

# AN APPRAISAL OF AEROBIC CAPACITY, FLEXIBILITY, AGILITY & REACTION TIME IN BASKETBALL PLAYERS & AGE MATCHED CONTROLS

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## ABSTRACT

**Introduction & background:** Successful game of basketball needs ability of the players to generate good speed, agility and tremendous power during the play of game. Skills like dribbling, shooting and passing are of utmost importance for a player at any level of play. Not merely skills but also physical and physiological characteristic of a player will contribute to the success of the player as well as of the team. Optimal performance thus requires a combination of technical and tactical abilities as well as a high degree of physical fitness. Efforts, to improve the standard of our sportsmen, have achieved an insignificant success in this respect.

**Aims & objectives:** The present study was undertaken to assess, analyze and compare aerobic capacity, flexibility, agility & reaction time in Basketball players & age matched controls. Also compare these results with national and international standards available.

**Material & method:** Parameters like aerobic capacity using bicycle ergometer and modified Astrand's nomogram, flexibility using goniometry & sit-reach test, agility using quadrant jump, burpees' squat thrust & reaction time were assessed. As we lag far behind in scientific assessment of Indian basketball players this study thus aims at their fitness and game specific skills.

There is a highly significant increase in VO<sub>2</sub> max of the basketball than the control group. The trunk flexibility was significant while the shoulder and knee flexibility was highly significant in basketball players. The agility of the basketball players was not significantly different from controls except burpee's squat thrust. The reaction time for audio-visual stimulus was significantly more in basketball players.

**Suggestion:** As there is a need to improve in all sections of the game, we should make exercise and

game mandatory at all levels of education, so that we can groom young talents if identified early into a new generation of successful Indian sportsmen.

**Keywords:**

Basketball	Solapur	Aerobic capacity
Flexibility	Agility	Reaction time

## INTRODUCTION

Successful game of basketball needs ability of the players to generate good speed, agility and tremendous power during the play of game. Skills like dribbling, shooting and passing are of utmost importance for a player at any level of play. Not merely skills but also physical and physiological characteristic of a player will contribute to the success of the player as well as of the team<sup>(1)</sup>. The performance of Indian athletes, players, sportsmen at various national and international competitions has been poor and this is of great concern especially to the coaches, physical educationists, sports scientists, doctors and researchers. Optimal performance thus requires a combination of technical and tactical abilities as well as a high degree of physical fitness. Efforts, to improve the standard of our sportsmen, have achieved an insignificant success in this respect. The performance of any player will depend upon his physical fitness<sup>(2)</sup>.

Techniques like dribbling, passing, laying up shooting, etc not only need skill but these skills should be enriched with physical and physiological determinants like anthropological measurements, body composition, strength, endurance & power of leg muscles, aerobic capacity, flexibility, agility and reaction time. All these are dependant on each other, thus using a scientific approach in learning, understanding the game and identifying lacunae in technical skills and dependant physiological parameters encouraged us to undertake this study.

## AIMS & OBJECTIVES

The present study was undertaken to assess, analyze and compare aerobic capacity, flexibility, agility and reaction time in basketball players and age matched controls. Also compare these results with national and international standards available (if any). The objectives of this study were to assess those physiological components considered important to game performance in players selected to the team. Thus parameters assessed, analyzed and compared were aerobic capacity, flexibility, agility & reaction time in Basketball players & age matched controls.

## MATERIAL & METHODS

Testing physiological parameters for basketball has become more specific over past decade with further advances in sports science, technology and general understanding. However despite the progress in testing procedures and knowledge, there still appears a limited research regarding the analysis and critical appraisal of tests used especially for basketball. Hence, the present study was carried out in thirty male basketball players playing at university level, their age ranged from 18-19 yrs with an average of 18.6yrs. Thirty age matched subjects served as control group. Parameters like aerobic capacity using bicycle ergometer and modified Astrand's nomogram<sup>(3)</sup>, flexibility using goniometry & sit-reach test, agility using quadrant jump, burpees' squat thrust & reaction time were assessed. As we lag far behind in scientific assessment of Indian basketball players this study thus aims at their fitness and game specific skills. The physical and physiological parameters were assessed in Exercise and Sports Physiology Lab in Department of Physiology, Dr.V.M.Govt. Medical College, Solapur.

