

Comparative study of visual and auditory reaction times on the basis of gender and physical activity levels of medical students

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Abstract

Background: Reaction time (RT) is the elapsed time between the presentation of a sensory stimulus and the subsequent behavioral response. Simple reaction time is usually defined as the time required for an observer to detect the presence of a stimulus. It is a physical skill closely related to human performance. **Aims and Objectives:** To study visual and auditory reaction times on the basis of gender and physical activity levels of Medical Students. **Methodology:** After approval from institutional ethical committee a cross-sectional study was carried out in the Department of Physiology of at the Medical College in the medical students after their written explained consent during the June 2016 to June 2017. There were totally 60 medical students; of the similar age group; both male and female were taken equally. The tests were done using Inquisit 4.0 computer software released in 2013 by Millisecond Software in Seattle, Washington. The statistical analysis done by un-paired t-test and calculated by SPSS version 19. **Result:** In our study we have found that VRT and ART were significantly different in males and females i.e. 225.52±10.21 and 252.32±15.32 (P<0.0001; t = 7.9731, df = 58), and 215.32±9.82 and 235.42±17.23 (P<0.0001; t = 6.0500, df = 58) respectively. The VRT and ART were significantly different in Sedentary and Regularly exercising Medical students i.e. 249.11±16.32 and 250.12±9.22 (P<0.0001, t=6.92, df=58) and 238.71±13.82 and 215.25±9.92 (P< 0.005, t=7.82,df=58) respectively. It is also clear that overall the ART was more than VRT. **Conclusion:** It can be concluded from our study that VRT and ART were significantly different in males and females, the VRT and ART were significantly different in Sedentary and Regularly exercising Medical students, overall the ART was more than VRT.

Key Words: ART (Auditory Reaction Time), VRT (Visual Reaction Time), Physical activity, Factors affecting ART and VRT.

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INTRODUCTION

Reaction time (RT) is the elapsed time between the presentation of a sensory stimulus and the subsequent behavioral response. Simple reaction time is usually defined as the time required for an observer to detect the

presence of a stimulus. It is a physical skill closely related to human performance. It represents the level of neuromuscular coordination in which the body through different physical, chemical and mechanical processes decodes visual or auditory stimuli which travel via afferent pathways and reach the brain as sensory stimuli. Simple reaction time can be determined when an individual is asked to press a button as soon as a light or sound appears. Research done by Pain and Hibbs, reference¹, shows that simple auditory reaction time has the fastest reaction time for any given stimulus. A study done by Thompson andl., reference² has documented that the mean reaction time to detect visual stimuli is approximately 180 to 200 milliseconds, whereas for sound it is around 140-160 milliseconds. On the other hand, there are also researches done by Yagi andl., reference³, that show that reaction time to visual stimuli is

faster than to auditory stimuli. Research by Verleger, reference⁴ also confirms that visual reaction time is faster than auditory reaction time during or after exercise. There are various factors that affect the reaction time to a stimulus. Factors like intensity and duration of the stimulus, age and gender of the participant, effect of practice can affect the reaction time of an individual to a particular stimulus. For example, there are relative differences between the reaction time to visual and auditory stimuli between genders. Male athletes tend to be faster than their female counterparts in responding to different stimuli. Researches done by Engel, reference⁵, show the reaction time to sound to be faster in males when compared to females. Studies done by Dane andl., reference⁶

MATERIAL AND METHODS

After approval from institutional ethical committee a cross-sectional study was carried out in the Department of Physiology of at the Medical College in the medical students after their written explained consent during the June 2016 to June 2017. There were totally 60 medical students; of the similar age group; both male and female were taken equally. The tests were done using Inquisit 4.0 computer software released in 2013 by Millisecond Software in Seattle, Washington. During the visual RT (VRT) task, in the center of the white screen background, the participant gets presented a black fixation cross that is followed after variable time intervals by a target stimulus that is, red circle and the standard procedure was done as per described by Aditya Jain andl¹³. The physical activity person was decided as regularly exercising if he/she does at lestdoing brisk walking (6km/hr) or any Type of exercise like Push up, Running, Jogging, Swimming etc. at least 5 days in the week and those who not doing were considered as Sedentary. The statistical analysis done by un-paired t -test and calculated by SPSS version 19.

