

MASTERS VERSUS MEDIOCRE: A CROSS SECTIONAL STUDY OF COMPARISON OF VISUAL AND AUDITORY REACTION TIME BETWEEN ELITE ADULT MALE ATHLETES AND HEALTHY, RECREATIONALLY ACTIVE ADULT MALES**Dr. Vivekanand Upadhyay¹, Dr. Nidhi Singh^{*2}, Dr. Anup Krishnan³, Dr. Puja Dudeja⁴ and Dr. Shraddha Raj⁵**¹MBBS, DSM, PhD, Sports Medicine Specialist, AFSMC Pune.²*MBBS, MD (Physiology), AFSMC Pune.³MBBS, DSM, PhD, Sports Medicine Specialist, MH Dehradun.⁴MBBS, MD (Community Medicine), PhD, Professor Community Medicine, AFMC Pune.⁵MBBS, MD, DNB, Assistant Professor, RCC, IGIMS, Patna.***Corresponding Author: Dr. Nidhi Singh**

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ABSTRACT

Introduction: Reaction time is an important motor quality which finds its use in many sports. It is particularly important in sports which require a quick start like swimming, athletics or quick response to game conditions as in boxing and kabaddi. **Aim:** The present study aims to find out auditory and visual reaction time of elite athletes of different sports and compare it with control. **Materials and methods:** 95 elite athletes were categorized as per their sports. Auditory and visual reaction timings were recorded using audio – visual reaction timer following standard protocols and compared with 56 healthy controls. **Results:** While the control group showed visual reaction time of (0.605 ± 0.157s) and auditory reaction time of (0.806 ± 0.392s), the studied players had better visual (0.506 ± 0.141s) (p<0.005) and auditory (0.710 ± 0.289s) (p<0.005) reaction timing. The visual reaction timings of Volleyball was(0.546 ± 0.135s) (p<0.05), Swimming (0.446 ± 0.121s) (p<0.005), Weight lifting (0.518 ± 0.102s) (p<0.05), Boxing (0.509 ± 0.092s) (p<0.05), Athletics (0.483 ± 0.134s) (p<0.005), Kayak & Canoe (0.485 ± 0.115s) (p<0.005), Kabaddi (0.636 ± 0.197s) (p>0.05) and Handball (0.452 ± 0.105s) (p<0.005) while auditory reaction timings of Volleyball was(0.708 ± 0.245) (p>0.05), Swimming (0.641 ± 0.230s) (p<0.05), Weight lifting (0.831 ± 0.440) (p>0.05), Boxing (0.698 ± 0.280) (p>0.05), Athletics (0.640 ± 0.222) (p<0.005), Kayak & Canoe (0.691 ± 0.261) (p<0.05), Kabaddi (0.871 ± 0.373) (p>0.05) and Handball (0.818 ± 0.362s) (p>0.05). **Conclusion:** Elite players have better reaction time than control. While athletes, swimmers and Kayak & Canoe apportsmen have better auditory reaction time, all elite players had better visual reaction time than control. Knowledge of reaction time is an important tool in talent identification as well as in differentiating the master from the mediocre.

KEYWORDS: Reaction time is an important Kabaddi apportsmen master from the mediocre.**INTRODUCTION**

Reaction Time(RT), also known as Perceptual Latency, is defined as the time interval between the application of a stimulus and the production of response of the individual towards it(Magill 1998). The stimuli applied may be visual, auditory, pain, touch or temperature and accordingly the response can be measured (Niruba 2011). Reaction time is divided into 03 parts viz. Perception time i.e the time interval between application of the stimulus and its perception, Decision time i.e the time for processing the information by the CNS and planning a response and finally the Motor time i.e the time for the actual response to the stimulus(Tripo, 1965). Since RT depends on the rate of signal transmission and synaptic and neuronal processing it can be considered as an indirect index to assess the processing ability of the

CNS(Parker, 2013). Audio or Visual Reaction Time is the time elapsed between application of an auditory/visual stimulus and the subsequent response to it. While in auditory RT the stimulus is in the form of different tones of sound, in the visual RT it is in the form of different colour LEDs displays.

RT is affected by many physiological factors including age, sex, nutrition, physical fitness, training, stress, left v/s right handedness, exercise, arousal, fatigue(Bamne et al., 2011) as well as the characteristic of the stimulus in terms of its strength, duration and intensity.

RT is a vital factor for decision making skills in day to day life. However, it is extremely crucial in certain occupations like Drivers, Pilots, Military personals,

Security guards and Sports personnel. It has been found that athletes tend to have a faster RT than non-athletes (Moka et al., 1992) and there are variations in RT in different sports per se (Moka et al., 1992).

