

A Comparative Study of Auditory and Visual Reaction Time in Young and Elderly Males

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ABSTRACT

Background: With the advancing age there is an increase in the incidence of mishaps and thereby morbidity. An important factor of increase in these incidences may be the effect of age on reaction time. Hence, the present study was conducted to determine whether or not age affects the reaction times.

Objective: Present study was undertaken to compare and study the effect of advancing age on auditory and visual reaction time.

Methods: 160 normal, healthy male subjects were distributed in two groups (80 each) according to age (18-25 years) and (48-55 years) and their audio-visual reaction time was measured with the help of Audio-Visual reaction time apparatus.

Data Analysis: Unpaired 't' test was applied for comparing the parameters between the two groups.

Results: Statistically highly significant difference amongst the two groups was observed. It was found that audio-visual reaction time increases as age advances, as there is effect of aging on the myelination of neurons.

Conclusion: Young males responded very quickly, seen in terms of less reaction time. So, it can be concluded that reaction time task is a good indicator of sensorimotor performance of an individual. Delayed Audio-Visual reaction time in elderly age group was seen. This suggests that the old individuals should be more cautious during general movements.

Key Words: Auditory Reaction Time (ART), Visual Reaction Time (VRT), Young and Elderly male Individuals.

INTRODUCTION

Reaction time is defined as an interval of time between the application of stimulus and the initiation of appropriate voluntary response under the condition that the subject has been instructed to respond as rapidly as possible⁽¹⁾. Thus it indicates the time taken to react to external stimulus, by an individual⁽²⁾. In everyday life one has to respond to many simple situations of reaction time, usually at our home for example, response to a door bell, telephone ring, etc.

Reaction time is one measure of information processing. It is used to judge the ability of a person to concentrate and

coordinate. It provides an indirect index of the integrity and processing ability of the central nervous system⁽³⁾ and a simple, non invasive means of determining sensorimotor co-ordination and performance of an individual⁽⁴⁾.

With improving health care and services, the entire world has seen a spurt of growth in geriatric population. The process of aging is an inevitable process, which is characterised by progressive and generalised impairment of homeostasis, resulting in declining ability to respond to external or internal stresses and increased risk of diseases⁽⁵⁾. It is associated with many changes including a general decline in

sensorimotor function, which may impair the ability to perform activities of daily living safely and independently⁽⁶⁾. A critical element in safe performance of day-to-day activities is the ability to react to incoming stimuli and its slowing has obvious consequences on life.

Simple reaction time shortens from infancy into the late 20s, then increases slowly until the 50s, and then lengthens faster as the person gets into his 70s and beyond⁽⁷⁾.

Reaction time is found to be altered by a number of factors both physiological and pharmacological^(8,9). Factors affecting reaction time are –Arousal, Age, Gender, Left v/s Right Hand, practice, fatigue, fasting, distraction, personality type, punishment, stress, exercise and intelligence of a subject^(10,11).

An early study reported that for teenagers (15-19 years) mean reaction times were 187 ms for light stimuli and 158 ms for sound stimuli⁽¹²⁾. One persistent finding in literature is a slowing of responses with advancing age^(6,13, 14).

As the proportion of older individuals continue to rise, it is increasingly important that they are able to remain mobile and independent. One of the largest implications that an increased reaction time may have is in the area of slips and falls. Falls are commonly incurred by one third of the elderly population and are a common source of morbidity and mortality.⁽¹⁵⁾

Hence, considering reaction time as a good indicator of sensorimotor coordination and performance of an individual the present study was undertaken to compare the effect of age on Audio-visual reaction time in young and elderly males.

MATERIALS AND METHODS

Present study was conducted in the Department of Physiology, Government Medical College, Aurangabad. 160 normal,

healthy male subjects were distributed in two groups, eighty (80) each according to age.

Group I:- (18-25 years) and

Group II:- (48-55 years), were enrolled for the study .

All the subjects included in the study were non-alcoholic, non-diabetic, having normal vision and normal hearing acuity and had no clinical evidence of any CNS disease and had perfect sense of physical, mental and psychological well-being. They were not on any medication therapy or placebo treatment.

Informed consent was taken from all participants. Audio-visual reaction time was measured by the dominant hand with the Medicaid RTM-604, Audio-Visual reaction time apparatus, in a quiet room. The instrument is specially designed to measure response time in milliseconds (ms). It had two modes of providing stimulus- Audio and Visual. Each subject was made acquainted with the apparatus and the procedure to alleviate any fear or apprehension. The tests were done with the subject sitting comfortably in a chair. After familiarizing the subject with the instrument and after repeated practice, three readings for each parameter were noted. The least reading of three was taken as the value for reaction time task for both Auditory and Visual Reaction time and was noted in the subject's record profile. Unpaired “ t” test was applied for comparison between the two groups.

