A COMPARATIVE STUDY BETWEEN YOUNG AND ELDERLY INDIAN MALES ON AUDIO-VISUAL REACTION TIME

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ABSTRACT
Background: With the advancing age there is an increase in the incidence of falls and thereby morbidity. An important aspect of increase in the incidence of these mishaps may be due to the effect of age on reaction time. Objectives: Hence, the present study was undertaken to study the effect of advancing age on Auditory, Visual Reaction times. Method: 50 Normal healthy male subjects were distributed in two groups according to age (18-28 yrs) and (45-55 yrs) and their Audio-Visual reaction time was found out with the help of Audio-Visual reaction time apparatus. Results: Assessed by using Student ‘t’ test. It was found that Audio-Visual reaction time increases as the age advances and Audio-Visual reaction time is significantly different amongst the two studied age groups which showed that as the age advances there is effect of of ageing on the myelination of neurones. Conclusion: Delayed Audio-Visual reaction time in elderly age group suggests that they should be more cautious during general movements as well as during driving.

Key Words: Auditory Reaction Time and Visual Reaction Time

INTRODUCTION
Reaction is a purposeful voluntary response to external stimulus. There is certain time period between application of stimulus and appropriate motor response. Reaction time is defined as interval of time between presentation of stimulus and appearance of appropriate voluntary response in a subject. Our emotions, attention, memories these and all added reaction we make are responses to stimuli which play upon us (Joseph et al., 1946). In everyday life one has to respond almost instantaneously to many diverse situations. Many simple situations of reaction time are usually at our home itself e.g. response to a door bell, telephone ring or whistle of pressure cooker. Audio-Visual reaction time is the speed, with which a person can respond to an auditory stimulus and visual stimulus respectively (Luchies et al., 2002). It is an indirect index of the processing ability of Central Nervous System and simple means of determining sensory motor association and performance of an individual (Das et al., 1997). Reaction time has physiological significance and is a simple and non invasive test for peripheral as well as central neural structures (Mohan et al., 1984).

Reaction time can be divided into three parts. The first part is perception time, the time for the application and perception of stimulus. Second part is decision time, which signifies time for giving a suitable response to the stimulus. The third part is motor time, which is the time for the compliance to the order received (Tripo, 1965).

Reaction time can be described into three types (1) Simple reaction time: – here there is one stimulus and one response. (2) Recognition reaction time: – here there are some stimuli that should be responded to and other that should not get response. (3) Choice reaction time: – here there are multiple stimulus and multiple responses (Luce, 1986 and Welford, 1980).

Reaction time is decisive for our everyday lives and needs intact sensory skills, cognitive processing and motor performance. It determines the alertness of a person because how quickly a person responds to a stimulus depends on his reaction time and therefore it must be lesser in certain occupation e.g. Drivers, sportsmen, pilots, military people, doctors, nursing staff, security guards where alertness is a must for general population. Reaction time is found to be altered by a number of factors both physiological and pharmacological (Mohan et al., 1984 and Malathi et al., 1990). 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 the subject (Bamne et al., 2011). Some factors like nutrition, exercise, personal habits, environmental influences, substances like antioxidants in heroic doses can slow down the process of aging to some degree; still it has proved to be almost an inevitable process.

An early study reported that for teenagers (15-19) mean reaction times were 187 msec for light stimuli and 158 ms for sound stimuli (Galton, 1899). Simple reaction time shortens from infancy into the late 20s, then increases slowly until the 50s, and then lengths faster as the person gets into his 70s and beyond (Welford, 1977).
The process of aging 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 (Sircar, 2001). 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 (Patten & Craik, 2000). A critical element in safe performance of activities of daily living is the ability to react to incoming stimuli and its slowing has obvious consequences for life, such as applying the brakes of a car to avoid collision.

One persistent finding in literature is a slowing of responses with advancing age (Patten & Craik, 2000; Salhouse, 1985; Ostrow, 1989). 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 in them (Jevas & Yan, 2001).

Hence considering Reaction time as a good indicator of sensorimotor coordination & performance of an individual the present study was undertaken to compare the effect of age on Audio-Visual reaction time in young male adults of 18-28 yrs and elderly male age group of 45-55yrs.

MATERIALS AND METHODS
The Study group comprised of healthy male adults in age group of 18-28 years and 45-55 years respectively. 50 males in each group were evaluated for Auditory and Visual reaction time. 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.

Each subject was made acquainted with the apparatus and the procedure to alleviate any fear or apprehension. Auditory and Visual Reaction Time were measured in a quiet room. The tests were done with the subject sitting comfortably in a chair. The Auditory and visual reaction time was measured by reaction time instrument i.e. “Audio-visual reaction time apparatus” by Medisystems. It had a Resolution---0.1 sec and it had a display Accuracy---100% being the pizeo electric crystal used for 100% accuracy of time.

The instrument is specially designed to measure response time in seconds. It had two modes of providing stimulus-Audio and Visual. Auditory reaction time was recorded for low pitch (frequency) sound stimuli. Visual reaction time was recorded for red light which served as stimulus. As soon as the stimulus was perceived by the subject, he responded by pressing the response switch. The display indicated the response time in seconds. After familiarising the subject with the instrument and after repeated practise, three readings for each parameter were noted. The interval between the stimuli was randomly varied from 2-5 seconds. 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.

RESULTS
Table No. 1 shows average Visual and Auditory reaction time in seconds recorded in the two age groups. The results were assessed by using Student ‘t’ test. The average Reaction time increased as the age advances. The findings of this study revealed that Auditory and Visual reaction time were higher in elderly age group (45-55 yrs) as compared to younger age group (18-28 yrs) and was found to be highly significant (P<0.001).

| Table 1: Shows measured value of visual reaction time (Mean±S.D) in both groups |
|---------------------------------|-----------------|-----------------|--------------|
| VRT (Secs.)                    | Young Males     | Elderly Males   | P Value      |
| N                              | 50              | 50              | × 0.001      |
| Mean                           | 0.1948±0.09     | 0.3946±0.13     |              |

| Table 2: Shows measured value of auditory reaction time (Mean±S.D) in both groups |
|---------------------------------|-----------------|-----------------|--------------|
| ART (Secs.)                    | Young Males     | Elderly Males   | P Value      |
| N                              | 50              | 50              | × 0.001      |
| Mean                           | 0.1692±0.06     | 0.3262±0.14     |              |
Figure 1: Visual Reaction Time (VRT)

Figure 2: Auditory Reaction Time (ART)
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 (Magill, 1998). 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.

In the present study, As Table 1 and Table 2 depicts, the average Audio-Visual reaction time increases as the age advances as both Visual Reaction Time (VRT) and Auditory Reaction Time (ART) were significantly higher in elderly males than the young male individuals. It was concluded that as the age advances Audio –Visual reaction time increases which may be due to effect of ageing on the myelination of neurones. 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 or it may 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 (2001) who studied effect of ageing on cognitive functions.

Nettelbach et al., (1980) who studied factors affecting reaction time 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 (Cerella, 1985). 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 (Marsh & Geel, 2000).

Thus, we can conclude in 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. 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(Botwinich & Brinley, 1962). Though the effect of age increases with task complexity, cognitive slowing is argued to be a common phenomenon in the elderly (Luchies et al., 2002).

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.

CONCLUSION

Thus we conclude that elderly age group should be more cautious while performing the daily routine activities due to lengthening of Audio –Visual reaction time so as to prevent any type of injury in any form which may be harmful to the individual for their health.

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