Various studies have been made abroad to find RT in sportsmen of different games e.g. Soccer, basketball, Cycle, Swimming etc. but a single consolidated study covering elite athletes of multiple games and their comparison with controls has not been done so far as Indian population is concerned. Hence the need for the work undertaken.

MATERIALS AND METHOD

Place and duration

The study was conducted at a specialized Sports Medicine Centre in North India between 2012 and 2015.

Sample

The study was conducted on 95 elite athletes who were categorized in various groups according to their respective sports and 56 healthy controls. The participants of the two groups were matched for age. Post hoc power was calculated and was found to be more

than 80%. Ethical clearance was obtained and informed consent was taken from participants.

Study group

The study group consisted of 95 elite male athletes who were training for national level championships at an elite sports training centre in northern India. The players were currently actively training with an average training of at least 20 hrs/wk for the past 04 weeks and were in the preparatory phase of their training cycle, with no player having any forthcoming tournament within the next 60 days. The age ranged from 18 to 33 years (24.32 ± 2.16 years). The game distribution of the players is given as per Fig 1.

Control

56 college students who had volunteered for the study were selected to be control groups. Their age ranged from 19 to 26 years (22.62 ± 2.25 years) ($p > 0.05$). No one from the control group had ever participated in or had trained for any sports competition beyond school/ college level. All participants claimed to be recreationally active with at least 6 hrs/wk of self paced recreational physical activity.

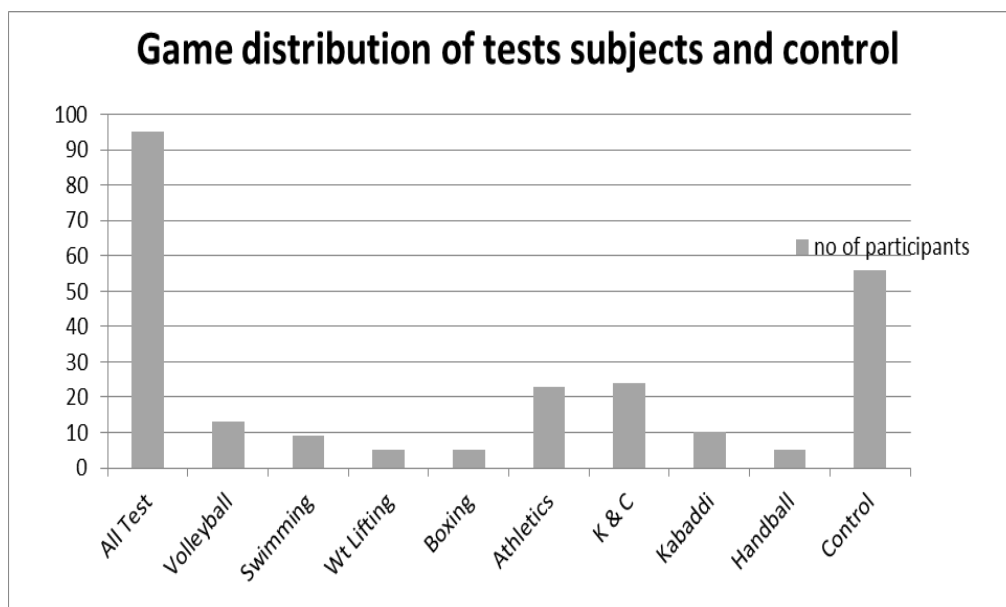


Fig. 1: Game wise distribution of Test subjects and control.

Inclusion and exclusion criteria

All the subjects were physically fit, non-alcoholic, non-diabetic with normal visual and hearing acuity, no clinical evidence of any CNS/ CVS disease with perfect sense of physical, mental and psychological wellbeing. They were not on any medications/ placebo treatment and were not having any pathology or injury to the upper limb. Both the test group and the control group did not suffer from any mental/psychological disorders/clinical evidence of peripheral neuropathy/muscle weakness/neuro vascular complication/motor neuron disease.

Equipment used

The study was conducted on "Audio Visual Reaction Time apparatus" by Medisystems. It works on the Malathi and Parulekar principle and uses piezo electric crystal is used for high accuracy of recorded time. It consists of 2 panels, one facing the subject and the other facing the examiner. The subject panel consists of different lights and their respective buttons, the panel facing the examiner consists of digital timer, selection knob and on-off button. It has 2 modes of providing the stimulus – audio stimulus (04 different tones in sound) and visual stimulus (04 different colours LEDs). It had a resolution of 0.001sec. RT was recorded for both auditory and visual stimuli. As soon as the stimuli was

perceived by the subject he responded by pressing the response switch with index finger of the dominant hand. The display indicated the RT in seconds up to 3 decimal places.