The following parameters were studied:

### Proforma

- A) Cardio-respiratory fitness (aerobic capacity):  
VO<sub>2</sub> max (Bicycle Ergometer): ml/kg/min
- B) Flexibility:
- |                       |   |      |
|-----------------------|---|------|
| Trunk (sit-n-reach)   | – | cms  |
| Shoulder (Goniometry) | - | deg. |

- |                   |   |      |
|-------------------|---|------|
| Knee (Goniometry) | - | deg. |
|-------------------|---|------|
- C) Agility:
- |                       |   |     |
|-----------------------|---|-----|
| Burpee's Squat thrust | - | no. |
| Shuttle run           | - | sec |
| Quadrant jump         | - | no. |
- D) Reaction Time: (msec)
- |            |   |            |
|------------|---|------------|
| Auditory   | : |            |
| Right hand | : | Left hand: |
| Visual     | : |            |
| Right hand | : | Left hand  |

	Basketball players	Controls	P value	Sig.
	Mean ± SD	Mean ± SD		
VO <sub>2</sub> max (ml/kg/min)	45.17 ± 9.2	24.95 ± 5.5	<0.001	HS*

Table I : Aerobic capacity

\*HS= Highly significant.

	Basketball players	Controls	P value	Sig
	Mean ± SD	Mean ± SD		
Modified. sit n reach (cms)	18.4 ± 2.79	16.2 ± 2.3	< 0.005	MS*
Shoulder Goniometry (deg)	178.7 ± 3.5	174.2 ± 2.16	< 0.001	HS*
Knee Goniometry (deg)	135.5 ± 2.37	129.8 ± 7.0	< 0.001	HS*

Table II : Flexibility

	Basketball players	Controls	P value	Sig.
	Mean ± SD	Mean ± SD		
Burpee's squat (no.)	19.6 ± 2.27	17.7 ± 2.98	< 0.01	S*
Shuttle run (sec)	10.7 ± 1.87	10.5 ± 0.42	0.62	NS***
Quadrant jump	18.8 ± 2.29	19.7 ± 2.01	0.11	NS***

Table III : Agility

	Basketball players		Controls		P value	Sig
	Mean $\pm$ SD		Mean $\pm$ SD			
	Right	Left	Right	Left		
Auditory (msec)	104.1 $\pm$ 20.2	107.0 $\pm$ 24.5	136.3 $\pm$ 15.2	144.3 $\pm$ 15.8	< 0.001	HS*
Visual (msec)	111.4 $\pm$ 22.2	116.8 $\pm$ 19.6	130.6 $\pm$ 14.8	146.6 $\pm$ 13.6	< 0.001	HS*

Table IV : Reaction time:

## RESULTS

There is a highly significant increase in VO<sub>2</sub> max of the basketball than the control group.

The trunk flexibility was significant while the shoulder and knee flexibility was highly significant in basketball players.

The agility of the basketball players was not significantly different from controls except burpee's squat thrust.

The reaction time for audio-visual stimulus was significantly more in basketball players.

## DISCUSSION

The game of basketball is recreational and a competitive game. It helps promotion of health, body control, alertness, co-ordination and team spirit <sup>(4)</sup>.

Aerobic capacity holds great physiologic significance because of its dependence on functional capacity and integration of the systems required for oxygen supply, transport, delivery and utilization. Our study revealed a highly significant increase in the aerobic capacity of basketball player's than our control group. Our observations are in accordance with the earlier studies done by Tsunawake N <sup>(5)</sup>, V Selvam <sup>(6)</sup>, Reizbos <sup>(7)</sup> et al, Apostolidis <sup>(8)</sup> et al, wherein they had studied VO<sub>2</sub>max and found that the aerobic capacities differed with the different playing positions of basketball players. As our literature lacks in information regarding VO<sub>2</sub>max of Indian basketball player, this study thus has collected some data on basketball players.

Flexibility is defined as the extent or full range of movement in any joint without undue strain to the

articulation and muscles attachments <sup>(9)</sup>. Greater flexibility is mechanically advantageous as it saves energy and reduces the risk of injuries. We have seen a significant increase in the flexibility in players than the controls. These players stood at a very good score of 7th grade according to the grading and scoring for general physical fitness of National level athletes <sup>(10)</sup>. Also the players ranked a grade of advance beginner as compared to controls who scored at a beginner grade <sup>(9)</sup>.

Agility is defined as the ability of an individual to rapidly change the body position and direction in a smooth, quick & precise manner. In our study we found that the burpees' squat thrust test score of basketball players stood in the "intermediate grade" of the raw score norms <sup>(9)</sup>. This score was significantly more in basketball players as compared to controls which stood at advanced beginner's grade <sup>(9)</sup>. But the scores of the shuttle run and quadrant jump were not significant in both the groups. The groups stood at the 15th grade and intermediate grade <sup>(9)</sup> of basketball and controls respectively. Swiftiness of basketball is one of the biggest reasons for its popularity <sup>(11)</sup>. Hence, before selecting the player, agility should be tested and in the training program, different means to improve agility such as passing, receiving, dribbling, passing dribbles, lay up shooting should be included.

