

Effect of Duration of Exposure to Digital Screen on Visual & Auditory Reaction Time among Undergraduate Medical Students**Jagdish Hundekari^{1*}, Bhumika Badjatiya², Sanjay Wasnik³, Chandeeep Kaur⁴, Lokendra Singh Kot⁵, Krushna Trankatwar⁶**¹Professor & HOD, Department of Physiology, Government Medical College, Ratlam (MP)²Ind Year Medical student, Government Medical College, Ratlam (MP)³Assistant Professor, Department of Physiology, Government Medical College, Ratlam (MP)⁴Ind Year Medical student, Government Medical College, Ratlam (MP)⁵Demonstrator, Department of Community Medicine, Government Medical College, Ratlam (MP)⁶Senior Resident, Department of Ophthalmology, Government Medical College, Gondia (MH)

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Conflict of interest: Nil

Abstract:**Introduction:** In undergraduate medical students, use of Digital screens have been increased due to the fact that students engage themselves in studies on online platforms by watching videos, reading E books even after the online regular classes. Apart from these for their leisure time they use mobile phones for scrolling on social media platforms, chatting and playing games which involve activity of the eye. The Reaction Time (RT) is one of the frequently used tests in the experimental physiology to assess the sensory-motor performance. Reaction time (RT) is a measure of the quickness with which an organism responds to some sort of stimulus.**Objectives:** To assess the effect of mobile use on visual & Auditory reaction time in undergraduate medical students aged 18-25 years.**Method:** A total of 147 subjects aged 18-25 years were selected and depending on duration of mobile phone usage, participants were divided into three groups – Group I(N=17) → Less than 1 year, Group II (N= 41) → Between 1-2 yrs& Group III (N=89) → more than 2 yrs. Procedure was explained to all the participants. Visual & Auditory Reaction time was evaluated using ruler drop test and the data was statistically analyzed.**Result:** The mean value and standard deviation for age was 20.60 ± 1.72 years, Mobile phone usage was 2 -6 hours per day and Visual & Auditory Reaction time was increased non-significantly as duration of mobile usage increases.**Conclusion:** The study concludes that there is non-significant correlation between visual & auditory reaction time and mobile phone usage in undergraduate medical students aged 18-25 years.**Keywords:** Digital Screen Exposure, Visual Reaction Time, Auditory Reaction Time, Undergraduate Medical Students.

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Introduction

In undergraduate medical students, use of Digital screens have been increased due to the fact that students engage themselves in studies on online platforms by watching videos, reading E books even after the offline regular classes. Apart from these for their leisure time they use mobile phones for scrolling on social media platforms, chatting and playing games which involve activity of the eye. The Reaction Time (RT) is one of the frequently used tests in the experimental physiology to assess the sensory-motor performance [1]. All these activities extend their screen time up ranging from 5-6 hrs a day.

Luce and Welford [2,3] described three types of RT. (1) Simple RT: Here there is one stimulus and

one response. (2) Recognition RT: Here there is some stimulus that should be responded to and other that should not get a response. (3) Choice RT: Here there are multiple stimulus and multiple responses. The time required to respond to a visual stimulus is known as Visual Reaction Time (VRT). Usage of computer screen or mobile screen for longer hours especially for occupational purpose decreases the visual reaction time in the individuals when compared with those who use it for lesser hours like recreational purpose. [4,5,6]

Most of the studies have been done on digital screen exposure and the perception of eyestrain through questionnaire's but hardly any study has been conducted on correlation of perception of eye

strain with the visual reaction time. So we aim to evaluate Effect of duration of exposure to digital screen on eye strain among undergraduate medical students and its correlation with visual reaction time.

Material & Method

The study was conducted on undergraduate medical students of both the sexes between 18-25 years of age after the approval from Institutional ethical committee. After obtaining written consent form and questionnaire, a total of 147 participants were selected with minimum exposure of digital screen for 2 hrs/day. Depending on duration of mobile phone usage, participants were divided into three

groups – Group I(N=17) → Less than 1 year, Group II (N= 41) → Between 1-2 yrs & Group III (N=89) → more than 2 yrs. Procedure was explained to all the participants. Visual & Auditory Reaction time was evaluated using ruler drop test and the data was statistically analyzed using SPSS statistics (IBM Inc. version 20 for Windows) software.

Result

The mean value and standard deviation for age was 20.60 ± 1.72 years, Mobile phone usage duration was 2 -6 hours per day. The mean value and standard deviation for ART & VRT was shown in Table No.1.

