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Original Research Article

To Compare Basketball Players' and Sprinters' Physical Fitness Measures Such as Body Composition, Strength and Endurance

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Abstract

Aim: A comparative study of physical fitness parameters between basketball players and sprinters.

Methods: This study was done the Department of physiology, Darbhanga Medical College, Darbhanga, Bihar, India for 6 months. 50 basketball players and 50 sprinters aged between 15 and 20 years and playing at various levels in Darbhanga bihar were selected for our study. Various physical fitness parameters were assessed in Exercise and Sports Physiology Lab. Physical and physiological parameters such as height, weight, upper segment, lower segment, arm span, body-composition, strength, and endurance were assessed.

Results: The highly significant difference between two groups for height and weight. Arm span and upper body segments were statistically significant between two groups, whereas the difference in lower segments was not significant. Only lean body mass was a statistically significant when compared between basketball players and sprinters. Bench press, bench squat, and leg dynamometry were statistically significant between two groups, whereas there was no substantial difference in back dynamometry. Endurance was highly significant for the lower body while significant in the upper body between these two groups.

Conclusion: Our study observed significant variances in the anthropometric features of sprinters and basketball players. Here in, basketball players were taller, heavier with more lean body mass than sprinters, but the experimental group was far-off behind the international standards. Equally important is the fact that the weight of a player has to be more attributing to more lean body mass and not just fat mass or fat percent.

Keywords: Physical fitness, basketball players, sprinters.

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Introduction

Success of team sports require psychological and physical wellbeing in addition to precise motor skills, tactical qualities, playing style, seasonal period, individual and team motivation [1]. Of the determinants affecting sports performance, physical fitness may be the most important [2]. Physical fitness is defended as the capacity to perform daily activity with

vitality and sharpness, without undue fatigue while being able to appreciate recreation time interests and to meet the unpredicted emergencies [3]. Fitness components related to health are body composition, cardio-respiratory fitness, flexibility, muscle strength and muscular endurance. To motor potential to carry out physical activity with regard to speed, agility, power, balance, coordination and reaction time is described by skill related physical fitness [4]. In basketball games, most important skills are dribbling, passing, and shooting [5]. These skills must be enriched with ideal anthropometric parameters, body composition, strength, endurance, and ability of the players to generate good speed and tremendous power to attain success in basketball games and sprinting. These physical and physiological parameters and skills help basketball players to engage themselves in the game by use of short sprints across the court during any game. These shorter sprints need the player to be replete with strength and endurance as of an athlete. Studies on anthropometric characteristics between basketball players and sprinters have been far less reported or studied. Hence, our study aimed to compare physical fitness parameters between basketball players and sprinters.

Material and methods

This study was done the Department of physiology, Darbhanga Medical College, Darbhanga, Bihar, India for 6 months. 50 basketball players and 50 sprinters aged between 15 and 20 years and playing at various levels in Darbhanga bihar ere selected for our study. Various physical fitness parameters were assessed in Exercise and Sports Physiology Lab. Physical and physiological parameters such as height, weight, upper segment, lower segment, arm span, body-composition, strength, and endurance were assessed.

Anthropometric Measurements

A lever system balance machine measured weight (kg) with minimum clothes [6]. A scale mounted on a wall was used to measure the standing height (cm) in a barefooted subject [6]. Arm span (cm) was measured as the distance between the tips of middle fingers of both the hands when horizontally abducted and maximally outstretched, with the subject standing back to the wall where two standard measuring tapes were fixed on a wall perpendicular to each other [6]. Lower segment (cm): The measurement from greater trochanter to the floor in a standing position with standard measuring tape was taken [6]. Upper segment (cm): The difference between total height and the lower segment was calculated as the upper segment [6]. Body Composition Skin fold caliper was used to measure the skin fold thickness (mm) at standard sites. As the tester's pinch includes the fat obtained in between the double thickness of the skin and excludes the muscle it is measure of subcutaneous fat. Percentage of body fat was calculated using Fat-o-measure' (Skin fold caliper) [7]. The fat mass (kg) was calculated from the total body weight (kg) and the lean body mass (kg) was estimated by subtracting the fat mass from the total body weight. Fat mass = Body weight × (% body fat/100).

Strength

Bench press test (1RM)

Dynamic muscular strength was measured as the weight lifted in one repetition (1RM method) on a multi-station resistance machine. After a successful lift, the weight was increased gradually until the maximum weight was lifted. The individual rested for 2–3 min in between attempts. The relative muscular strength was calculated by dividing the 1RM score by the body weight of the individual [6].

Bench squat test (1RM)

The bar was placed on the shoulders (behind the neck) of the player after adjusting the desired amount of weight by the assistants. The player first lowered to an erect sitting position on the bench with the feet at a comfortable distance apart, and a

firm grasp of the hands-on the bar and then returned to a standing position without rocking back and forth. After that, weight was added by the assistants for second trial [6]. The score was divided by his own body weight and was graded according to raw score norms for bench squat test [6].

Static Strength was assessed by leg and back dynamometer

Leg dynamometry

The player stood on the dynamometer, in such a way that the bar attached to the spring lied just above the knees and perpendicular to the horizontal line from both the knees. The player with bent knees pushes himself up from the standing position by making his knees straight till his knees were fully extended [8].

Back dynamometry

Static strength was recorded from the dynamometer readings when the player was asked to pull the bar of the dynamometer, from the spring as much far as possible with his knees straight [8].