RESULT

Table 1: Distribution of the Male and Female patients as per the VRT and ART

| Reaction time | Male (n=30) mean±SD | Female (n=30) mean±SD | P- value (t-test) |
|---------------|---------------------|-----------------------|---------------------------------|
| VRT | 225.52±10.21 | 252.32±15.32 | P<0.0001 t = 7.9731 df = 58. |
| ART | 215.32±9.82 | 235.42±17.23 | P<0.0001 t = 6.0500 df = 58 |

From above table it is clear that VRT and ART were significantly different in males and females i.e. 225.52±10.21 and252.32±15.32 (P<0.0001; t = 7.9731, df = 58), and 215.32±9.82 and 235.42±17.23 (P<0.0001; t = 6.0500, df = 58) respectively.

Table 2: Distribution of the patients as per the VRT and ART with respect to Physical activity level

| Reaction time | Sedentary (n=100) mean±SD | Regularly exercising (n=20) mean±SD | P-value (t-test) |
|---------------|---------------------------|-------------------------------------|-----------------------------|
| VRT | 249.11±16.32 | 250.12±9.22 | P<0.0001, t=6.92, df=58. |
| ART | 238.71±13.82 | 215.25±9.92 | P< 0.005, t=7.82, df=58. |

The VRT and ART were significantly different in Sedentary and Regularly exercising Medical students i.e. 249.11±16.32 and250.12±9.22 (P<0.0001, t=6.92, df=58) and 238.71±13.82 and 215.25±9.92 (P< 0.005, t=7.82,df=58) respectively. It is also clear that overall the ART was more than VRT.

DISCUSSION

Human RT works by having a nervous system recognize the stimulus. The neurons then relay the message to the brain. The message then travels from the brain to the spinal cord, which then reaches person’s hands and fingers. The motor neurons then tell the hands and fingers how to react. The accepted figures for mean simple RTs for college-age individuals have been about 190 ms for light stimuli and about 160 ms for sound stimuli.^{7,8} RT in response to a situation can significantly influence our lives due its practical implications. Fast RTs can produce rewards (e.g. in sports) whereas slow RT can produce grave consequences (e.g. driving and road safety matters). Factors that can affect the average human RT include age, sex, left or right hand, central versus peripheral vision, practice, fatigue, fasting, breathing cycle, personality types, exercise, and intelligence of the subject.⁹ In our study we have found that VRT and ART were significantly different in males and females i.e. 225.52±10.21 and 252.32±15.32 (P<0.0001; t = 7.9731, df = 58), and 215.32±9.82 and 235.42±17.23 (P<0.0001; t = 6.0500, df = 58) respectively. The VRT and ART were significantly different in Sedentary and Regularly exercising Medical students i.e. 249.11±16.32 and 250.12±9.22 (P<0.0001, t=6.92,df=58) and 238.71±13.82 and 215.25±9.92 (P< 0.005, t=7.82,df=58) respectively. It is also clear that overall the ART was more than VRT. These findings are similar to N Parekh⁵ andl (2004) observed that reaction time for auditory and visual stimuli were less in aerobic exercisers as compared to control ¹⁰ Prabhjot Kaur⁶ andl (2006) found that athletes performed better than controls for auditory as well as visual reaction time tasks ¹¹Spirduso¹² (1975) showed that athletes which are physically active have less reaction time and movement time, hence exhibit reduced whole body reaction time as compared to non-athletes. This was attributed to faster central nervous system processing

times producing faster muscular movements in athletes also Aditya Jain andl¹³. They found In both the sexes' RT to the auditory stimulus was significantly less ($P < 0.001$) as compared to the visual stimulus. Significant difference was found between RT of male and female medical students ($P < 0.001$) as well as between sedentary and regularly exercising healthy medical 1st year students.

CONCLUSION

It can be concluded from our study that VRT and ART were significantly different in males and females, the VRT and ART were significantly different in Sedentary and Regularly exercising Medical students, overall the ART was more than VRT.

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