

## Comparative Study of Visual and Auditory Reaction Time on the Basis of Gender in First Year Medical Students

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### Abstract

**Introduction:** RT (Reaction time) is defined as the interval of time between the presentation of the stimulus and appearance of appropriate voluntary response in the subject. Human RT works through nervous system that recognizes the stimulus. Neurons relay this impulse to brain which travels to spinal cord and reaches person's hand and fingers. RT in response to a situation can significantly influence our life due to its practical implications. Fast RTs can give rewards (e.g. in sports), whereas slow RT can lead to grave consequences (e.g. driving and road safety matters). Factors that can affect the human RT include age, gender, left or right hand, central versus peripheral vision, practice, fatigue, fasting, exercise etc. Hence present study was conducted, which was aimed to compare VRT (visual reaction time) and ART (auditory reaction time) on the basis of gender in first year medical student. **Material and Methods:** Study was conducted in 120 medical students (60 male 60 female). Visual Reaction time and auditory reaction time were recorded by using Reaction time apparatus Anand Agencies Pune. It works on 230 volts AC. The instrument is specially designed to measure reaction time in seconds. It has Inbuilt digital chronoscope present on examiners side which measures the reaction time in seconds. Data was analyzed by unpaired "t" test. We found both ART and VRT in male were statistically significant than in female ( $p < 0.05$ ). **Conclusion:** Thus our study showed Males have shorter reaction time than females. Males react faster than females in response to changes in external environment.

**Keywords:** Auditory Reaction Time; Male; Female; Reaction Time; Visual Reaction Time.

### Introduction

The ability of animal to cope up with environmental changes for their survival and existence depends upon the responses given by animal. Quickness of response depends on the integrity of cell communication, sensory perception, central processing and motor response.

Reaction time (RT) is a measure of quickness with which an organism responds to some sort of stimulus. RT is defined as the interval of time between the presentation of stimulus and appearance of appropriate voluntary response in the subject [1,2]. Human RT works through nervous system that recognizes the stimulus. Neurons relay this impulse to brain which travels to spinal cord and reaches person's hand and fingers. The motor neurons then tell the hands and fingers how to

react. Reaction time is an indirect index of processing of central nervous system and also a simple means of determining sensory and motor performance [3].

RT in response to a situation can significantly influence our life due to its practical implications. Fast RT can yield rewards (e.g. in sports) whereas slow RT can lead to 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 subject [4-7]. So we have chosen factor gender for this study.

There are three basic types of reaction time experiments [8]

1. Simple reaction time experiments: involve presenting a uniform stimulus and requiring a uniform response. Thus in simple reaction time

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- tasks only one stimulus is presented which commands a single response. (e.g. spot the dot and react to sound; both measure simple reaction time).
- Choice reaction time (Disjunctive reaction time) experiments: involve presentation of multiple stimuli each calling for a specific response. Thus in choice reaction time tasks several (minimum two) stimuli are presented and the subject is required to respond correspondingly (e.g. pressing a key in response to the appearance of a particular light on a screen). In choice reaction time tasks, subject has to discriminate between various stimuli and make a choice amongst responses which require differentiation.
  - Associative reaction time experiments: involve responding in the form of verbal association to a stimulus which can be either verbal or pictorial. Many believe that overall males have a quicker reaction time than females. The present study was undertaken to confirm whether or not this claim is true.

Thus, this study was conducted to scientifically contribute to the field of RT.

#### *Aims and Objectives*

To compare visual and auditory reaction time on the basis of gender in first year medical students

#### **Materials and Methods**

After obtaining approval from research and ethical committee, DVVPF's medical college a total 120 first year medical students of 2016 batch were selected and written informed consent was taken from all the participants. They were categorized into two groups; first group consisted of 60 first year MBBS male students and Second group comprised of 60 first year MBBS female students. The study was conducted in the research lab, Department of Physiology, vikhe patil Medical College, between 3.00pm and 5.00pm .

#### *Inclusion Criteria*

120 healthy medical students in age group of 17-24 yrs both male and females.

#### *Exclusion Criteria*

- History of smoking, alcoholism.
- Those having any history of hearing and visual disorders.

- History of any medications affecting cognitive performance was excluded from the study.
- Those having any major illness in the present or past,

Visual Reaction time and auditory reaction time were recorded by using audiovisual Reaction time apparatus designed by Anand agencies Pune. It works on 230 volts AC. The instrument is specially designed to measure reaction time in seconds. It has Inbuilt digital chronoscope present on examiners side which measures the reaction time in seconds [9].

All the subjects were thoroughly acquainted with the apparatus. All tests were done in quite room at room temperature of 26-32 degree Celsius

#### *Auditory Reaction Time*

The auditory stimulus was provided in the form of high (beep tone) frequency sound. After connecting the instrument to mains, subject was asked to sit on chair in front of the instrument. He/she was asked to press the response switch using the thumb as soon as, he/she hears the tone. Like wise 3 readings were taken and average of these three readings was taken as the subject's best reading.