RESULTS

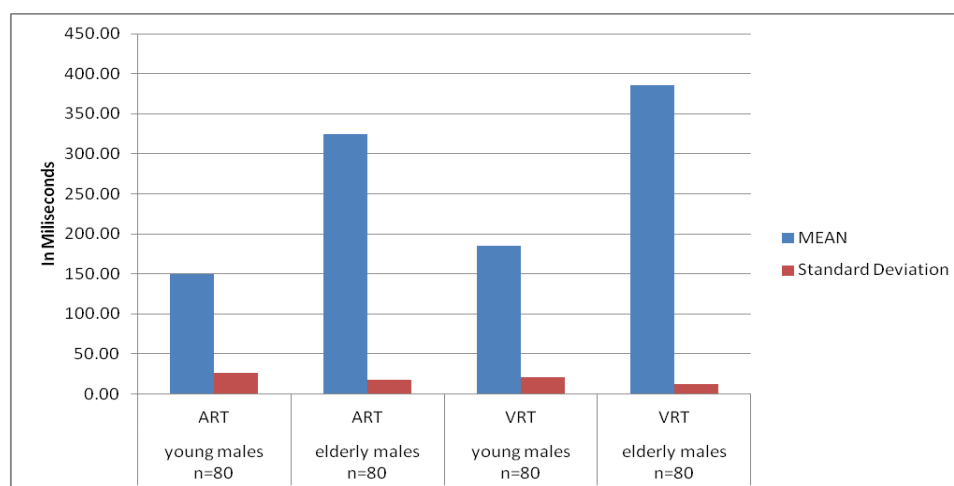
Table No. 1 Baseline Characteristics

PARAMETERS	GROUP I	GROUP II
Age (Year)	19.8± 3.7	50.2± 1.2
Height (Centimeter)	162.4± 8.4	159.8± 7
Weight (Kilogram)	55.5± 9.4	61.6± 4.4

Table No. II

PARAMETER	GROUP I (Mean±S.D)	GROUP II (Mean±S.D)	p VALUE
ART (ms)	149.24 ±26.34	324.51± 17.24	< 0.001*
VRT (ms)	185.55 ±20.60	385.23 ± 12.67	< 0.001*

*Highly Significant



DISCUSSION

Reaction time is an important component of motor movements. It is one of the important methods to study a person's central information processing speed and fast coordinated peripheral movement response. Reaction time is the interval between the onset of a stimulus and the commencement of a movement response⁽¹⁶⁾. Singer et al. (1993) defined reaction time as being composed of four stages, namely: the start of Eye movements, eye movement time, decision time and muscle contraction time.⁽¹⁷⁾

In the present study, as shown in Table II, the average Auditory Reaction Time (ART) and Visual Reaction Time (VRT), were significantly higher in elderly males than the young male individuals. It may be due to effect of ageing on the myelination of neurons. Possible reasons for this delay in response could be due to axonal degeneration and axonal shrinkage occurring with advancing age which not only prolongs mental processing time but also decreases speed of conduction of neurons. It may also be due to loss of co-ordination with advancing age due to inability to maintain fine balance between agonists and antagonists muscles, especially during rapid movements. There may also be decrease in motor skills with increase in age. Our finding is consistent with observations of Jevas and Yan⁽¹⁵⁾ who studied effect of ageing on cognitive functions. Nettelbach et al.⁽¹⁸⁾ who studied

factors affecting reaction time, also reports similar findings. Though the analysis of literature shows a common observation but the course, location and the nature of slowdown is not very clear. All the components of reaction time; the mental processing time to perceive a signal and to decide upon a response, movement time and device response time are likely to get delayed in elderly people. Senile changes in peripheral processes, like decelerated muscular response and impulse transduction through sensory nerves can account for 20% of reaction time lengthening⁽¹⁹⁾. But since sensory receipt and motor outflow times are believed to remain similar across the lifespan, the cause could be the slowed processing rate of Central Nervous System⁽²⁰⁾. As, when troubled by a distraction these elderly people tend to devote their exclusive attention to one stimulus, and ignore another stimulus completely than young people, further slowing their reaction time⁽²¹⁾. Though the effect of age increases with task complexity, cognitive slowing is argued to be a common phenomenon in the elderly⁽²²⁾. This indicates that the elderly individuals should be more careful and vigilant about the injuries and fall that may occur as a result of increased reaction time.⁽²³⁾

CONCLUSION

Thus, we can conclude from the present study that reaction time task is a good indicator of sensorimotor performance

of an individual, as the young individuals performed better in the reaction time tasks than elderly individuals who have the tendency to be more careful and monitor their responses more thoroughly. The study showed that elderly age group showed prolonged reaction time. Hence, they should be more cautious while performing the daily routine activities so as to prevent themselves from injury in any form which may be harmful to the individual's health.

Limitations

- 1) Age group range selected for this study, is very short.
- 2) Female subjects were not assessed for AVRT

Recommendation

AVRT measurement can be added in the routine health check-up, after the age of forty (40) years for every individual.

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