

RESEARCH IMPLICATIONS FOR THE COACH AND PERFORMER

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There were over three hundred references available to the authors for a review of basketball publications. Most of them were written by coaches and contained information on how to perform a given skill. A few authors did semi-research on specific aspects of basketball. Some authors of textbooks of a research nature explained in biomechanical manner how various skills were performed, including analysis of sequence pictures of many of the actions.

Coaches who wrote basketball books often had a professional writer to assist them. The contents were an exposition of their concepts, insights and systems of play. Some of these authors explained and illustrated how they believed certain fundamentals and team play should be executed. A few will be cited to illustrate:

Bee, Clair: Basketball for Everyone, Ace Books, New York, 1962. This is an instructional handbook on how to execute certain individual moves. The audience to whom he wrote was the player, coach and spectator.

Buck, R.: Shuffle and Press Offense for Winning Basketball, Prentice-Hall, Inc., Englewood Cliffs, N. J., 1960. He mentioned offensive ways of counter attacking Pressure Defenses.

Bunn, John W.: Scientific Principles of Coaching, Prentice-Hall, Inc., New York, 1955. This is a technical treatise on many sports, including basketball.

Dean, Everett: Progressive Basketball, Prentice-Hall, Inc., New York, 1950. He covered his own system of play, both offense and defense.

Cousy, Bob and Frank G. Power, Jr.: Basketball Concepts and Techniques, Allyn and Bacon, Inc., Boston, 1970. These authors used such terms as kinetic energy and other scientific terms. The treatment of basketball ideas was generally good.

Smith, Dean and Robert D. Spears: Basketball, Multiple Offense and Defense, Prentice-Hall, Inc., Englewood Cliffs, N. J., 1981. This was a comprehensive treatment of many aspects of basketball, excluding individual fundamentals.

HISTORY

Every field of endeavor has a history. Basketball is no exception. Every coach and player owes a debt to those who preceded them in forming the foundation upon which later people built newer and better techniques. Where would an inquiring person be able to find information on the history, especially if biomechanical concepts are foremost? Some of the coaches as authors have mentioned briefly something about the history of the game. Very little, if any, information from a biomechanical point of view is contained, but some can be inferred by viewing the pictures and drawings found in their publications and comparing the actions with modern players' maneuvers. A sample of where to find historical information is listed:

Allen, Forrest C.: My Basketball Bible, 7th Ed., Kansas City, Mo., Smith-Grievess Co., 1928.

Allen, Forrest C.; Better Basketball, Whittlesay House, McGraw-Hill Book Co., New York, 1937. Both of the above attempt to cover all aspects of basketball. The historical-biomechanical contribution lies in the pictures showing the action of the players in that era.

Encyclopaedia Britannica: "Basketball", 15th Ed., This edition presents information on the origin and present status of the game.

Naismith, James: Basketball, Its Origin and Development, The Association Press, New York, 1941. Naismith is the inventor of the game of basketball which took place at the International Y.M.C.A. training school in Springfield, Mass., in December 1891. The five principles he listed were:

1. There must be a ball; it should be large, light and handled with the hands.
2. There shall be no running with the ball.
3. No man on either team shall be restricted from getting the ball at any time that it is in play.
4. Both teams are to occupy the same area, yet there is to be no personal contact.
5. The goal should be horizontal and elevated. (p. 62)

This is an interesting, factual and often amusing account of the invention of the game. The influence of the known games was evident. It is postulated that behind the head, underhand and one-hand shots were taken at the basket early in the history of the game.

Thanassoulas, George P.: "Dr. James Naismith, 1861-1939, Inventor of Basketball", Master's thesis, Wake Forest University, Winston-Salem, North Carolina, August, 1972. This is an interesting, revealing and thorough study of the inventor and contains as well additional information not included by Naismith in his book.

It is very possible that many of today's moves and throws were used by the original players. A true relationship between the actions then and now are not available. However, since passes and throws in basketball are actually one-handed, the first players must have laid the foundation for present mechanics of the fundamentals.

SHOOTING, INCLUDING THE JUMP SHOT

Shooting is the act of projecting the basketball toward a target, the basket or backboard. Selected references follow.

Cooper, John M. and Daryl Siedentop; The Theory and Science of Basketball, Lea and Febiger, Philadelphia, PA., 1969.

Cooper and Siedentop have said that, "Generally speaking, shooting is the most important and the most difficult skill to master." (p.46) They stated that, "Shooting in basketball falls under the general category of throwing and therefore the player exhibits many of the characteristics that are seen during all throws." (p. 48) Wooden* has stated that a shot is "a pass to the basket."

