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Original Research Article

Effect of Screen Time on Visual Evoked Potentials in Young Adults

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Abstract:

Introduction: Visual evoked potentials (VEPs) are electrical potential differences recorded from scalp to visual stimuli. VEPs provide a sensitive method for documenting the abnormalities in the visual pathways. Screen time usually refers activities done in front of the screen. There are studies which have said that too much screen time increases the risk of Obesity, Anxiety, Depression, Retinal Illumination, Lack of judgment skills, Sleep disturbances and more chances of Cardio vascular diseases. This study was aimed to assess the effect of Screen Time on VEP.

Material and Methods: It was a cross-sectional analytical study. The participants (N=100) were divided in two groups: Group 'A' (control group) with 50 normal individuals and Group 'B' (study group) had 50 individuals using screen time more than 6 hours per day. Pattern reversal visual evoked potential was recorded. VEP Parameters – N75, P100 & N145 latencies and amplitude of P100 (N75-P100 and P100-N145) were recorded in both groups. The level of significance was tested between two groups using student's t-test.

Results: The latencies of N75 and P100 wave were significantly increased (p value = 0.001). The amplitude of P100 wave did not show much differences (p value = 0.001). Whereas, N145 wave latency was increased but not significant.

Conclusion: We conclude that using screen time for longer time in a day can also affect the visual processing mechanism as evidenced by VEP changes.

Keywords: Visual Evoked Potential, Screen Time, Visual Processing.

Introduction

Screen time usually refers activities done in front of the screen, like as watching TV, working on computers, using mobile phones or playing video games.[1] Screen time is considered as sedentary activity, since very few energy is utilized. Most IT professionals spend about 6 to 8 hours a day on screen. Too much screen time increases the risk of Obesity, Anxiety, Depression, Retinal Illumination, and lack of judgment skills, Sleep disturbances and more chances of Cardio vascular diseases.[1]

Visual Evoked Potentials (VEPs) are electrical potential differences recorded from the scalp in response to the visual stimuli.[2] They provide a sensitive method for documenting the abnormalities in the visual pathways.[3] Many studies have proven that VEP is useful in identifying optic nerve pathologies.[4] However, very few studies are done in correlation between eye disturbances in more screen time users and effect of VEP in them. Hence, this study was conducted to assess the effect of screen time on VEP and compared it with age and gender matched healthy individuals.

Materials and Methods

The permission was taken from the institutional research &ethics committee to conduct the study in the Electrophysiology Research Laboratory of Department of Physiology, Sree Balaji Medical College and Hospital (SBMCH), Chennai. It was a cross-sectional analytical study.

Based on previous study, the sample size was calculated to be 100.[5] The participants were separated into two groups: Group 'A' (control group) with50 normal individuals and Group 'B' (study group) 50 individuals who used screen time more than 6 hour per day for around 2 years of both gender with age

between 18 to 25 years.[6,7] The subjects with refractive errors were excluded from the study.[8] The purpose and procedure of the study was explained to all in their native language and written consent was taken.

The pattern reversal VEPs were recorded using EMG EP MK II equipment (Electromyography, Evoked potential machine, MK II model, Recorders and Medicare System Private Ltd. Chandigarh, India).[9] The recording electrodes (Ag/AgCl) were applied over the scalp as suggested by 10-20 International system of electrode placement: one on the occiput (Oz); another on the vertex (Cz); and last one placed at forehead (Fz).21The subjects were asked to sit comfortably in front of the computer screen at distance of 100cm and were instructed to fix their gaze at red Colored dot in the centre of checkerboard pattern.[10] Every time there is alteration in the checkerboard pattern, the subject's visual system will generate an electrical response which will be recorded and stored in the computer.

The statistical analysis was done using software SPSS version 24. The level of significance was tested between two groups using student's t-test. The 'p' value < 0.05 was considered statistically significant.

Results

Table-1 shows VEP wave duration (N_{75}, P_{100}, and N_{145}) between two groups. The P_{100} duration was increased (delay in latency)in all the Group B individuals as compared to Group A and the difference was highly significant. There was also a significant delay in latency of N_{75} wave and N_{145} wave in the study group.

Table-2 shows VEP amplitudes (N_{75}-P_{100} and P_{100}-N_{145}) between two groups. The N_{75}-P_{100} and P_{100}-N_{145} showed a significant decrease in Group B. The 'p' value of N_{75}-P_{100} amplitude was highly significant in both eyes, whereas 'p' value of P_{100}-N_{145} amplitude was significant only in the right eye of study group. Table-1 shows VEP parameters (Latency of N_{75}, P_{100} and N_{145} waves) of right eye and left eye of both groups. The Values are expressed as mean ± Standard Deviation (SD).

