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Effect of Mobile Use on Reaction Time

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Abstract

The use of cellular phones has skyrocketed in recent years, with more than 118 million subscribers in the United States as of July 1, 2001. Recent estimates suggest that cell phone users spend 60% of their cell phone time while driving. Reaction time is one of the important methods used to study a person's central information processing speed and fast coordinated peripheral movement response. The purpose of this study was to compare the reaction time without mobile use and with mobile use. It can be concluded that the reaction time is a prolonged with mobile use. The results of the study that has been described carry two significant implications for use of cellular phones. First, all users of cellular phones should be advised not to engage in intense phone conversations while the vehicle is moving. Businesses whose employees regularly carry on transactions by means of cellular phones might advise, or even direct that protracted dealings over the phone be avoided while the vehicle is underway.

Background and Purpose: The use of cellular phones has skyrocketed in recent years, with more than 118 million subscribers in the United States as of July 1, 2001 [1]. This increase has been accompanied by an increase in the number of individuals concurrently driving and talking on the cell phone. Recent estimates suggest that cell phone users spend 60% of their cell phone time while driving [2]. Unfortunately, due to the inherent limited capacity of human attention, engaging in these multi-tasking activities often comes at a cost of diverting attention away from the primary task of driving [3]. The concurrent performance of a secondary task that is unrelated to the primary task of driving can be considered a distraction. Convergent findings suggest that when drivers converse on a cell phone they are more likely to be involved in an accident [4-6] and generally show a different driving profile than non-distracted drivers [5,7-8]. A number of reports have found that when conversing on a cell phone drivers adopt increased time headways to traffic and reduce speed [7-9] although this finding is not universal [10]. Furthermore, epidemiological studies suggest that drivers on the cell phone are up to four times more likely to be involved in an accident [4,6]. It may also be the case that a person's emotional state may simultaneously increase the likelihood of using a cell phone and driving erratically [11]. Reaction time is one of the important methods used to study a person's central information processing speed and fast coordinated peripheral movement response. Reaction Time is independent of social-cultural influences and can purely indicate the efficiency or dysfunction of biological process in brain. For any response to occur the stimulus initially activates the sense organs and the impulse is then conducted to the brain and from the brain is sent back to execute the movement required to accomplish the task. Slowed performance is usually accompanied by prolonged simple Reaction Time [12-13]. The purpose of this study was to compare the reaction time without mobile use and with mobile use.

Objectives of the study

1. To find out the auditory and visual time in healthy controls
2. To find out sex wise and stimulus wise difference in ART and VRT
3. To compare the auditory and visual reaction time of controls with and without concurrent mobile use
4. To find out any difference and if present, it's statistical significance and to analyze the reason for the observed facts.

Materials and methods

The study was carried out in the Department of Physiology, Govt. Medical College, and Bhavnagar. The present study included 73 subjects aged 17-19 Healthy individual were used in this study. The subjects included in the study were non-alcoholics, non-smokers having normal vision. They were not having any pathology or injury to the upper limb. The subjects were informed about the nature of the study and a written consent was obtained. The present study was conducted on 'Audio-visual reaction time apparatus RTM 608' by Medicaid systems. The instrument has a resolution of 0.001 sec and accuracy of +1 digit. It has two modes of providing stimulus- audio stimulus (continuous sound on speaker) and visual stimulus (shooting red, yellow and green lights). The reaction time was recorded for auditory low and high frequency sound stimuli and visual reaction time for red, green and yellow light stimuli. As soon as the stimuli was perceived by the subject, he responded by pressing the response switch by the index finger of the dominant hand. The display indicated the response time in seconds. They were given 10 trials and after repeated practice, three readings for each parameter were noted. The average of three readings was taken as the value for reaction time task and was noted in the subject's record profile. The dual-task condition involved conversing on a cell phone with a research assistant. The participant and the research assistant discussed topics that were being of interest to the participant.

Results

Present study was carried out in 73 students of first MBBS. There were 40 girls and 33 boys in study group.

Table 1: Reaction time for visual and auditory stimulus in different sex group.