Study protocol

Ethical clearance for the study was obtained. The subjects were explained the procedure of the test in detail and written informed consent was taken from them. The test was done in quiet and comfortable surroundings at room temperature, which ranged between 22 – 26°C. All tests were done in morning between 09:00 to 11:00 hrs.

The subjects were given 10 trials for practice and after that 03 recordings for each parameter were noted. The

average of these was taken as the RT and recorded in subject's profile. Same procedure was followed for all the subjects.

RESULT

The results obtained were tabulated and subjected to statistical analysis using student 't' test with respect to the control group. A p value of 0.05 or less was considered as significant while that of <0.005 was considered highly significant. Visual RT was lower than Auditory RT for all the tested subjects. Players were found to have a significantly lower auditory ($p < 0.005$) as well as visual ($p < 0.005$) RT than the control group.

The results obtained have been summarized in table 1.

Table 1: Comparison of Visual and Auditory reaction time between athletes and non athletes.

	n	Visual Reaction Time (s)	p	Auditory Reaction Time (s)	p
Control	56	0.605 ± 0.157		0.806 ± 0.392	
All Test	95	0.506 ± 0.141	<0.005	0.710 ± 0.289	<0.005
Volleyball	13	0.546 ± 0.135	<0.05	0.708 ± 0.245	>0.05
Swimming	09	0.446 ± 0.121	<0.005	0.641 ± 0.230	<0.05
Wt Lifting	05	0.518 ± 0.102	<0.05	0.831 ± 0.440	>0.05
Boxing	05	0.509 ± 0.092	<0.05	0.698 ± 0.280	>0.05
Athletics	23	0.483 ± 0.134	<0.005	0.640 ± 0.222	<0.005
K & C	24	0.485 ± 0.115	<0.005	0.691 ± 0.261	<0.05
Kabaddi	10	0.636 ± 0.197	>0.05	0.871 ± 0.373	>0.05
Handball	05	0.452 ± 0.105	<0.005	0.818 ± 0.362	>0.05

The visual reaction timings of Volleyball was (0.546 ± 0.135s) ($p < 0.05$), Swimming (0.446 ± 0.121s) ($p < 0.005$), Weight lifting (0.518 ± 0.102s) ($p < 0.05$), Boxing (0.509 ± 0.092s) ($p < 0.05$), Athletics (0.483 ± 0.134s) ($p < 0.005$), Kayak & Canoe (0.485 ± 0.115s) ($p < 0.005$), Kabaddi (0.636 ± 0.197s) ($p > 0.05$) and Handball (0.452 ± 0.105s) ($p < 0.005$) while auditory reaction timings of Volleyball

was (0.708 ± 0.245) ($p > 0.05$), Swimming (0.641 ± 0.230s) ($p < 0.05$), Weight lifting (0.831 ± 0.440) ($p > 0.05$), Boxing (0.698 ± 0.280) ($p > 0.05$), Athletics (0.640 ± 0.222) ($p < 0.005$), Kayak & Canoe (0.691 ± 0.261) ($p < 0.05$), Kabaddi (0.871 ± 0.373) ($p > 0.05$) and Handball (0.818 ± 0.362s) ($p > 0.05$).

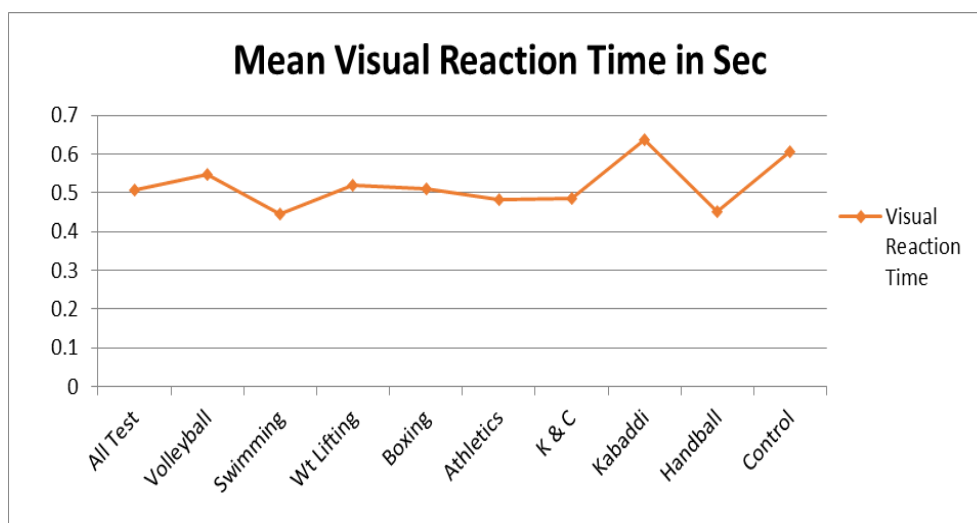


Fig. 2: Figure showing mean visual reaction time of different categories of athletes and controls in sec.

