



E-ISSN: 2707-7020
P-ISSN: 2707-7012
JSSN 2020; 1(2): 54-58
Received: 15-05-2020
Accepted: 21-06-2020

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Relationship of effect of plyometric training and skill training on the development of fitness related parameters and skill performance variables among male basketball players

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Abstract

To study the effect of combination of plyometric training and skill training on the development of jumping ability, anaerobic capacity and skill performance of Male Basketball players, sixty male Basketball players (18-25 yrs.) were selected from various colleges in Meerut District, Uttar Pradesh. The subjects were divided as the Experimental group-1 (n=20, PLYOSKILL group) performed the plyometric and skill training, Experimental group-2 (n=20; SKILL group) performed the Skill Training alone, Experimental group:-3 (n=20, CONTROL group) did not perform any training. Pre-test values of jumping ability, anaerobic capacity and playing ability were $14.3 \pm .69$, 780.9 ± 54.12 , $4.6 \pm .59$, for PLYOSKILL group, $14.27 \pm .69$, 780.9 ± 54.1 , $4.6 \pm .59$ for Skill group and $14.27 \pm .67$, 780.95 ± 52.9 , $4.7 \pm .656$ for Control group respectively. After 12 week of training programme the physical variables and playing ability were significantly improved at ($P < 0.05$ level). The post-test values of jumping ability, anaerobic capacity and game playing ability were $16.4 \pm .59$, 818.2 ± 44.2 , $6.7 \pm .55$ for PLYOSKILL group, $15.02 \pm .59$, 800.2 ± 28.25 , $6.0 \pm .72$ for skill group and $14.22 \pm .73$, 775.80 ± 49.47 , $4.75 \pm .638$ for control group respectively. The study shows that combination of plyometric training and skill training were significantly developed jumping ability, anaerobic capacity and skill performance variables among male basketball players.

Keywords: Plyometric training, skill training, fitness, basketball

Introduction

Basketball, game played between two teams of five players each on a rectangular court, usually indoors. Each team tries to score by tossing the ball through the opponent's goal, an elevated horizontal hoop and net called a basket.

The only major sport strictly of U.S. origin, basketball was invented by James Naismith (1861–1939) on or about December 1, 1891, at the International Young Men's Christian Association (YMCA) Training School (now Springfield College), Springfield, Massachusetts, where Naismith was an instructor in physical education.

For that first game of basketball in 1891, Naismith used as goals two half-bushel peach baskets, which gave the sport its name. The students were enthusiastic. After much running and shooting, William R. Chase made a midcourt shot—the only score in that historic contest. Word spread about the newly invented game, and numerous associations wrote Naismith for a copy of the rules, which were published in the January 15, 1892, issue of the Triangle, the YMCA Training School's campus paper.

While basketball is competitively a winter sport, it is played on a 12-month basis—on summer playgrounds, in municipal, industrial, and church halls, in school yards and family driveways, and in summer camps—often on an informal basis between two or more contestants. Many grammar schools, youth groups, municipal recreation centres, churches, and other organizations conduct basketball programs for youngsters of less than high school age. Jay Archer, of Scranton, Pennsylvania, introduced “biddy” basketball in 1950 for boys and girls under 12 years of age, the court and equipment being adjusted for size.

History

The early years

In the early years the number of players on a team varied according to the number in the class and the size of the playing area. In 1894 teams began to play with five on a side when the playing area was less than 1,800 square feet (167.2 square metres); the number rose to

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seven when the gymnasium measured from 1,800 to 3,600 square feet (334.5 square metres) and up to nine when the playing area exceeded that. In 1895 the number was occasionally set at five by mutual consent; the rules stipulated five players two years later, and this number has remained ever since.

Since Naismith and five of his original players were Canadians, it is not surprising that Canada was the first country outside the United States to play the game. Basketball was introduced in France in 1893, in England in 1894, in Australia, China, and India soon thereafter, and in Japan in 1900.