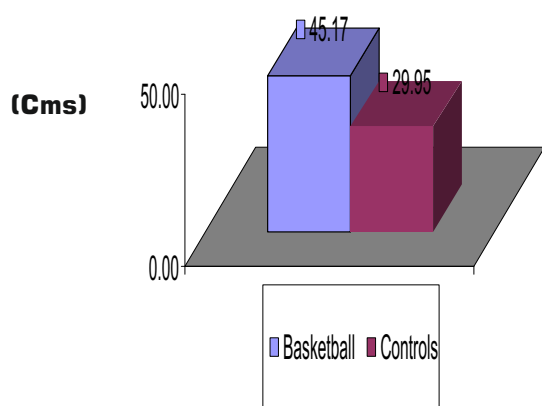
Reaction time is the time between the application of the stimulus and the response is the reaction time <sup>(11)</sup>. In our study we observed that auditory reaction time is significantly less in both the hands of basketball players than controls. Also that the visual reaction time of basketball players was significantly less in both hands than the control group. Reaction time is one of the factors of great significance in competitive games. In the selection criteria, reaction time should be assessed and training programs with different means to improve the reaction time should be included.

Summary and conclusion: Basketball players in our study group still lag far behind in different study variables flexibility and agility when compared with national players. Hence there is a need to improve the physical fitness parameters so as enhance the player's performance.

Suggestions: As there is paucity of literature on Indian basketball players, horizontal and vertical study using battery of test should be encouraged to collect and quantify data, which can be helpful players, coaches & sports doctors. We should make significant contributions to improve the performance of players to reach at an optimal level not only on the physical, but psychological, social and spiritual health of the sportsperson. Assessment & analysis should be done regularly and training schedule must be prepared accordingly. As there is a need to improve in all sections of the game, we should make exercise and game mandatory at all levels of education, so that we can groom young talents if identified early into a newer generation of successful Indian sportsmen.

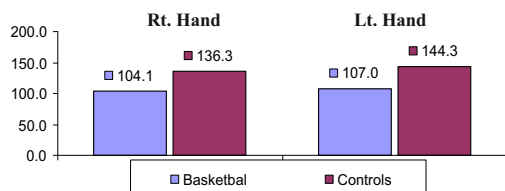
### Aerobic Capacity: VO<sub>2</sub> Max

(ml/kg/min)