Table 1: Mean \pm SD for Auditory & Visual Reaction Time depending on duration of usage of digital screen

Reaction Time	Duration of exposure	N	Mean	Std. Deviation
Auditory Reaction Time	<1 Years	17	511.8824	143.06593
	>2 Years	89	531.0674	114.02161
	1-2 Years	41	543.122	108.23983
	Total	147	532.2109	115.63477
Visual Reaction Time	<1 Years	17	489.4118	1966.89854
	>2 Years	89	567.5202	2291.13719
	1-2 Years	41	529.0512	2600.96117
	Total	147	547.7578	2348.32518

Table 2: Comparison of Auditory & Visual Reaction Time depending on duration of usage of digital screen

Anova		Sum of Squares	df	Mean Square	F	Sig.
Auditory Reaction Time	Between Groups	12022.71	2	6011.356	0.446	0.641 (NS)
	Within Groups	1940202	144	13473.62		
	Total	1952224	146			
Visual Reaction Time	Between Groups	10697905	2	5348953	0.97	0.382 (NS)
	Within Groups	7.94E+08	144	5516932		
	Total	8.05E+08	146			

Discussion

The finding of the present study revealed that the reaction time is prolonged non significantly with mobile use. Previous studies showed increase in reaction time with mobile phone usage [7,8]. Slowed performance is usually accompanied by prolonged simple Reaction Time [9,10] Non-significant increase in Reaction Time as duration of mobile usage increases could be due to duration of exposure; may be too short. According to the belief of the Russian National Committee report to WHO, the following health risks are likely to be challenged by the children cellular phone users in the upcoming future. Also prolongation of reaction time in this age might be because of the factors like less recognition to stimuli, differences in the lifestyle, reduce physical activity.

Conclusion

Thus we observed a non-significant increase in reaction time depending on usage of digital screen in undergraduate medical students aged 18 – 25

yrs. This may put them at higher risk of road accidents, memory loss, receding attention, vanishing learning and cognitive skills, sleep disorders, increase in stress sensitivity, and epilepsy.

Implication

This study will help assess the effect of continuous usage of Digital screen on digital eye strain and visual reaction time.

All users of cellular phones should be advised not to engage in intense phone usage for the better improvement in reaction time, which is also a strong indicator for their cognitive abilities as the children grow older.

References

1. American Optometric Association, Effects of Computer Use on Eye Health and Vision, American Optometric Association, St. Louis, MO, USA, 1997, [https:// www. aoa. org/ Documents/optometrists/effects-of-computer-](https://www.aoa.org/Documents/optometrists/effects-of-computer-)

- use.pdf.
2. Luce RD. Information Theory of Choice-Reaction Times. London: Academic Press; 1968. Available from: [http:// www.biology.clemson.edu/bpc/bp/Lab/110/reaction.htm](http://www.biology.clemson.edu/bpc/bp/Lab/110/reaction.htm). [Last accessed on 2011 Aug 08].
 3. Welford AT. Choice reaction time: Basic concepts. In: Welford AT, editor. Reaction Times. New York: Academic Press; 1980; 73-128.
 4. Sini Sreenivasan, M.S. Kusumadevi. Effect of Computer Usage on Visual Reaction Time in Information Technology Professionals of Bangalore City International Journal of Physiology, 2020:8(1).
 5. Shah C, Gokhle PA, Mehta HB. Effect of Mobile Use on Reaction Time. Al Ameen J Med Sci. 2010; 3(2):160-164.
 6. Seo-young Kang, Ji Eun Hong, EJ Choi, Jungmook Lyu. Blue-light induces the selective cell death of photoreceptors in mouse retina .J Korean Ophthalmic Opt Soc. 2016; 21(1): 69-76.
 7. Shah C, Gokhale PA, Mehta HB. Effect of mobile use on reaction time. Al Ameen Journal of Medical Science. 2010;3(2):160-4.
 8. Rutuja Jage et al Effect of Mobile Phone Usage on Reaction Time in School Going Children Aged between 6-12 Years using a Ruler Drop Method - A Cross Sectional Study. International Journal of Science and Research, 2021: 10(10); 82-85.
 9. Bruhn P, Parsons OA. Continuous reaction time in brain damage. Cortex. 1971; 7: 278-291.
 10. 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/pasa2006/06_pasa017.shtml)