While basketball helped swell the membership of YMCAs because of the availability of their gyms, within five years the game was outlawed by various associations because gyms that had been occupied by classes of 50 or 60 members were now monopolized by only 10 to 18 players. The banishment of the game induced many members to terminate their YMCA membership and to hire halls to play the game, thus paving the way to the professionalization of the sport.

Originally, players wore one of three styles of uniforms: knee-length football trousers; jersey tights, as commonly worn by wrestlers; or short padded pants, forerunners of today's uniforms, plus knee guards. The courts often were of irregular shape with occasional obstructions such as pillars, stairways, or offices that interfered with play. In 1903 it was ruled that all boundary lines must be straight. In 1893 the Narragansett Machinery Co. of Providence, Rhode Island, marketed a hoop of iron with a hammock style of basket. Originally a ladder, then a pole, and finally a chain fastened to the bottom of the net was used to retrieve a ball after a goal had been scored. Nets open at the bottom were adopted in 1912–13. In 1895–96 the points for making a basket (goal, or field goal) were reduced from three to two, and the points for making a free throw (shot uncontested from a line in front of the basket after a foul had been committed) were reduced from three to one.

Baskets were frequently attached to balconies, making it easy for spectators behind a basket to lean over the railings and deflect the ball to favour one side and hinder the other; in 1895 teams were urged to provide a 4-by-6-foot (1.2-by-1.8-metre) screen for the purpose of eliminating interference. Soon after, wooden backboards proved more suitable. Glass backboards were legalized by the professionals in 1908–09 and by colleges in 1909–10. In 1920–21 the backboards were moved 2 feet (0.6 metre), and in 1939–40 4 feet, in from the end lines to reduce frequent stepping out-of-bounds. Fan-shaped backboards were made legal in 1940–41.

A soccer ball (football) was used for the first two years. In 1894 the first basketball was marketed. It was laced, measured close to 32 inches (81 cm), or about 4 inches (10 cm) larger than the soccer ball, in circumference, and weighed less than 20 ounces (567 grams). By 1948–49, when the laceless molded ball was made official, the size had been set at 30 inches (76 cm).

The first college to play the game was either Geneva College (Beaver Falls, Pennsylvania) or the University of Iowa. C.O. Bemis heard about the new sport at Springfield and tried it out with his students at Geneva in 1892. At Iowa, H.F. Kallenberg, who had attended Springfield in 1890, wrote Naismith for a copy of the rules and also presented the game to his students. At Springfield,

Kallenberg met Amos Alonzo Stagg, who became athletic director at the new University of Chicago in 1892. The first college basketball game with five on a side was played between the University of Chicago and the University of Iowa in Iowa City on January 18, 1896. The University of Chicago won, 15–12, with neither team using a substitute. Kallenberg refereed that game—a common practice in that era—and some of the spectators took exception to some of his decisions.

The colleges formed their own rules committee in 1905, and by 1913 there were at least five sets of rules: collegiate, YMCA–Amateur Athletic Union, those used by state militia groups, and two varieties of professional rules. Teams often agreed to play under a different set for each half of a game. To establish some measure of uniformity, the colleges, Amateur Athletic Union, and YMCA formed the Joint Rules Committee in 1915. This group was renamed the National Basketball Committee (NBC) of the United States and Canada in 1936 and until 1979 served as the game's sole amateur rule-making body. In that year, however, the colleges broke away to form their own rules committee, and during the same year the National Federation of State High School Associations likewise assumed the task of establishing separate playing rules for the high schools. The National Collegiate Athletic Association (NCAA) Rules Committee for men is a 12-member board representing all three NCAA divisions. It has six members from Division I schools and three each from Divisions II and III. It has jurisdiction over colleges, junior colleges, the National Association of Intercollegiate Athletics (NAIA), and Armed Forces basketball. There is a similar body for women's play.