Cooper and Siedentop have listed the following principles of performance in shooting. (p. 46)

1. Good shooters should always aim at a specific target.
2. Good shooters should maintain constant eye focus on the target until the ball is released.
3. The ball just before it is released should always be "wiggled" in order to have good touch in shooting.
4. The shooter should not hold his body in a fixed position for a very long time before releasing the ball (especially his arms and hands).
5. The ball should be delivered with a reverse spin in most instances.
6. The better the shooter, the more intense the concentration on shooting is.
7. Shooting is characterized by medial shoulder rotation, elbow extension, forearm pronation and wrist flexion.
8. The longer the distance from the basket the ball is delivered, the more pronounced is the forearm pronation.
9. The longer shots require that the ball be released at a higher angle (greater arch).
10. Longer shots require that parts of the body be used to add momentum to the hand.
11. Technically, the higher the arch of the shot, the more chance it has to go in the basket.
12. A 45 degree angle of release enables the player to propel the ball the longest distance.
13. Shots released at a greater height from the floor need to be released with less arch.
14. Most shots should be aimed at a target (spot) just over the rim.

*Wooden, John R. Practical Modern Basketball, The Ronald Press Co., New York, 1966, p. 71.

15. Every player must be able to rebound the ball off the board into the basket as he gets close to the basket.

16. Right hand, one hand set shots should normally be delivered with the right foot forward.

17. The more spin that is given to the ball, the further from the basket it can be rebounded off of the board.

18. The non-shooting hand should be used to support the ball until the last moment before release of the ball occurs.

19. As a player moves up in competitive level, he must be able to deliver his shots with greater quickness in order to have greater opportunity to achieve success in scoring.

20. While there are many styles of shooting a ball at the basket, it appears that there are certain basic patterns of mechanics that underlie all good shooting styles.

Hay, James G.: The Biomechanics of Sports Techniques, 2nd Ed., Prentice-Hall, Inc., Englewood Cliffs, N. J., 1978. Hay has allotted Chapter 9 of his text to a discussion of most of the phases of basketball. His treatise is at times qualitative in nature, perhaps by necessity. Some of it is quite technical. For example, the angle of entry in shooting is discussed quite thoroughly and calculations and graphs are shown. Several sequences of fundamental moves are shown and analyzed. This book is worth the time of the basketball coach to read.

The skill in basketball that is written most about is shooting, especially the one-hand jump shot. Other than previously mentioned references, others will be cited in regard to shooting and specifically ones on jump shooting.

Gates, Gary and L. E. Holt: "The Development of Multiple Linear Regression Equations to Predict Accuracy in Basketball Jump Shooting at Ten and Twenty Feet." School of HPER, Dalhousie University, Halifax, N. S., Canada.

They found that:

1. More successful shooters demonstrated a greater angle at the shoulder at the point of releasing the basketball (lateral view).

2. More successful shooters used a smaller elbow angle at the start of the shot than the poorer performers.

3. A greater back spin during flight was associated with the high performance shooters.

4. The successful shooters demonstrated a closer alignment of the upper arm with the vertical at release, than the lower percentage shooters.

Sharman, Bill: Sharman on Basketball, Prentice-Hall, Inc., Englewood Cliffs, N. J., 1967. This is a treatise involving shooting done by a great shooter. His comments are based on practical experience. Some of his ideas are still sound, others need to be brought up-to-date.

There are several things about the jump shot that seems to be in agreement. In some there is disagreement. Before discussing these, it must be kept in mind that the jump shot can be started from a standing position, off a dribble and after a cut

is made and the ball is received. (Cousy, Bob and Frank G. Power, p. 71) The first step method, with the lead foot being moved up and planted first then the trail leg joins it in the approach, is advocated by William Penrose and Brian Blankby in film analysis: Jump Shooting-two Methods, The Australian Journal for Health, Physical Education and Recreation, Canberra, Australia, March, 1976, pp. 17-22.*

Brancazio, Peter, Sport Science, Simon and Schuster, New York, 1984, has devoted a section to the science of basketball shooting (pp. 306-314). It is a most interesting analysis and should be read by every basketball coach. Some of his comments are as follows:

