeep, K., Bhardwaj, B. Relationship among Selected Biomechanical Variables with Lay Up Shot Performance of Basketball Players. *VSRD Technical and Non-Technical Journal*. 2011; 2(5):229-233.
5. Yadav Singh S.K. Advantage of biomechanics in sports *International Journal of Applied Research* 2016; 2(5): 669-670
6. Chawla Neera J. Biomechanics in Physical Education application of Biomechanics in Teaching Physical Education, (*IJERED*) ISSN. 2016; 4(5):2320-8708.
7. Dutt S. Role of biomechanics in physical education and sports, *National Journal of multi-disciplinary Research and Development*, ISSN: 2455-9040. 2018; 3(1):983-984.
8. [https://en.wikipedia.org/wiki/Sports\\_biomechanics](https://en.wikipedia.org/wiki/Sports_biomechanics).
9. [www.prohealthphysio.co.nz](http://www.prohealthphysio.co.nz)