Endurance

Push-up test assessed endurance of shoulder group of muscles and bent knee sit ups assessed endurance of abdominal muscles [6]. Descriptive statistics such mean, standard deviation was estimated. *t*-test or Mann–Whitney U-test was used. $P < 0.05$ was considered as statistically significant. Data were analyzed software SPSS v25.0.

Results

Table 1 shows highly significant difference between two groups for height and weight. Arm span and upper body segments were statistically significant between two groups, whereas the difference in lower segments was not significant. Only lean body mass was a statistically significant when compared between basketball players and sprinters [Table 2]. Bench press, bench squat, and leg dynamometry were statistically significant between two groups, whereas there was no substantial difference in back dynamometry [Table 3]. Endurance was highly significant for the lower body while significant in the upper body between these two groups [Table 4].

Table 1: Anthropometric measurements

Variables	Basketball player	Sprinters	*P*-value
	Mean±SD	Mean±SD	
Height (cm)	176.6±5.3	169.9±5.4	0.0001
Weight (kg)	61.9±8.9	54.1±5.8	0.0001
Arm span (cm)	91.1±3.1	88.06±3.8	0.01
Upper segment (cm)	73.1±7.4	64.5±6.2	0.01
Lower segment (cm)	104.6±3.5	104.4±2.7	0.7

HS: Highly significant, S: Significant, NS: Not significant. SD: Standard deviation.

Table 2: Body composition

Variables	Basketball player	Sprinters	*P*-value
	Mean±SD	Mean±SD	
Percent fat	12.6±3.3	11.7±3.8	0.4
Fat mass (kg)	7.9±3.2	6.4±2.9	0.06
Lean body mass (kg)	54.1±6.5	47.8±4.5	0.0001

Table 3: Strength

Variables	Basketball player	Sprinters	*P*-value
	Mean±SD	Mean±SD	
Bench press (Relative)	0.78±0.3	0.55±0.2	0.0001
Bench squat (Relative)	0.96±0.3	1.15±0.4	0.01
Leg dynamometry (kg)	113.6±28.6	119±26.8	0.01
Back dynamometry (kg)	107±27.5	106.8±24.9	0.6

Table 4: Endurance

Variables	Basketball player	Sprinters	*P*-value
	Mean±SD	Mean±SD	
Push-ups (no.)	28±2.7	24.7±4.7	0.01
Sit-ups (no.)	30.2±5.6	48.3±10.1	0.0001

Discussion

Our study revealed basketball players to be taller, heavier than sprinters, and this can be attributed to having more lean body mass, stronger upper body, and having more upper body endurance, while sprinters had better lower limb strength and endurance than basketball players. Several studies on basketball players individually are reported in the literature, while some of the literature shows studies of different parameters in among football, and volleyball players. Basketball players belong to advanced intermediate grades of raw scale norms[6] for bench press while sprinters belong to beginner grade. Strength for lower limbs assessed by bench squat in basketball players belonged to beginner grad, whereas sprinters belonged to advanced intermediate raw scale norms [6], according to Johnson Nelson.

In accordance with our study, basketball players and volleyball were also found to be tall than other players by Rahmawati *et al [9]*. and Kansal *et al [10]*. also found that taller players perform well because of greater height as basketball and volleyball require handling the ball above the head. Studies on Malaysian male athletes by Nudri *et al [11]*. and Turkish male athletes by Pelin *et al [12]*. reported that the height of basketball players was greater than the players of other sports groups. According to Sodhi and Siddhu [13], a standard reference of Indian athlete is 170.3 cm and Olympic athletes is 176.4 cm, the average weight of Indian athlete is 60.2 kg and that of Olympic athletes is 70.8 kg and the average percent fat of Indian athletes is 11.7%. Our players are far behind the standard references for these parameters can be used as selection criteria and train them to improvise these parameters. According to Wilmore and Costill [14], the average percent fat of basketball and volleyball players should be within the range of 6–15% which is in accordance to our study. Another study done by Kariyawasam [15] on Sri Lankan basketball and football team found that probably due to deficiencies in player training program their players receive relatively less recognition and achievements in the international arena. Similar study was done by Prafull *et al [16].*, where height, dynamic strength, muscle endurance, and flexibility and power of legs in basketball players were highly significant than controls. Another study by Kamble and Vandana [17] revealed that height, weight, and lean body mass along with strength, endurance is significantly more in sprinters than controls.

Accomplishments as squad need physical fitness along with accurate motor skills, tactical qualities, playing panache, not only as individuals but also as well as teams need inspiration [18]. Physical appropriateness thus is the most important element [19]. Physical, physiological, and psychological features of a player do make a player

successful. Physical and physiological parameters help basketball players to engage themselves in the game by use of short sprints across the court during any game. These shorter sprints need the player to be complete with strength and endurance as of an athlete.

Conclusion

Our study observed significant variances in the anthropometric features of sprinters and basketball players. Herein, basketball players were taller, heavier with more lean body mass than sprinters, but the experimental group was far-off behind the international standards. Equally important is the fact that the weight of a player has to be more attributing to more lean body mass and not just fat mass or fat percent. Games and physical activity schedule should be compulsory at various educational stages. Talent searches should be initiated at university and states. This development of strategies would help capturing the talents at very young age and then can be trained which would help improve players performance and reach a particular level.

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