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Research article

AN APPRAISAL OF REACTION TIME IN ELITE SPRINTERS AND ITS COMPARISON WITH AGE-MATCHED CONTROLS

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ABSTRACT

Aim: Our study aimed to quantify sprinter's reaction time and compared it with age-matched controls. **Material methods**: Database of 30 male sprinters and age-matched controls for reaction time (auditory, visual and whole body reaction time) was compiled. Sprinters included those who had participated in different state and national athletic meets. After compilation of this data, it was statistically analyzed using unpaired T-test. **Results**: Our study indicated a highly significant (P value < 0.001) relationship in auditory and visual reaction time between athletes and controls. Our study also revealed that athletes reacted and responded quickly than controls. Whole body reaction time for front and back were highly significant (P value <0.001). Reaction time for right side was significant (P value <0.01), whereas whole body reaction time did not differ on left side in these two groups. **Conclusion**: Considering the findings of this study, the results suggest that sprinters reacting abilities are faster and quicker than controls, which definitely affects sprint performance. The above finding is of great interest for coaches and athletes in sports involving reacting skills.

Key Words: Sprinters, Audio-Visual reaction time, Whole body reaction time, Solapur.

INTRODUCTION

Sprints- Short distance running, sprints include 100m, 200m, and 400m running races in track and field competition. Although the running distances vary, upper limit is usually 400m[1]. Ward and Watts defined sprinting as "running at or close to maximum speed". It is said that sprinters are born and not made. The shortest common outdoor running distance is 100m. It is one of the most popular and prestigious events in the sport of athletics[2]. It has been contested at the summer Olympics since 1896 (1928 for women). The reigning 100m Olympic champion is often named as "the fastest man/woman in the world". The current men's world record of 9.58 s is held by Usain Bolt of Jamaica, set at the 2009 World Athletics Championships final on 16 august 2009. Runners begin in the starting blocks and race begins when an official fires the starter's pistol. Sprinters typically reach the top speed somewhere after between 50-60m. Their speed then slows down towards the finish line. The most important parameters required to be a world class sprinter are quick reaction time, speed,

agility, power, etc. Especially for 100m sprint, one of the most important parameter to be considered for success in the race is reaction time. Reaction time refers to how long it takes you to react to a stimulus or reaction time is an elapsed time between the presentation of sensory stimulus and subsequent behavioral response[3]. It is considered to an index to the speed of processing. The behavioral response is typical to a button press but it can also be eye movement, local response or some observable behavior. For e.g. how far the sprinter gets off the blocks and reacts to a gun. In case of football or basket ball player, it is a lot easier to look good and carry out their skills but a little more difficult when you have to react and do it in fractions of a second as in case of sprints.

Aims and objectives: The present study was undertaken to access, analyze and compare auditory, visual and whole body reaction time in sprinters and age matched controls and to compare these results with national and international standards available from the literature.

MATERIAL AND METHODS

The present study was carried out in thirty (30) male sprinters who were selected and playing for university and state level. Their age ranged from 16-20 yrs with an average of 17.2yrs. All the players who were practicing for 2-3hrs for 5days a week since 3 to 4 years were included in our study. Subjects excluded from the study were those who were not regularly practicing, who had a past history of major respiratory or cardiovascular disease or who were injured. Thirty (30) age matched subjects served as control group. Ethical committee clearance was taken. Informed consent was also taken from the subjects. Reaction time parameters were assessed in Exercise and Sports Physiology Lab in Department of Physiology, Dr.V.M.Govt.Medical College, Solapur.

Proforma

Reaction Time: (msec)

1. Auditory: Right hand: Left hand:
2. Visual: Right hand: Left hand:
3. Whole body reaction time:
   Right: Left:
   Front: Back:

Reaction time:

1. **Auditory reaction time:** It was measured using a device which had stimulus box and a switch which the subject is suppose to press in response to the tone stimuli. Chronoscope measured the time interval in milliseconds between the appearance of stimulus and response[3].
2. **Visual reaction time:** It was measured with stimulus box and a switch which the subject is supposed to press in response to the green light stimuli. Chronoscope measured the time interval in milliseconds between the appearance of stimulus and response. The player was asked to place his hands on the box in such a way that his thumbs rested on the response buttons. He was asked to respond to a given stimuli (tone and green light) as quickly as possible. The time required for the response was noted down. The best of three trials was noted down[3].
3. **Whole body reaction time:** Here we assessed the player's reaction time as a whole to given stimulus. The apparatus for whole body reaction time comprises of a stimulus box, standing box, stepping box and a stimulator box. The player was asked to stand on the standing box while the stimulus box was placed at an eye level of the player. The four stepping boxes were placed on four sides of the player i.e. right, left, front and back. An arrow was blinked on the stimulus box. After seeing the arrow, the player stepped on the stepping box of that side as quickly as possible. The time interval between the initiation of response and end of response (stepping box) were recorded using chronoscope. Two chronoscopes were used; one starting at the appearance of the stimulus and stopping at the initiation of response and the other

chronoscope stopping at the end of the response. From this we found out the reaction time, movement time and the response time[3].