Table 1:

VEP Parameters	Group A (Normal) (n=50) (Mean ± SD)		Group B (Cataract) (n=50) (Mean ± SD)		'p' value (<0.05 = significance)	
	Right Eye	Left Eye	Right Eye	Left Eye	Right Eye	Left Eye
N_{75} (ms)	74.01 ± 9.51	75.20 ± 9.52	84.81 ± 6.05	86.81 ± 6.05	0.01	0.001
P_{100} (ms)	103.16 ± 1.59	104.25 ± 1.45	109.35 ± 7.34	111.45 ± 8.54	0.001	0.001
N_{145} (ms)	140.72 ± 6.74	141.73 ± 7.71	148.83 ± 7.71	156.83 ± 12.69	0.83	0.02

Table 2:

VEP wave Amplitude (μV)	Group A (Normal) (n=50) (Mean ± SD)		Group B (Cataract) (n=50) (Mean ± SD)		'p' value (<0.05 = significance)	
	Right Eye	Left Eye	Right Eye	Left Eye	Right Eye	Left Eye
N_{75}-P_{100} (μV)	6.38 ± 1.99	7.53 ± 1.73	4.77 ± 2.35	4.67 ± 2.46	0.001	0.001
P_{100}-N_{145} (μV)	7.35 ± 2.76	6.86 ± 3.18	4.54 ± 2.37	4.94 ± 3.16	0.01	0.08

Table-2 shows amplitudes of N75-P100 and P100-N145 in both the groups.

Discussion

The VEPs consist of a series of waveforms: N_{75}, P_{100} and N_{145}wave latency (in milliseconds) and amplitudes of N_{75}-P_{100} and P_{100}-N_{145} (in microvolts).[2] They are produced by activity of neurons in the brain to visual stimuli. The generation of P_{100} wave is due to activation of primary visual cortex by the discharge of thalamocortical nerve fibers. N_{75} wave reflects the activity of foveal stimulation and originates in Brodmann's area 17. Wave N_{145} is due to stimulation of visual association area 18. [10] P_{100} wave is the most prominent wave that shows even small variation between each individual and even in the same individual with repeated measurement.[3] Many factors affect VEP like age, gender, refractive errors, cataract, glaucoma, optic neuritis and systemic diseases like hypertension and diabetes.[8,9]

In our study N_{75} and P_{100} waves were significantly prolonged in both the eyes. Whereas the latency of N_{145} wave in left eye showed significant prolongation but in right eye it was not statistically significant. The N_{75}-P_{100} amplitude was significantly decreased and P_{100}-N_{145} was also decreased but statistically not significant. These changes in VEP wave pattern in persons with screen time use more than 6 hour per day indicate that it affects the efficiency of processing of visual information.

Conclusion

Based on the study findings, we conclude that the changes in visual evoked potential in persons using screen time more than 6 hours per day were We suggest more electrophysiology research has to be done in the future in to elucidate the precise role of these conditions on visual processing.

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References:

1. Milena F, Andrea H, et al. Impact of adolescents Screen Time and Nocturnal Mobile phone Related awakenings on sleep and General Health Symptoms: A prospective Cohort study. International Journal of Environmental Research and Public Health. 2019; 16:518. Available from: Int. J. Environ. Res. Public Health. 2019; 16: 518.
2. Pal G k, Pravati Pal. Textbook of Practical Physiology. 4th ed. India: Universities press Private Limited; Visual evoked potentials: 2016; Chapter 45:328-331.
3. Misra UK, kalita J. Clinical Neurophysiology. 2nd ed. India: Elsevier publishers; 2006. Chapter 8, Visual evoked potential: 2006;309.
4. Chen et al. Screen viewing behavior and sleep duration among children aged 2 and below. BMC Public Health. 2019; 19:59.
5. Jeon J, Oh S, Kyung S. Assessment of visual disability using visual evoked potentials. BMC Ophthalmology [Internet]. 2012; 36:9.
6. M. Kuba et al. Aging effect in pattern, motion and cognitive visual evoked potentials. Vision Research [Internet]. 2012; 62:9-16.
7. Ruby Sharma et al. Visual evoked potentials: Normative values and Gender differences. Journal of Clinical and Diagnostic Research [Internet]. 2015; 9(7):cc12-cc15.
8. Anju T J, Parveen S Y, Swarna B G. Effect of myopia on visual evoked potential. IOSR Journal of Dental and Medical Sciences [Internet]. 2015;14(4):49-52.
9. Jeffrey Froehlich, David I. Kaufman. Effect of Decreased Retinal Illumination on simultaneously recorded Pattern Electroretinogram and Visual-Evoked Potentials. Investigative Ophthalmology and visual science [Internet]. 1991; 12 (2):310-318.
10. 10/20 System Positioning Manual. Trans cranial Technologies [Internet]. Trans Cranial technologies ldt, Hong Kong. 2012. Available from: www. transcranial.com.