

Effect Of Prolonged Mental Activity On Auditory Reaction Time In Young Healthy Subjects

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Abstract: Background: Reaction time is the time interval between onsets of a stimulus to the appearance of response which is purpose by voluntary movement by subject. Reaction time is important for our everyday in life and requires sensory motor association, cognitive processing and performance of an individual. It has physiological significance and is a simple and non-invasive test for peripheral as well as central neural structures **Method:** The study was carried out on 73 young healthy subjects (46male & 27 female) in the Department of Physiology, Government medical college, Bhavnagar after obtaining informed written consent in prescribed format with anthropological measurement & physiological measurement by use of instrument Multiple Choice Reaction Time Apparatus, Inco Ambala Ltd (Accuracy ± 0.001 Sec). Inclusion Criteria: Age 15-25 Years. Subject, Both sex, Normal hearing, Normal Sighted vision, No any medical or surgical illness. Exclusion Criteria: Participants who fail to give consent. Musculoskeletal disability & any type of neuropathy, Hearing problem which affect on reaction time **Results:** student paired t- test was applied for before & after 3 hours lecture for significance difference in male & female. The simple & choice auditory reaction time was significant (p value < 0.05) on prolonged mental activity. **Conclusion:** Reaction time was prolonged because of disturbance of sensorimotor activity

Keywords: Young healthy subject, Auditory reaction time

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Introduction: Reaction time is the time interval between onsets of a stimulus to the appearance of response which is purpose by voluntary movement by subject¹. Reaction time is important for our everyday in life and requires sensory motor association², cognitive processing and performance of an individual³. it is important in such occupation e.g. doctors, nursing staff, Drivers, sportsmen, pilots, military people, police staff, security guards.

It has physiological significance and is a simple and non-invasive test for peripheral as well as central neural structures. ⁴ Reaction time is found to be altered by a number of factors both physiological and pharmacological¹

It provides an indirect index of the integrity and processing ability of the central nervous system and a simple, noninvasive means of determining sensorimotor co-ordination and performance of an individual & to judge the ability of the person to concentrate and coordinate ⁵

Reaction time is considered as a ideal tool for measuring sensory motor association. Reaction time (RT), is time between the onset of a stimulus which can be any type of sensory stimuli like visual, auditory, pain, touch or temperature and the subsequent other sensory

response to occur.. The motor response is typically a button press but can also be an eye movement, a vocal response, or some other motor response⁶. The our study was to investigate the relevance of reaction time (RT) measurements to the evaluation of warning-sound urgency⁷

Simple Reaction Time is One Stimulus & One Response (Shorter duration) Choice Reaction Time is multiple stimuli and multiple responses. The reaction must correspond to the correct stimulus. (Longest duration).

In this study aim to measure simple & choice auditory reaction time (ART) in young male & female subject & to study effect of prolonged mental activity on simple & choice auditory reaction time (ART) in young healthy Subjects.

Material & Method: After taking permission from ethical committee & institutional review board, government medical college, bhavnagar, the study was carried out on 73 young healthy subjects (46male & 27 female) in the Department of Physiology, Government Medical College, Bhavnagar after obtaining informed written consent in prescribed format with anthropological measurement & physiological measurement by

use of instrument Multiple Choice Reaction Time Apparatus, Inco Ambala Ltd (Accuracy ± 0.001 Sec).

Subjects with age eligible 15 to 25 year, Both sex, Normal hearing & Sighted vision and No any medical or surgical illness were included from study. Subjects with Participants who fail to give consent, musculoskeletal disability, any type of neuropathy and Hearing problem which affect on reaction time were excluded from our study.

The instrument is composed of four key on each side. One side is for stimulus and other side is for response. There is LED screen on the stimulus side with shows the time duration between stimulus and response & light was seen on screen on front of subject.

The duration time was noted in case record forms. Simple auditory reaction time of 4 different sounds –Horn, Bell, Ring, Whistle & choice auditory reaction time were measured on prolonged mental activity (before & after 3 hours lecture).

