

# A study of auditory reaction time in cricket, hockey and baseball players

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## Abstract

**Background:** The superior performance of today's athletes is the result of complex blend of many factors. The performance of athletes is directly related to their reaction time; hence coaches, trainers as well as players are realizing the significance of reaction time with respect to their performance. Reaction time varies with many factors like age, sex, practice, etc. Reaction time may vary with type of sport played as well. **Aims and objectives:** To determine the Auditory Reaction Time, Visual Reaction Time and Whole body Reaction Time in Cricket, Hockey and Baseball Players. **Materials and Methods:** The present included 180 Players (60 hockey, 60 cricket and 60 baseball players) aged between 15 to 25 years playing at university or district level and still practicing for their respective game. The control group consisted of 60 age and sex matched male students which included college students, interns and residents from the same area. Subjects were informed about the procedure to find reaction time. Each subject's detailed history was taken, along with it clinical examination was done. Reaction time was recorded preferably after warm-up exercise in the morning session. Audio-visual Reaction Time Apparatus was used for determination of auditory as well as visual reaction time. The device also includes a built-in digital chronoscope with its display on the side of examiner, which records and displays reaction time in milliseconds. **Results:** In the present study, auditory reaction time recordings for tone using right hand was minimum among Baseball players ( $108.91 \pm 9.35$  msec) followed by Hockey players ( $121.73 \pm 19.43$  msec) and Cricket players ( $123.96 \pm 11.49$  msec). The auditory reaction for tone using right hand among control was  $134.43 \pm 21.39$  msec. Also, when click was presented to the subjects and auditory reaction time of right hand was recorded among Hockey players was  $123.35 \pm 16.36$  msec, among Cricket players was  $124.66 \pm 13.19$  msec, among Baseball players was  $108.20 \pm 8.82$  msec and among Controls was  $133.00 \pm 17.45$  msec. When tone stimulus was presented to left hand auditory reaction time recordings it was least in baseball players ( $111.75 \pm 11.48$  msec) followed by was seen in Cricket players ( $125.30 \pm 11.67$  msec) and Hockey players ( $126.01 \pm 20.77$  msec) while it was maximum among Controls group ( $137.20 \pm 21.29$  msec). And, when the auditory stimulus of click was presented to left hand reaction time recordings among the Hockey players was  $124.63 \pm 17.68$  msec, among the Cricket players was  $123.81 \pm 10.76$  msec, among the Baseball players was  $114.63 \pm 10.10$  msec and among Controls was  $136.21 \pm 18.62$  msec. **Conclusion:** Auditory Reaction Time for tone and click was found to be statistically significant between, Hockey and Baseball players, Cricket and Baseball players, except for between Hockey and Cricket players. Also, values for all the players were found to be statistically significant when compared with controls.

**Key words:** Auditory Reaction Time, tone, click, athletes.

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## INTRODUCTION

The superior performance of today's athletes is the result of complex blend of many factors. These factors include genetic endowment, physiology, biomechanics, training, health status and experience. Champion athletes, depending on their sports vary considerably in their physiological attributes. It is therefore necessary to gain an understanding of the essential performance characteristics important to a specific sport in order to develop optimal training strategies for the athlete. Speed of movement and quick reactions are prized qualities in sports. In any type of sport quick reactions in the field are most important requirements for the success of the players. Both offensive

and defensive players need to react and move as fast as possible to overcome their opponents and peers. Reaction time is one of the factors of great significance in competitive sports, especially in team games.<sup>1,2</sup> Thus, performance of athletes is directly related to their reaction time, hence coaches, trainers as well as players are realizing the significance of reaction time with respect to their performance. Reaction time varies with many factors like age, sex, practice, etc. Reaction time may vary with type of sport played as well. The reaction time is an indirect index of the processing capability of central nervous system and also a simple means of determining sensory and motor performances. To give response to a stimulus is the basic property of any living organism. This property depends upon various physical, psychological and environmental factors. The simple way to examine this is by noting the reaction time, i.e. the interval of time between the presentation of the stimulus and the initiation of the response.<sup>1,2</sup> Sensory neurons convert a stimulus into an electrochemical signal, which flows through the length of the sensory neurons, then through a neuron or neurons of the Central nervous system, and then through the length of the motor neurons. Generally, motor neurons will cause a muscle to contract.<sup>3</sup> Hockey is a unique sport that combines speed, physical contact and skills to create exciting competition that rivals few others. The game is played at a very high speed and involves quick decisions by the players.<sup>4</sup> Similarly, in cricket the players have to exhibit speed and quick decision making during various skills like batting, bowling and fielding. Thus in high speed ball games like cricket, baseball and hockey reaction time is very important because these games are characterized by perceptual uncertainties and time constraints that require a performer to process visual information and react in fraction of seconds. The reaction time is often overlooked and usually under-estimated element in the selection of athletes for different sports. In games, in which movement's of a participant are conditioned by signals, by movements of opponents, or by motion of the ball, reaction time is of great importance. A sprinter who can start faster than other contestants; a baseball catcher who can react faster to the change in the direction of the motion of the ball; a ping pong player who is always in the right place at the right time-all have a definite advantage over slower reacting men.<sup>5</sup>

The present study was conducted to study the Auditory Reaction Time in Cricket, Hockey and Baseball Players.