#### *Visual Reaction Time*

The visual stimulus was provided in the form of green and red color light. Both visual stimuli were given separately. Subject was asked to press response switch as soon as the red or green color light blinks. 3 readings were taken and average of these 3 readings was taken as the subject's best reading.

The data was statistically analyzed by using student unpaired 't' test.

#### **Results**

Graph I Comparison of ART and VRT in between male and female.

Table 1 show that visual reaction time for green color light in males ( $0.189 \pm 0.036$ ) was significantly faster than in females ( $0.207 \pm 0.032$ ).

Table 2 show that visual reaction time for red color light in males ( $0.177 \pm 0.037$ ) was significantly faster than in females ( $0.195 \pm 0.028$ ).

Table 3 show that auditory reaction time in males ( $0.192 \pm 0.047$ ) was significantly faster than females ( $0.210 \pm 0.031$ ).

**Table 1:** Comparison of visual reaction (green color light) time in seconds between male and female

Gender	N	Mean ± SD	'p' value
Male	60	0.189 ± 0.036	0.004*
Female	60	0.207 ± 0.032	

\* p<0.05 statistically significant \*\* p<0.001 statistically highly significant

**Table 2:** Comparison of visual reaction (red color light) time in seconds between male and female

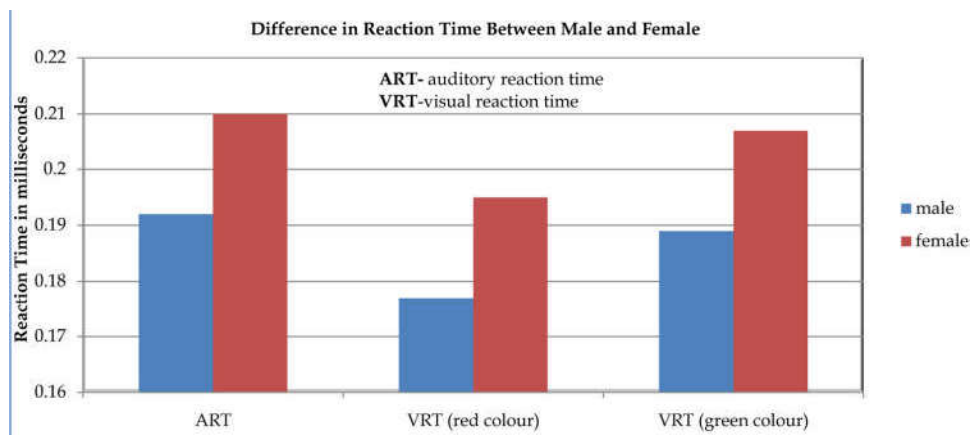
Sex	N	Mean ± SD	'p' value
Male	60	0.177 ± 0.037	0.0032*
Female	60	0.195 ± 0.028	

\* p<0.05 statistically significant \*\* p<0.001 statistically highly significant

**Table 3:** Comparison of auditory reaction time in seconds between male and female

Sex	N	Mean ± SD	'p' value
Male	60	0.192 ± 0.047	0.0147*
Female	60	0.210 ± 0.031	

\* p<0.05 statistically significant \*\* p<0.001 statistically highly significant



**Graph 1:** Showing faster VRT and ART in males as compared to in females

**Discussion**

The present study was aimed to compare visual reaction time (VRT) and auditory reaction time (ART) in 1 st year MBBS medical students on the basis of gender.

We compared visual reaction time (red and green color light) and auditory reaction time in 60 male and 60 female medical students. We have chosen red and green color as maximum number of cones present in retina is activated for red color, followed by blue and least response was for green color [10]. In the present study we found that both VRT and ART in male were statistically significant than in female. Table 1, Table 2 and Graph 1 shows visual reaction time for green and red color light in male is faster than in female

(p<0.05) . Table 3 and Graph 1 shows auditory reaction time in males is faster than in females (p<0.05).

Reaction time is dependant on several factors like arrival of stimulus at the sensory organ to neural signal, neural transmission, processing and muscular activation. Research done by Misra et.al showed that both reaction time (ART and VRT) of hands and feet were faster in males than in females [11]. Another study done by Narhare P et al showed that males responded faster than females for choice reaction time [12].

Research done by Dane S et al showed that VRT in male handball players was faster than in female hand ball players [13]. Study done by Pawlak Jason with the help of javascript software also showed that

males have faster reaction time than females [14]. Another study done by David Lipps et al in sprinters also found reaction time was faster in male than in female [15]. Few other studies also had similar findings [16,17,18].

Probable Mechanism Include [12,19]

1. Time lag between the presentation of stimulus and the beginning of motor response to stimulus is faster in male as compared to female.
2. It takes same time for both visual and auditory stimuli to reach the cortex but, the time taken for the corresponding motor response and muscle contraction might differ.
3. Males have more muscle fibres than females which allows them to perform physical actions more quickly than females.

### Conclusion

Thus our study showed males have faster reaction time than females. Males react faster than females to changes in the external environment.

### Abbreviation

RT- Reaction Time

ART- Auditory Reaction Time

VRT- Visual Reaction Time

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