Growth of the game

Basketball grew steadily but slowly in popularity and importance in the United States and internationally in the first three decades after World War II. Interest in the game deepened as a result of television exposure, but with the advent of cable television, especially during the 1980s, the game's popularity exploded at all levels. Given a timely mix of spectacular players—such as Earvin (“Magic”) Johnson, Julius Erving (“Dr. J”), Larry Bird, and Michael Jordan—and the greatly increased exposure, basketball moved quickly to the forefront of the American sporting scene, alongside such traditional leaders as baseball and football. Four areas of the game developed during this period: U.S. high school and college basketball, professional basketball, women's basketball, and international basketball.

US high school and college basketball

Basketball at the high school and college levels developed from a structured, rigid game in the early days to one that is often fast-paced and high-scoring. Individual skills improved markedly, and, although basketball continued to be regarded as the ultimate team game, individualistic, one-on-one performers came to be not only accepted but used as an effective means of winning games.

In the early years games were frequently won with point totals of less than 30, and the game, from the spectator's viewpoint, was slow. Once a team acquired a modest lead, the popular tactic was to stall the game by passing the ball without trying to score, in an attempt to run out the clock. The NBC, seeing the need to discourage such slowdown tactics, instituted a number of rule changes. In 1932–33 a line was drawn at midcourt, and the offensive team was

required to advance the ball past it within 10 seconds or lose possession. Five years later, in 1937–38, the centre jump following each field goal or free throw was eliminated. Instead, the defending team was permitted to inbound the ball from the out-of-bounds line underneath the basket. Decades passed before another alteration of like magnitude was made in the college game. After experimentation, the NCAA Rules Committee installed a 45-second shot clock in 1985 (reduced to 35 seconds in 1993), restricting the time a team could control the ball before shooting, and one year later it implemented a three-point shot rule for baskets made beyond a distance of 19.75 feet (6.0 metres). In 2008 the three-point line was moved to 20.75 feet (6.3 metres) from the basket.

More noticeable alteration in the game came at both the playing and coaching levels. Stanford University's Hank Luisetti was the first to use and popularize the one-hand shot in the late 1930s. Until then the only outside attempts were two-handed push shots. In the 1950s and '60s a shooting style evolved from Luisetti's push-off one hander to a jump shot, which is released at the top of the jump. West Virginia University guard Jerry West and Purdue University's Rick Mount were two players who demonstrated the devastating effectiveness of this shot.

Nevertheless, with each passing decade, the teams with the tallest players tended to dominate. Bob Kurland (7 feet [2.13 metres]) led Oklahoma A&M to two NCAA championships in the 1940s and led the nation in scoring in 1945–46. In the same era George Mikan (6 feet 10 inches [2.08 metres]) scored more than 550 points in each of his final two seasons at DePaul University before going on to play nine professional seasons in which he scored more than 11,000 points. Mikan was an outstanding player, not only because of his size but because of his ability to shoot sweeping hook shots with both hands.

In the 1950s Bill Russell (6 feet 9 inches [2.06 metres]) led the University of San Francisco to two NCAA championships before going on to become one of the greatest centres in professional basketball history. Wilt Chamberlain (7 feet 1 inch [2.16 metres]) played at the University of Kansas before turning professional in the late 1950s and is regarded as the greatest all-around big man ever to play. It remained, however, for Lew Alcindor (later Kareem Abdul-Jabbar), also 7 feet 1 inch, to most influence the rules. After his sophomore year (1966–67) at the University of California at Los Angeles (UCLA), the dunk shot was banned from collegiate basketball, ostensibly because the rules committee felt, again, that the big men had too great an advantage. The rule was rescinded beginning with the 1976–77 season, and the dunk shot became an important part of the game, electrifying both fans and players.