## **MATERIALS AND METHODS**

The present study was conducted in the sports physiology laboratory of department of physiology of the tertiary care institute.

The study included 180 Players (60 hockey, 60 cricket and 60 baseball players) aged between 15 to 25

years playing at university or district level and still practicing for their respective game. This constituted the study group.

The control group consisted of 60 age and sex matched male students which included college students, interns and residents from the same area. The subjects and controls were divided in different groups,

- **Group I**-Hockey players
- **Group II**-Cricket players
- **Group III**-Baseball players
- **Group IV**- Control.

The subjects and controls were informed about the nature of the study and written consent was obtained. The clearance of ethical committee was obtained.

Following inclusion and exclusion criteria was used to select the study subject and controls.

### **Inclusion criteria for group I, II and III**

- Those who have represented at university or district level in their respective games.
- Those still practicing regularly at least 5 days a week, for last three years.

### **Exclusion criteria for group I, II and III**

- Those players who were not practicing regularly.
- Those players who were injured during practice or during matches were excluded from the study. Minor injuries included sprains and strains and major injuries included recurrent shoulder dislocation, fracture ankle joint, fracture patella, ligament injuries etc.
- Players with major respiratory illness or cardiovascular illness in past.
- Those players having problems with hearing or vision.
- Those players having problems regarding CNS (Central Nervous System).
- Those players having history of smoking or alcoholism.

### **Exclusion criteria for group IV**

- Those undertaking any game regularly.
- Those doing regular exercise.
- Those performing regular yogic practices.
- Those having history of smoking and alcoholism.
- Those having diminished hearing or vision.
- Those players having problems regarding CNS (Central Nervous System).

## **METHODOLOGY**

Subjects were informed about the procedure to find reaction time. Each subject's detailed history was taken, along with it clinical examination was done. Reaction time was recorded preferably after warm-up exercise in the morning session. Audio-visual Reaction Time Apparatus

was used for determination of auditory as well as visual reaction time. The device also includes a built in digital chronoscope with its display on the side of examiner, which records and displays reaction time in milliseconds.

The auditory Reaction Time was recorded by Audio-Visual reaction time apparatus. Auditory reaction time was the time taken by an individual to react to an auditory stimulus. Subject was informed about the

procedure. After that subject was given practice and then three readings were noted. Readings for both hands right and left are taken, by changing the settings on instrument to right hand selection key and left hand selection key. Reaction times for two different types of auditory stimuli (Auditory stimulus beep and Auditory stimulus click) were taken.

**RESULTS**

**Table 1: Auditory reaction time - right hand**

Parameter	Group	Mean±SD	Comparison	T value	P value	S/NS*
TONE	I-Hockey Players	121.73±19.43	I and II	0.758	>0.05	NS
			I and III	4.56	<0.05	S
			I and IV	3.37	<0.05	S
	II-Cricket Players	123.96±11.49	II and III	7.80	<0.05	S
			II and IV	3.31	<0.05	S
	III-Baseball Players	108.91±9.35	III and IV	8.39	<0.05	S
	IV-Control	134.43±21.39				
	CLICK	I-Hockey Players	123.35±16.36	I and II	0.478	>0.05
I and III				6.26	<0.05	S
I and IV				3.09	<0.05	S
II-Cricket Players		124.66±13.19	II and III	7.96	<0.05	S
			II and IV	2.92	<0.05	S
III-Baseball Players		108.2±8.82	III and IV	9.74	<0.05	S
IV-Control		133±17.45				

\* S=significant NS=non- significant

In the present study, auditory reaction time recordings for tone using right hand was minimum among Baseball players (108.91 ± 9.35 msec) followed by Hockey players (121.73 ± 19.43 msec) and Cricket players (123.96 ± 11.49 msec). The auditory reaction for tone using right hand among control was 134.43 ± 21.39 msec. Also, when click was presented to the subjects and auditory reaction time of right hand was recorded among Hockey players was 123.35 ± 16.36 msec, among Cricket players was 124.66 ± 13.19 msec, among Baseball players was 108.20 ± 8.82 msec and among Controls was 133.00 ± 17.45 msec.