1. The shooter must determine in a fraction of a second the launching speed and angle to use in shooting. All this is to be done with very little conscious thought.
 2. Pure shooters can be made.
 3. The shooter should use little force and release as quickly as possible.
 4. Since the shooter launches his shot up an incline, the angle of release is between 45 and 52 degrees. This is dependent on the distance and height used in the release. The long range shot calls for a lower angle of release as compared with the short range shot. The taller player releases closer to 45 degrees than the shorter player. The player using a soft shot is using "the minimum-force angle." He believed it is better to err on the side of too much arch than too little.
 5. The back spin should be used in shooting since a back spinning ball "loses speed when it contacts a surface."
 6. He mentioned that the elbow should be kept under the ball in order to direct the ball in a straight line toward the target.
- Summary of the comments from the following selected authors are presented:

Brancazio, Peter J.: Sport Science, Simon and Schuster, New York, 1983, 306-314.

Bunn, John W.: Scientific Principles of Coaching, Prentice Hall, Englewood Cliffs, N. J., 1955, 253.

Gorton, Beatrice: Selected Kinetic and Kinematic Factors Involved in the Basketball Jump Shot, Indiana University, 1978, 7-17.

Hartley, Joe W., and Cliff Fulton: Mechanical Analysis of the Jump Shot, The Athletic Journal, March, 1971, 51:92, 95, 128-129.

Hess, Charles: Analysis of the Jump Shot, Athletic Journal, November, 1980, 61:3, 30-58.

Lehmann, George: Basketball is My Game, Lessons by Lehmann, Riverside, N. J., 1981.

Macauley, Ed.: Anatomy of the Jump Shot, Scholastic Coach, December, 1970, 8-11.

*Personal copy sent to authors

Martin, Thomas P.: Movement Analysis applied to the Basketball Jump Shot, The Physical Educator, October, 1981, 3:38, 127-133.

Richardson, Tom and Bill Karemer: Improved Rebounding Performance through Strength Training, National Strength and Conditioning Association Journal, January, 1983, 4:6, 6-7, 70-71.

Wooden, John and Bill Sharman: The Wooden-Sharman Method, Macmillian Publishing Company, Inc., 1975, 62-69.

Most of these authors suggested that the best method to use in an approach to initiate the jump shot is the one-step method in which the front foot is placed down first then the trail leg joins it. Also, the body should be squared to the basket with the feet parallel. In the jump, it should be as vertical as possible with the feet five to ten inches apart and under the center of gravity of the player. The quicker and more forceful the jump from a crouched position, the more impetus and the higher the jump.

Balance in the air is another factor discussed. It was stated that many players "drift" in the air as they shoot. This is impossible unless it is initiated from the floor. The head and shoulders must be kept in a position above the rest of the body and the push from the feet against the floor in a vertical direction.

The position of the elbow and the hand is considered among the most important factors in determining consistent shooting. Keeping the elbow within the plane of the body and not laterally to the side is recommended. (Lehmann)

The position of the hand in grasping the ball for the shot varies with different authors. Bunn suggested that the ball be held on the fingers. Others (Cousy, Hess) want a slight bit of the palm to be involved. Macauley believed that the ball should be held in the palm of the hand for more control since the palm has more surface.

The target area and the release procedure is one that has caused some debate. As the ball is brought up to be shot toward the basket, it should be resting on the fingers and hand as discussed previously. The elbow is flexed as the eyes are already focused on the target. The shooter should aim (or as Cousy said, p. 36) "sighted on the target." Bunn, Hartley, Macauley and Wooden recommended the back of the rim. Others such as Cooper, advocated just over the front of the rim, some have suggested just short of the rim. All agree on a selection that is consistent.

There was some discussion on the finger or fingers that last impart force to the ball as it is released. Macauley contended that the ball is last touched by the index finger, while Wooden believed that the forefinger has the greatest sense of touch and should be the last finger to contact the ball.

At what point in the jump should the ball be released? That is, on the way up, at the apex, on the descent? Brancazio, Hess, Martin, Macauley favor shooters releasing the ball at the peak of the jump. Gorton found that women release on the way up and men at the peak.

The follow-through is essential even though it occurs after the ball is released. Continuing the action prevents injury and it indicates no stopping of the action has taken place prior to release.

Hartley (p. 129) wrote that "when the ball has been released the shooter's hand should follow-through with an outward turn. The outward turn will compensate for the normal inward rotation of the hand." Lehmann (p. 8) said that on the follow-through the shooter should try and place his wrist over the edge of the rim.

Many other skills such as dribbling, passing, jumping, receiving and guarding are discussed in most of the references given here. Each could be presented as jump shooting has been done. Time and space prohibits this from being feasible.