So too have the small- and medium-size players affected the game's development. Bob Cousy, playing at Holy Cross College and later for the Boston Celtics, was regarded as one of the game's first great playmakers. He was among the first to use the behind-the-back pass and between-the-legs dribble as effective offensive maneuvers. Later such smaller players as Providence College's Ernie DiGregorio, the University of North Carolina's Phil Ford, and Indiana's Isiah Thomas proved the importance of their role. Between those two extremes are players such as Louisiana State University's Pete Maravich, who set an all-time collegiate scoring record of 44.5 points per game in the 1969–70

season; Magic Johnson, the point guard who led Michigan State University to a championship in 1979 and the Los Angeles Lakers to several NBA championships; Oscar Robertson, a dominating performer for the University of Cincinnati in the late 1950s and for the Milwaukee Bucks in the 1970s; Larry Bird of Indiana State University, a forward of exceptional versatility who led the Boston Celtics to several championships; and Michael Jordan, a great all-around player with the University of North Carolina in the 1980s who is widely considered the best professional player in the history of the sport.

The most identifiable phase of college basketball in America is the postseason tournament held in March—popularly known as March Madness. Interest in the NCAA tournament paralleled the growth of the game. The first basketball tournament was staged by the Amateur Athletic Union in 1897 and was won by New York City's 23rd Street YMCA, later to become a traveling professional team known as the New York Wanderers. Although the YMCA was prominently identified with the game in its early years, it did not hold its first national tournament until 1923, and that event took place until 1962. The first national tournament for colleges was held in 1937 and was conducted by an organization in Kansas City, Missouri, that later became the NAIA.

The first NCAA tournament was played in 1939, and its growth took place in three stages. The first era ran through 1964, when it was essentially a tournament for champions of various conferences. There were just eight teams in the 1939 field, and by 1963 it had been expanded to 25 teams, all champions of their respective conferences, plus several successful independent teams. The most outstanding teams of the 1940s and '50s participated in both the NCAA and NIT tournaments, but, after the gambling scandals that followed the 1950 NIT championship, a rule was passed prohibiting a team from playing in both. Afterward the NCAA tournament progressively outgrew the NIT.

Common terms used in basketball include the following

Blocking

Any illegal personal contact that impedes the progress of an opponent who does not have the ball.

Dribble

Ball movement by bouncing the ball. A dribble ends when a player touches the ball with both hands simultaneously or does not continue his dribble.

Held ball

Called when two opponents have one or two hands so firmly upon the ball that neither can gain possession without undue roughness. It also is called when a player in the frontcourt is so closely guarded that he cannot pass or try for a goal or is obviously withholding the ball from play.

Jump ball

A method of putting the ball into play. The referee tosses the ball up between two opponents who try to tap it to a teammate. The jump ball is used to begin games and, in the professional game, when the ball is possessed by two opposing players at the same time.

Pass

Throwing, batting, or rolling the ball to another player. The

main types are (1) the chest pass, in which the ball is released from a position in front of the chest, (2) the bounce pass, in which the ball is bounced on the floor to get it past a defensive opponent, (3) the roll pass on the floor, (4) the hook pass (side or overhead), and (5) the baseball pass, in which the ball is thrown a longer distance with one hand in a manner similar to a baseball throw.

Pivot

A movement in which a player with the ball steps once or more in any direction with the same foot while the other foot (pivot foot) is kept at its point of contact with the floor.

Methods

Subjects: Sixty male basketball players were randomly selected from various colleges in Meerut District, Uttar Pradesh, representing inter collegiate level tournaments as subjects for this study.