**Table 2: Auditory reaction time-left hand**

Parameter	Group	Mean±SD	Comparison	T value	P value	S/NS*
TONE	I-Hockey players	126.01±20.77	I and II	0.228	>0.05	NS
			I and III	4.61	<0.05	S
			I and IV	2.88	<0.05	S
	II-Cricket players	125.3±11.67	II and III	6.35	<0.05	S
			II and IV	3.76	<0.05	S
	III-Baseball players	111.75±11.48	III and IV	8.08	<0.05	S
	IV-Control	137.2±21.29				
	CLICK	I-Hockey players	124.63±17.68	I and II	0.304	>0.05
I and III				3.77	<0.05	S
I and IV				3.46	<0.05	S
II-Cricket players		123.81±10.76	II and III	4.77	<0.05	S
			II and IV	4.42	<0.05	S
III-Baseball players		114.63±10.10	III and IV	7.82	<0.05	S
IV-Control		136.21±18.62				

\*S=significant NS=non- significant

When tone stimulus was presented to left hand auditory reaction time recordings it was least in baseball players

(111.75 ± 11.48 msec) followed by was seen in Cricket players (125.30 ± 11.67 msec) and Hockey players (126.01

$\pm 20.77$  msec) while it was maximum among Controls group ( $137.20 \pm 21.29$  msec). And, when the auditory stimulus of click was presented to left hand reaction time recordings among the Hockey players was  $124.63 \pm 17.68$  msec, among the Cricket players was  $123.81 \pm 10.76$  msec, among the Baseball players was  $114.63 \pm 10.10$  msec and among Controls was  $136.21 \pm 18.62$  msec.

Auditory reaction time for tone and click with right hand and left hand was found to be statistically significant between, Hockey and Baseball players, Cricket and Baseball players, except for between Hockey and Cricket players. Also, values for all the players were found to be statistically significant when compared with controls.

## DISCUSSION

The present study was conducted with the aim to study the Auditory Reaction Time in Cricket, Hockey and Baseball Players.

In the present study, auditory reaction time recordings for tone using right hand were as follows,

Hockey players:  $121.73 \pm 19.43$  msec  
 Cricket players:  $123.96 \pm 11.49$  msec  
 Baseball players:  $108.91 \pm 9.35$  msec  
 Controls:  $134.43 \pm 21.39$  msec

Similarly, when tone stimulus was presented to left hand auditory reaction time recordings were as follows,

Hockey players:  $126.01 \pm 20.77$  msec  
 Cricket players:  $125.30 \pm 11.67$  msec  
 Baseball players:  $111.75 \pm 11.48$  msec  
 Controls:  $137.20 \pm 21.29$  msec

Also, when click was presented to the subjects and auditory reaction time of right hand was recorded as follows,

Hockey players:  $123.35 \pm 16.36$  msec  
 Cricket players:  $124.66 \pm 13.19$  msec  
 Baseball players:  $108.20 \pm 8.82$  msec  
 Controls:  $133.00 \pm 17.45$  msec

And, when the auditory stimulus of click was presented to left hand reaction time recordings were,

Hockey players:  $124.63 \pm 17.68$  msec  
 Cricket players:  $123.81 \pm 10.76$  msec  
 Baseball players:  $114.63 \pm 10.10$  msec  
 Controls:  $136.21 \pm 18.62$  msec

Thus, it was found that auditory reaction time for both types of auditory stimuli using right hand as well as left hand is significantly less when players of any of the game are compared with the controls. When players of two different sports were compared it was found that Baseball players had significantly better reaction time than the hockey players and cricket players, however there was no

statistically significant difference between hockey players and cricket players. Ajay M. Gavkare *et al*<sup>6</sup> conducted a study to find the relation of reaction time to motor skill performance in sports. The values of auditory reaction time were found to be significantly less in athletes as compared to healthy controls. Prafull Kamble *et al*<sup>7</sup> the study was carried out in thirty male basketball players. Thirty age matched subjects served as control group. They found that auditory reaction time is significantly less in both the hands of basketball players than controls. Also, the visual reaction time of basketball players was significantly less in both the hands than the control group. Omer Senel *et al*<sup>8</sup> performed a study on elite soccer players. A total of 104 elite soccer players participated in the study. They found significant differences between the auditory and visual reaction times of both the right and left hands ( $p < 0.01$ ). There were no significant correlations between the reaction time and speed of the subjects. Moreover, there was a statistically significant positive correlation between the auditory and visual reaction times ( $p < 0.01$ ). Anil R Waghmare *et al*<sup>9</sup> Studied reaction time in 30 male handball players and their age and sex matched controls. Auditory reaction time of subjects was 125.6 m.sec and 131.8 m.sec for right hand and left hand respectively and for controls it was 136.02 m.sec and 144.32 m.sec in right hand and left hand respectively. It is clear that auditory reaction time is significantly less in both hands of subjects than controls. 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.<sup>7</sup> As there is paucity of literature in Indian players, horizontal and vertical study using battery of test should be encouraged to collect and quantify data, which can be helpful to players, coaches and sports doctors. Assessment and 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.<sup>7</sup> There is improvement in reaction in those performing regular aerobic exercise.<sup>10</sup>

## CONCLUSION

Auditory Reaction Time for tone and click was found to be statistically significant between, Hockey and Baseball players, Cricket and Baseball players, except for between Hockey and Cricket players. Also, values for all the players were found to be statistically significant when compared with controls.

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