Stimulus	Reaction time in boys	Reaction time in girls	P Value
Visual	272.317±177.669	254.559±162.939	NS
Auditory	260.358±189.271	249.555 ±192.011	NS
Visual with concomitant mobile	348.027±207.397	309.52±224.207	NS
Auditory with concomitant mobile	362.026±242.942	337.805 ±238.024	NS

Table 2: Show difference in reaction time according to type of stimulus

Stimulus	Visual	Auditory	P Value
Boys	272.317±177.669	260.358±189.271	NS
Girls	254.559±162.939	249.555 ±192.011	NS
Over all	262.586+170.082	326.927+217.522	P = 0.004

Table 3: Show difference in visual reaction time with and without concomitant mobile use

Stimulus	VRT	VRT with Mobile	P Value
Boys	272.317±177.669	348.027±207.397	P = 0.024
Girls	254.559±162.939	309.52±224.207	P = 0.054

Table 4: Show difference in auditory reaction time with and without concomitant mobile use

Stimulus	ART	ART with Mobile	P Value
Boys	260.358±189.271	362.026±242.942	P = 0.036
Girls	249.555 ±192.011	337.805 ±238.024	P = 0.015

Discussion

In present study there were 40 girls and 33 boys in the study group. Study reveals no statistically significant difference between the reaction time of male and female subject in contrast to other studies with young population as subjects indicated that reaction time for female was higher than that of the male [14]. On the basis of the results obtained it has been reported that the auditory stimulus evoked quicker reaction than the visual one [14], but present study does not find any statistical significance in the reaction time between visual and auditory stimulus if we compare it for two group separately but as a whole visual stimulus evoked quicker reaction than auditory stimulus. The most important finding of the present study was the difference in performance of the groups with and without concomitant mobile use. The finding of the study revealed that reaction time for auditory stimuli as shown in (Figure -1) and for visual stimuli as shown in (Figure -2) was found to be prolonged with concomitant mobile use when compared to controls. The results of auditory reaction time for high frequency sound and visual reaction time for green light is taken the statistical significance was determined using students 't' test. For auditory reaction time with and without mobile use difference in reaction time is statistically significant in both group (boys & girls), while for visual reaction time difference in reaction time is significant only in boys.

Figure 1

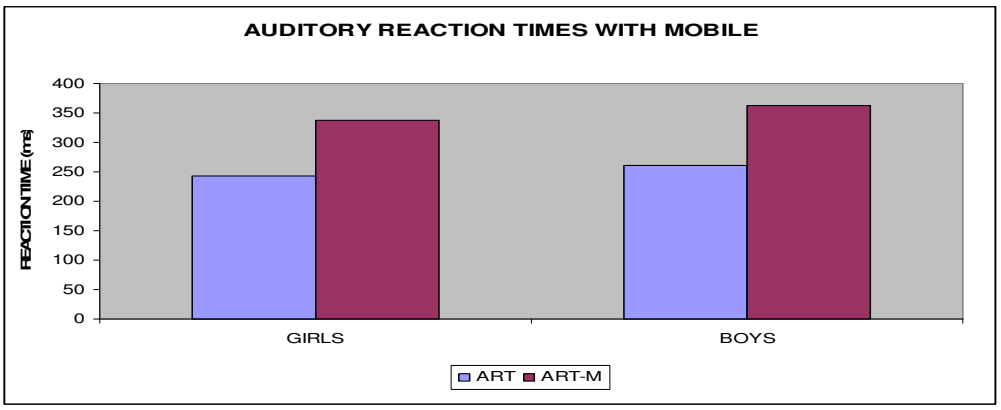
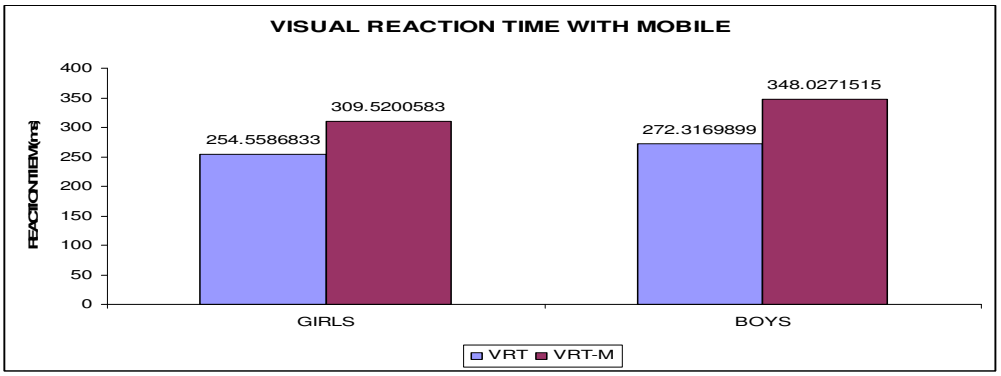


