

# Comparative study of visual and auditory reaction time in healthy adults

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## Abstract

**Background:** Reaction time (RT) is the duration of interval between presentation of a stimulus and the response. Many factors have been shown to affect reaction time like type of stimulus gender, exercise, distraction etc. **Aims and objective:** To compare Auditory reaction time (ART) and Visual reaction time (VRT) in the hand and foot in adults. **Material Methods:** This is a comparative study. With the help of Response Analyzer ART and VRT are recorded in all four limbs of 100 healthy adults. ART and VRT values are compared using t test. **Result:** ART was significantly shorter than VRT in all four limbs. **Conclusion:** ART of hand and foot is significantly less than VRT of hand and foot. **Key Word:** Visual reaction time, Auditory reaction time, Response Analyzer

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to respond surely and quickly in certain situations for athletes, pilots, drivers etc. The present study was conducted in 100 healthy adults to study the effect of type of stimulus, auditory and visual stimulus on reaction time.

## MATERIALS AND METHODS

In the present study VRT and ART was recorded in hand and foot in 100 healthy adults. Average age of the subjects was 17 to 25 years. All were subjected to hearing and visual acuity tests and found with normal hearing and vision. VRT and ART were recorded with the help of a simple electronic device Response Analyzer. Stimulus for VRT was a yellow soothing light with fixed intensity and for ART was a buzzer with fixed intensity. Subjects were briefed with the procedure and practice session was conducted and then they faced the test. Subject was asked to press the switch with thumb in case of hand and with the great toe in case of foot as soon as stimulus was presented. Each time 3 readings were taken and lowest reaction time was taken for as final. Time of recording was between 11 am to 1 pm and recording was done in a silent room with adequate amount of light. The data was analysed using SPSS software version 20. Quantitative data was presented using mean and standard deviation. For comparison of two quantitative variables was done using t – test. Test was considered significant if p value is less than 0.05.

## INTRODUCTION

Reaction time (RT) is the time taken by an individual to react to a stimulus. It is the duration of interval between presentation of a stimulus and the response. Study of reaction time spans more than a century and provides an indirect index of the processing capability of central nervous system. It depends on sensory motor performances. The time to react to a signal includes four processes, first receipt of a stimulus by a sense organ and conveyance of data by afferent nerves to brain, second identification of stimulus, third, choice the corresponding response and fourth initiation of the action that constitutes the response .The second and third processes involve cerebral cortex Many factors have been shown to affect reaction time like type of stimulus gender, exercise, distraction etc. Reaction time is important for individuals

## RESULTS

100 healthy adults of age group 17 to 25 years were included in the study and had mean age  $22.85 \pm 2.82$  years. Out of 100 adults 87 were males and 13 were females. According to Table 1, in right hand ART was  $175.22 \pm 15.41$  msec and VRT was  $190.87 \pm 8.77$  msec. Auditory reaction time of right hand was very highly significantly shorter than that visual reaction time (p value < 0.001). In left hand ART was  $188.13 \pm 13.59$  msec and VRT was  $200.43 \pm 5.12$  msec. Auditory reaction time

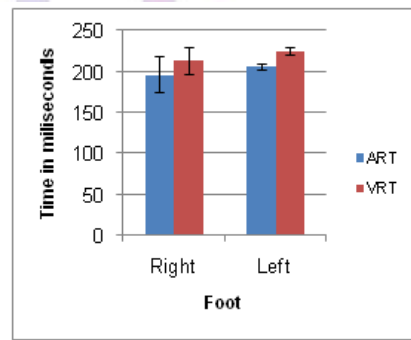
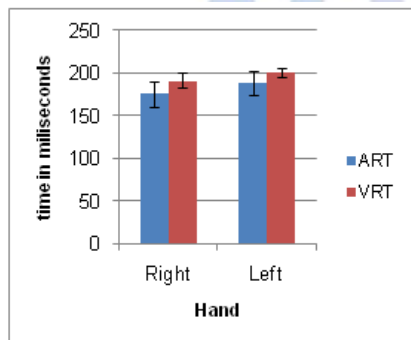
of left hand was very highly significantly shorter than that of visual reaction time (p value < 0.001). According to Table 2, in right foot ART was  $196.46 \pm 20.77$  msec and VRT was  $213.49 \pm 15.49$  msec. Auditory reaction time of right foot was highly significantly shorter than that of visual reaction time (p value < 0.01). In left foot ART was  $207.03 \pm 4.01$  msec and VRT was  $223.86 \pm 4.62$  msec. Auditory reaction time of left foot was very highly significantly shorter than that of visual reaction time (p value < 0.001).

**Table 1: Comparison between ART and VRT of hand**

Hand	ART (n=100) (mean $\pm$ SD, 95% CI)	VRT (n=100) (mean $\pm$ SD, 95% CI)	Statistic	P value
Right	$175.22 \pm 15.41$ (172.18 – 178.25)	$190.87 \pm 8.77$ (189.14-192.59)	8.84	P<0.001
Left	$188.13 \pm 13.59$ (185.45-190.81)	$200.43 \pm 5.12$ (199.42-201.43)	8.48	P<0.001

**Table 2: Comparison between ART and VRT of Foot**

Foot	ART (n=100) (mean $\pm$ SD, 95% CI)	VRT (n=100) (mean $\pm$ SD, 95% CI)	Statistic	P value
Right	$196.46 \pm 20.77$ (192.57-200.55)	$213.49 \pm 15.49$ (210.44-216.54)	6.57	P<0.01
Left	$207.03 \pm 4.01$ (206.24-207.82)	$223.86 \pm 4.62$ (222.95-224.77)	27.49	P<0.001



**Graph 1:** Comparison of ART and VRT in hands; **Graph 2:** Comparison of ART and VRT in feet

## DISCUSSION

ART of hand is less than that of VRT as shown in Table 1. ART of foot is less than that of VRT as Shown in Table 2. The difference is statistically very highly significant. The results show that the auditory reaction time is shorter than the visual reaction time. Similar results were obtained by other researchers like, Jose Shelton, *et al*<sup>1</sup>, Pain and Hibs, *et al*<sup>2</sup>, Thompson, *et al*<sup>3</sup> NeenaMisra, *et al*<sup>4</sup>, Malathi A, *et al*<sup>5</sup> Das S, *et al*<sup>6</sup>, Jayesh Solanki, *et al*<sup>7</sup> Ajay M Gavkare *et al*<sup>8</sup> The reason for shorter auditory reaction time can be more number of synapses in visual pathway as compared to auditory pathway leading to a prolonged conduction of signal in visual pathway than that in auditory pathway. Conduction of auditory stimuli to the cortex is rapid. Processing of

auditory stimuli in the auditory cortex is rapid. Therefore response from the motor cortex to the auditory stimulus is quick and has a shorter reaction time. Researches by Kemp *et al*<sup>9</sup>, show that an auditory stimulus takes only 8-10 milliseconds to reach the brain, but on the other hand, a visual stimulus takes 20-40 milliseconds. The faster the stimulus reaches the brain, the faster the signal is processed and the necessary responses are sent for the necessary motor reaction Van den Berg *et al*<sup>10</sup>

## CONCLUSION

ART of hand and foot is significantly less than VRT of hand and foot.

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