Table 1: Experimental group - 1: Training programme for plyometric with skill training group

Mon	Tue	Wed	Thu	Fri	Sat
Warm-up	Warm-up	Warm-up	Warm-up	Warm-up	Warm-up
10 minutes	10 minutes	10 minutes	10 minutes	10 minutes	10 minutes
Plyometric	Skill	Plyometric	Skill	Plyometric	Skill
drills	performance	Drills	performance	Drills	performance
	drills		drills		drills
	Overhead pass,		Overhead pass,		Overhead pass,
	under arm pass,		under arm pass,		under arm pass,
	setting, spiking		setting, spiking		setting, spiking
	and serving		and serving		and serving
Warm-down		Warm-down		Warm-down	
10 min		10 min		10 min	
	Warm down – 10		Warm down – 10		Warm down – 10
	minutes		minutes		minutes

Table 2: Experimental group – 2: Training programme for skill training group

Monday	Tue	Thu	Sat
Warm-up	Warm-up	Warm-up	Warm-up
10 minutes	10 minutes	10 minutes	10 minutes
Skill performance	Skill performance	Skill performance	Skill performance
drills	drills	drills	drills
	Overhead pass,	Overhead pass,	Overhead pass,
	Under arm pass,	Under arm pass,	Under arm pass,
	setting, spiking	setting, spiking	setting, spiking
	and serving	and serving	and serving
Warm down – 10			
minutes	minutes	minutes	minutes

Statistical analysis

A paired sample of student's t-test was used to determine the significance of the mean differences between the pre-test to post-test values of a variable in the same group. Analysis of variance (ANOVA) was used to know the significant

Protocol

The subjects were divided in to Experimental group:-1 (n=20, PLYOSKILL group) performed the plyometric and skill training, Experimental group:-2 (n=20; SKILL group) performed the Skill Training alone, Experimental group:-3 (n=20, CONTROL group) did not perform any kind of training.

Testing

The test items selected were highly standardized, appropriate and ideal for the selected variables. Jumping ability was measured by vertical jump test, anaerobic capacity was measured by using Margaria Kalaman test and playing ability was assessed by subjective rating. Test administration was done before and after 12 weeks of training regimen.

Training programme

Table 3: Significance of mean gains/losses between pre and post-test of plyometric with skill training group

Variables	Pre-test mean \pm SD	Post-test mean \pm SD	M.D.	Standard error DM	't'-ratio
Jumping ability	14.3 \pm .69	16.4 \pm .59	2.1	.18532	11.6*
Anaerobic capacity	780.9 \pm 54.12	818.2 \pm 44.2	37.3	4.89	7.6*
Playing ability	4.6 \pm .59	6.7 \pm .55	2.1	.208	10.3*

* Significant (Table value 2.093 at 0.05 level of confidence)

differences among the group. Statistical significance was accepted as $p = 0.05$ level of confidence.

Results

Table 4: Significance of mean gains/losses between pre and post-test of skill training group

Variables	Pre-test mean ± SD	Post-test mean ± SD	Standard		't'-ratio
			M.D.	Error DM	
Jumping ability	14.27± .69	15.02 ± .59	0.75	.233	3.2*
Anaerobic capacity	780.9 ± 54.1	800.2 ± 28.25	19.3	8.75	2.2
Playing ability	4.6 ± .59	6.0± .72	1.4	.222	6.2*

*Significant (Table value 2.093 at 0.05 level of confidence)

Table 5: Significance of mean gains/losses between pre and post-test of skill control group

Variables	Pre-test mean ± SD	Post-test mean ± SD	M.D.	Standard error DM	't'-ratio
Jumping ability	14.27± .67	14.22 ± .73	0.05	.080	.623
Anaerobic capacity	780.95 ± 52.9	775.80 ±49.47	-5.0	4.99	1.031
Playing ability	4.7±.656	4.75± .638	0.05	.05	1.00

Table value 2.093 at 0.05 level of confidence

Discussion

The scheduling of combined plyometric training and skill training on the development of jumping ability, anaerobic capacity and skill performance variables among male basketball players have produced significant development on jumping ability, anaerobic capacity and skill performance.

Conclusion and Recommendation

The coaches and physical education personnel may plan the training schedule for basketball players in such a way that combining of plyometric and skill training will bring better performance and therefore combining plyometric and skill training improves basketball performances.

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