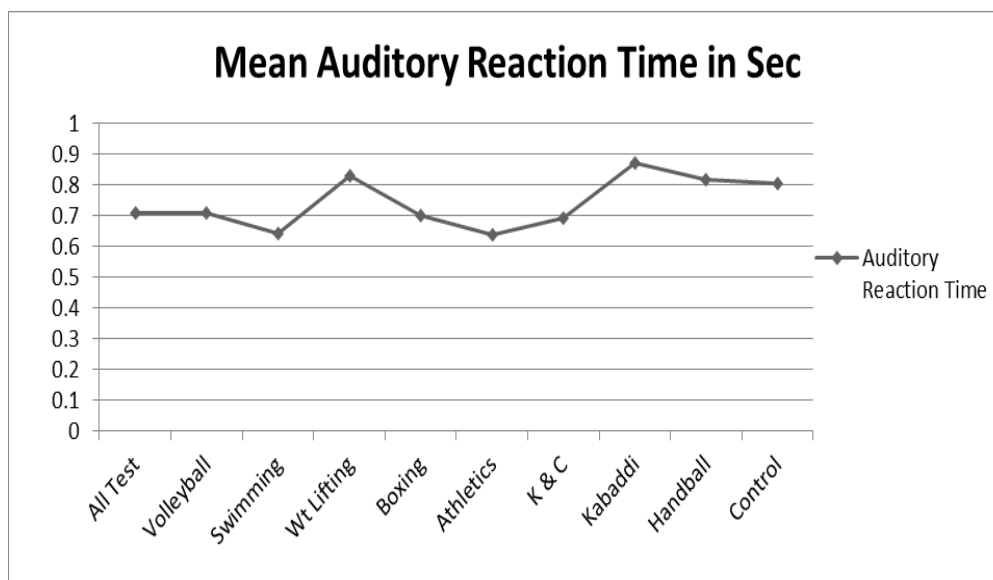


Fig. 3: Figure showing mean auditory reaction time of different categories of athletes and controls in sec.

DISCUSSION

The RT, both Auditory & Visual for sportsmen was better than controls. These findings correlate with studies done by^[6] Prabhjot Kaur (2010) and^[7] Prafull Kumar et al (2012) on athletes. Also subjects practicing any sports activity even as a leisure and not professionals tend to have a faster RT as compared to the ones with predominantly sedentary lifestyle^[8] (Jain 2015)^[9] (Badme 2012).

In our study Visual RT was faster than Auditory RT for all the subjects. This is similar to the results obtained by^[10] Yagi et al (1999) &^[11] Verlager (1997). However studies conducted by^[12] Praveen (2010)^[13] Pain & Hibbs (2007)^[14] Thompson et al (1992)^[15] Teichner WH (1954)^[16] Omer Senel et al(2006)^[17] Imamoglu et al (2000)^[18] Hascelik et al (1989)and^[19] Ziyagil et al.(1994) showed Auditory RT to be faster than the Visual RT.

A comparison among various sports reveal that the RT is fastest among athletes who show minimum VRT as well as ART. Interestingly, the values of ART and VRT were slowest for Kabaddi.

The athletes tend to have a faster RT than other sportsmen and controls. This may be attributed to their better concentration, co-ordination, alertness and accuracy. This alertness improves even further with exercise.^[20] (Mouelhi et al 2006). Studies have shown that the speed of thought processing is high among athletes which may be associated with structural changes in their brains as well^[21] (Jocelyn Faubert 2013).

RT is a good indicator of performance of an individual in various sports. Regular training decreases RT in healthy subjects^[22] (Linford et al 2006). RT is an indicator of alertness^[23] (Grishna Balakrishnan 2014) and prolonged RT can indicate decreased performance^[24] (Chinmay Shah 2010). Also, ART & VRT are good indicators to

determine the level of sensory motor co-ordination^[25] (Anupama Batra, 2014)

CONCLUSION

Elite players have better reaction time than control. While athletes, swimmers and Kayak & Canoe have better auditory reaction time, all elite players had better visual reaction time than control. Reaction time is not greatly trainable, knowledge of reaction time is an important tool in talent identification as well as in differentiating the master from the mediocre.

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