Measurement of simple & choice auditory reaction time:- Simple & choice auditory reaction time was measured by multi-choice reaction apparatus as different type of sound & different type of light, that given to the participants and in form of response, they had to press the button related to it with their dominant hand.

Multi-choice reaction apparatus display shows time of response in milliseconds on its LED screen which were recorded on case record form as on case study form. Best of three reaction time (shortest time after three trials) were recorded or considered and compared with control subjects. The testing procedures were quite simple, non-invasive and harmless from subject's point of view.

Statistical analysis: The results were expressed as Mean \pm SD and analyzed by using Student's paired t-test in GraphPad software. 'p' value of less than 0.05 was considered significant.

Result: The body mass index for male is 19.89 ± 3.31 (Mean \pm SD) and for female is 20.29 ± 2.85 (Mean \pm SD)

Table:-1 ART Comparison Between before & after three hours lecture in male;

Reaction time	Type of sound	ART MALE		P VALUE
		N=46 BEFORE	AFTER	
Simple Auditory Reaction Time	Horn	180 \pm 41.12	232.83 \pm 59.87	<0.0001
	Bell	159.83 \pm 33.25	201 \pm 45.89	<0.0001
	Ring	143.59 \pm 33.20	195.72 \pm 35.94	<0.0001
	Whistle	155.63 \pm 39.49	210.91 \pm 64.51	<0.0001
Choice reaction time		681.15 \pm 116.74	759.17 \pm 112.59	<0.0001

Table:-2 ART Comparison Between before & after three hours lecture in female;

Reaction time	Type of sound	ART FEMALE		P VALUE
		N=27 BEFORE	AFTER	
Simple Auditory Reaction time	Horn	202.33 \pm 58.08	273.81 \pm 68.41	<0.0001
	Bell	174.74 \pm 34.51	224.65 \pm 34.51	0.0002
	Ring	151.18 \pm 29.57	195.22 \pm 40.59	<0.0001
	Whistle	169.26 \pm 33.72	218.78 \pm 76.91	0.0015
Choice reaction time		713.30 \pm 111.82	817.93 \pm 94.48	<0.0001

Discussion: Reaction time measurement includes the latency in sensory neural code traversing peripheral and central pathways, perceptive and cognitive processing, a motor signal traversing both central and peripheral neuronal structures and finally the latency in the end effector activation (i.e. muscle activation)⁸ so any change in Simple auditory reaction time & choice auditory reaction time indicate that disturbance in peripheral & central nervous system⁸

In the present study, there was significant difference in ART & VRT during before & after 3 hour lecture in males in Table 1 & in females in Table 2 separately with normal BMI in male & female. It has an effect on sensorimotor activity. This finding suggests that reduced concentration in lecture, thinking⁸. After prolonged mental activity shows common symptoms such as Poor concentration, Slowness of

thinking and slow information processing speed, Impaired memory, Stress, Emotional lability and irritability, Sleeping problems, Noise and light sensitivity, Impaired ability to take initiative, Headaches. Fatigue also impairs the ability to take initiative and make decisions. They also commonly report slowness of thinking. Many people suffer from headaches after activities involving deep concentration. It is recommended to avoid taking on more activities over longer periods in an attempt to improve mental endurance as this does not work. When the limits of mental activity are pushed, mental fatigue increases and there is a decrease in performance. Poor concentration and more mistakes can be the consequence if one's mental activities are not adapted to one's mental fatigue.⁹

Conclusion: Reaction time was prolonged because of disturbance of sensorimotor activity. It is possible to find a balance between activities and rest, and this is essential. Time for rest during the day is necessary, as well as good strategies which conserve the energy levels. It is sensible to use the available energy for important tasks. It is advisable to do one thing at a time, take more time for each activity, to avoid planning too many activities in a short period and to ensure that rest is included when planning the day's activities. Activities in everyday life and work can be managed more efficiently by keeping the total mental load under control.

It can also take time to find appropriate working strategies and to accept that the activity level must be greatly reduced compared to before the mental fatigue developed.

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