Time taken between the stimulus and the initiation of response is called as the reaction time. Time interval between the initiation of response and the end of the response is called as movement time. Hence the total time required for the appearance of the stimulus and of the response is called as response time[4].

Stastical anaylysis: After compilation of the data, it was statistically analyzed using unpaired T-test.

RESULTS

Table.1: Audio-Visual Reaction Time

	Athletes		Controls		P value
	Right	Left	Right	Left	
Auditory (msecs)	98.4±6.9	106.4±9.5	135.4±4.4	143±15	P< 0.001***
Visual (msecs)	99.7±8.5	107.3±9.9	130 ±15.1	144±15.1	P< 0.001***

* Not Significant; **Significant; ***Highly Significant

Table. 2: Whole body Reaction Time

		Reaction Time	Movement Time	Response Time	P value
Right (secs)	Athletes	0.4 ± 0.08	0.3 ± 0.14	0.7 ± 0.17	P< 0.01**
	Controls	0.4 ± 0.06	0.4 ± 0.12	0.8 ± 0.10	
Left (secs)	Athletes	0.4 ± 0.08	0.3 ± 0.10	0.7 ± 0.13	P> 0.1*
	Controls	0.4 ± 0.08	0.4 ± 0.10	0.8 ± 0.11	
Front (secs)	Athletes	0.4 ± 0.08	0.3 ± 0.13	0.7 ± 0.14	P< 0.001***
	Controls	0.4 ± 0.06	0.45 ± 0.10	0.9 ± 0.09	
Back (secs)	Athletes	0.5 ± 0.11	0.3 ± 0.13	0.8 ± 0.15	P< 0.001***
	Controls	0.5 ± 0.05	0.4 ± 0.12	0.9 ± 0.11	

*NS-Not Significant; **-Significant; ***HS-Highly Significant

DISCUSSION

In our study the reaction time in athletes for auditory stimulus was 98.4 msec and 106.4 msec for right and left hand respectively, while controls had longer reaction time of 135.4 msec and 143.9 msec. Thus it is evident that the auditory reaction time was highly significant in athletes. The visual reaction time in athletes was 99.7 msec and 107.3 msec while the values in controls were 130 msec and 145 msec for right and left hand respectively. These were again highly significantly lower in athletes than the controls.

Whole body reaction time is more complicated to measure because of timing devices that has been used. Whole body reaction time was significantly lower in right and was not significant in left direction but were highly significant in front and back directions in comparison with controls.

Our study is in complete accordance with Mero A, Komi PV, Gregor RJ[5] who assessed

biomechanics of sprint running and showed that a good athlete have a short reaction time . Brisswalter J[6] investigated the influence of physical fitness and energy expenditure on a simple reaction time and gave the conclusion that significant effect of physical fitness on cognitive performance or simple reaction time is present during the exercise. The shorter reaction time of athletes in our study must be the added effect of running itself, which is one of the best exercises for improvement of physical fitness[7].Collet C[8] investigated the sprinters reaction time for starters shot and concluded that reaction time is a skill dependent upon experience and learning and is associated with race length. Hence shorter the race less is the reaction time.

CONCLUSION

Athletes reacted & responded quickly than controls. Whole body reaction time for front and back was highly significant whereas for right direction it was significant. Whole body reaction time did not differ in left side in these two groups. Athletes also had shorter audio-visual reaction time than controls. There was highly significant difference between reaction time of two groups.

A typical reaction time is around 0.2 to 0.3 secs. Auditory reaction time is generally 2-5 hundredth of a sec faster[9]. People with turtle-like reflexes may have reaction time closer to 0.4sec, but a world class sprinter can have reaction time closer to 0.1 sec. Anything less than 0.2 sec is considered excellent. Unfortunately reaction time is highly genetic but can be improved till 10-20% by over-speed training[10]. Considering the findings of this study, the results suggest that sprinters reacting abilities are faster and quicker than controls, which definitely affects sprint performance. The above finding is of great interest for coaches and athletes in sports involving reacting skills. Stimulants like caffeine, acetyl-l-carnitine and l-tyrosine can also be helpful. Stimulants enhance speed of perception and mental processes. These stimulants have positive stimulatory impact on reaction time. Increased arousal also naturally boosts reaction time.

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