Figure 2



The clinical significance of such subtle alterations is speculative. Probably such alterations might prove deleterious in subjects required to take instantaneous decisions in quick action during driving vehicle as A joint study released by the National Highway Traffic Safety Administration (NHTSA) and the Virginia Tech Transportation Institute in April 2006 concluded that nearly 80 percent of car crashes and 65 percent of near-crashes occur within three seconds of some kind of driver distraction. Dialing a cell phone ranked among the most dangerous distractions, tripling the risk of being involved in an auto accident [15].

Conclusion: Misuse of cell phones is a growing. It can be concluded that the reaction time is a prolonged with mobile use. The results of the study that has been described carry two significant implications for use of cellular phones. First, all users of cellular phones should be advised not to engage in intense phone conversations while the vehicle is moving. Businesses whose employees regularly carry on transactions by means of cellular phones might advise, or even direct that protracted dealings over the phone be avoided while the vehicle is underway It will only get worse. It's my opinion we can develop something futuristic by creating "Cell Phone Free Zones"

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References

1. Cellular Telecommunications Industry Association, 1250 Connecticut Avenue, NW Suite 800 .Washington, DC 20036, Phone: (202) 785 - 0081. (http://www.ctia.org/).
2. Hahn RW, Tetlock, PC, Burnett JK. Should you be allowed to use your cellular phone while driving? Regulation 2000; 23:46-55.
3. Kramer, AF., Larish, J. Aging and dualtask performance . In W. Rogers, A. D. Fisk, & N. Walker (Eds.), Aging and skilled performance. Hillsdale, N.J. :Erlbaum. 1996; pp. 83-112.
4. Redelmeier DA, RJ. Tibshirani. Association between cellular telephone calls and motor vehicle collisions. N England J Med 1997;36: 453
5. Strayer DL, Drews FA,Crouch DJ. A Comparison of the Cell Phone Driver and the Drunk Driver, Human Factors 2006; 48(2): 381.
6. McEvoy SP, Stevenson MR, McCartt AT, Woodward M, Haworth CP, Rina Cercarelli. Role of Mobile Phones in Motor Vehicle Crashes Resulting in Hospital Attendance: A Case-Crossover Study. Br Med J 2005; 331: 428
7. Strayer DL, Drews FA. Profiles in driver distraction: Effects of cell phone conversations on younger and older drivers, Human Factors 2004, 46:640.
8. Beede KE, Kass SJ. Engrossed in conversation: The impact of cell phones on simulated driving performance. Accident Analysis & Prevention 2006,38(2) :.415-421.
9. Lin CJ, Chen HJ. Verbal and cognitive distractors in driving performance while using Hands-Free Phones. Perceptual and Motor Skills 2006;103 (3): 803-810.
10. Redelmeier DA, Tibshirani, RJ. Association between cellular-telephone calls and motor vehicle collisions. N England J Med 1997; 336:453-458
11. Bruhn P. Disturbances of vigilance in subcortical epilepsy. Acta Neural Scand 1970, 46: 442-454
12. Bruhn, P,Parsons OA.Continuous reaction time in brain damage. Cortex 1971; 7: 278-291
13. Biswas A, Debnath S. Reaction time with respect to sex and nature of stimulus. Meeting Abstract. hysical activity and successful aging. Xth International EGREPA Conference. Cologne, 14.-16.09.2006. Düsseldorf, Köln: German Medical Science; 2006. Doc 06. (http://www.egms.de/en/meetings/pasa2006/06pasa017.shtml)
14. http://www.articlesbase.com/automotive-articles/cell-phone-and-automobile-accidents-on-the-rise-390037.html

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