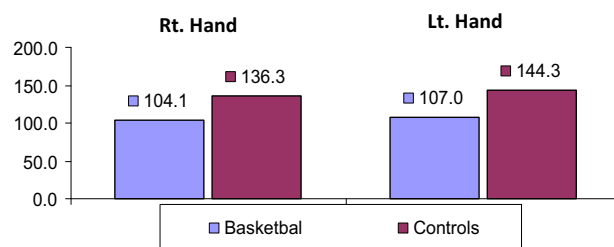
### Reaction Time: Auditory

msec



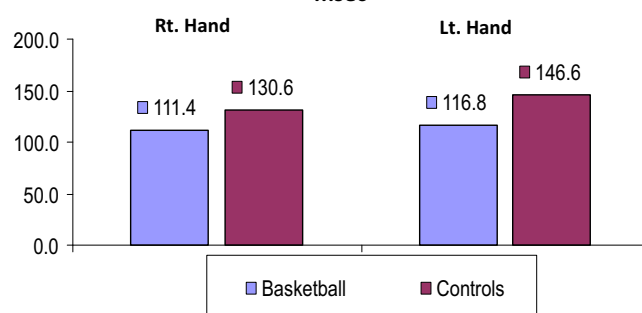
### Reaction Time: Auditory

msec



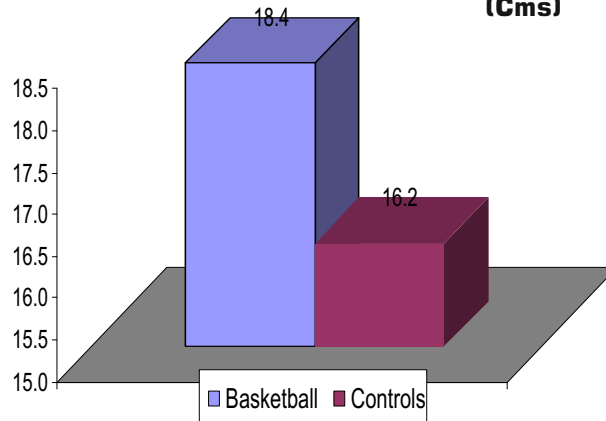
### Reaction Time: Visual

msec



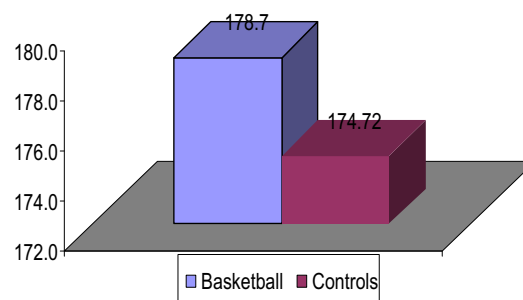
### Flexibility: Trunk (Sit and Reach)

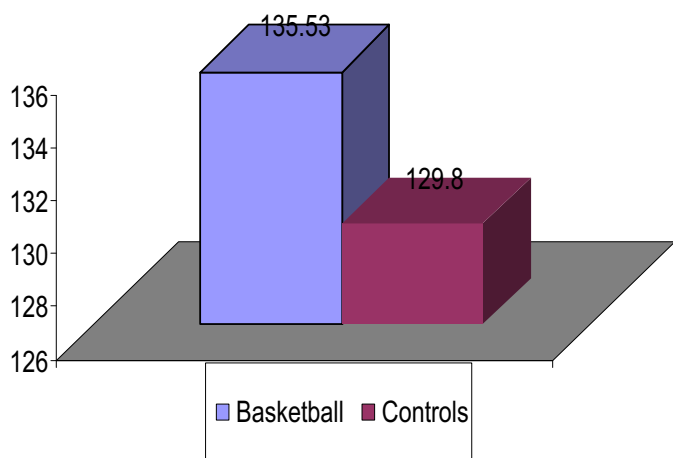
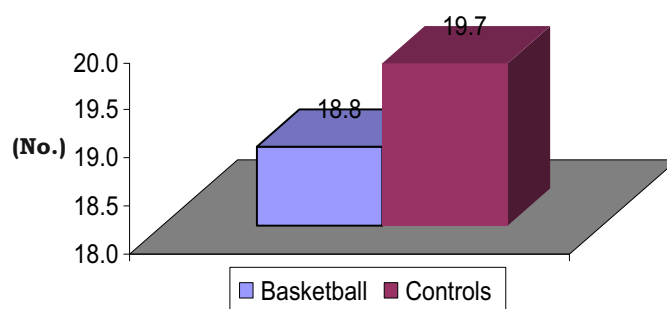
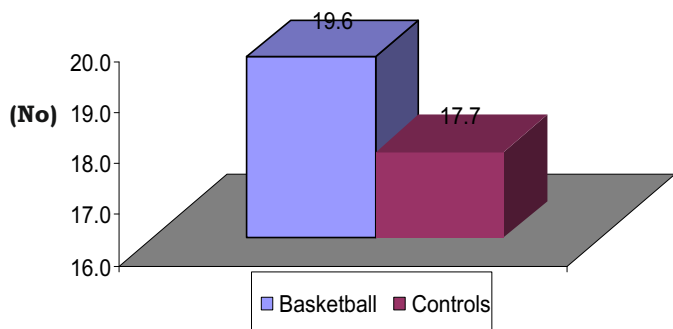
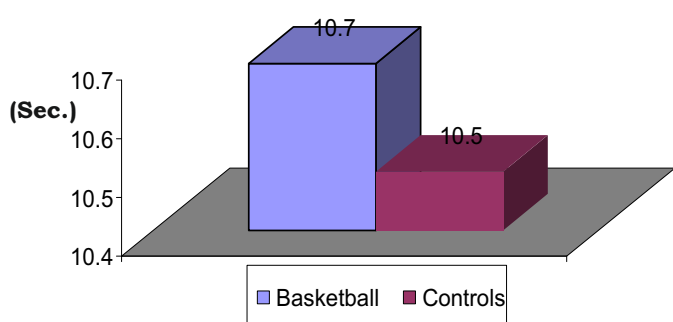
(Cms)



### Flexibility: Shoulder (Goniometry)

(Deg.)



**Flexibility: Knee (Goniometry)****(Deg.)****Agility: Quadrant Jump****Agility: Burpee squat thrust****Agility: Shuttle Run****REFERENCES**

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