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Effect Of Noise On Visual Evoked Potential.

Dr. Vijay B. S. Gaur[1] , Dr. Anju Thakur Jha[2]

Department of Physiology , L. N. Medical College & Research Center, Bhopal. M.P.
1. Associate Professor Department of Physiology LN MC & RC .
2. PG in Physiology LN Medical College & Research Center.

Corresponding author – Dr. Vijay B. S. Gaur, Associate Professor Department of Physiology LN MC & RC, Bhopal, M.P., e-mail – vijaypma@gmail.com

Abstract –

Objective – Latency N75 ,P100 and amplitude N75-P100 of recording is affected by various variables like age, refractive errors, eye dominance, sex hormones and the environmental atmosphere. So we tried to evaluate the effect of noise on VEP by using LED goggle as stimulation source.

Method – We studied 200 (F=(98 & M=102) healthy volunteers between age 17-22yrs of both sex after fulfilling the exclusion criteria. VEP was recorded for both eye at rest then with noise by a ringing bell placed 10cm from external auditory meatus during recording of VEP of both eye one by one. Evaluation of results done.

Result – We found that there was change in latency of N75 and P100 but not statistically significant but there was change in amplitude of N75-P100 for right eye p-Value is 0.0030 and for left eye p-Value is 0.0380 which is statistically significant.

Conclusion – The activation of exogenous attention system can change the amplitude response while performing VEP. Result of this study favors that while recording VEP room should be free of disturbing sound and patients are not to be distracted by the examiner too.

Key- words – VEP, Latency of N75 and P100, Amplitude N75-P100, Noise.

Introduction

Composers working with sounds and moving images are immediately confronted with a paradox. Audio visual materials appear to offer the possibility of complementing one another – of forming a highly effective means of communicating artistic ideas but they appear to carry the risk of distracting from one another[1].Test for visual field gives the assessment of the integrity and function of the retinal and early afferent visual pathways. But this is an unreliable and poorly repeatable as well as time consuming method. Special populations with cognitive impairment frequently have difficulty in performing with conventional subjective approaches to visual field testing. Some may have fixational eye movement deficit and cannot maintain accurate central fixation for sufficient period of time. The visual evoked potential method circumvent to a considerable extent all of the above potential problems involved in conventional visual field testing [2]. The input to primary sensory cortex evokes a characteristic response, it can be modified by concurrent

stimulation of another sensory modality. Most of this interaction occurs in higher (association) areas of the cortex, but multi-model neurons have been described close by or even with in the primary areas that receive direct input from the thalamic nuclei. When a subject views a visual stimulus paired with a brief click, a second click, occurring ˜60ms later produces the sensation of a second stimulus. It is thought to be developed in higher visual centers or could be due to feedback from the more anterior visual centers to primary cortex. But if excitation by the different modalities are independent , when the response to a combined auditory and visual stimulus has subtracted from it the responses to the isolated auditory and visual stimuli, there should be no residual voltage [3]. Several psychophysical studies have also provided evidence for modulation of visual perception still remains largely with-in the realm of phenomenology, and the underlying mechanisms are not extensively studied nor understood. It is not clear at what level of perceptual processing these cross model effects take place. These interactions may occur at early/late visual areas, or at poly-sensory associative cortical areas [4]. Some researchers say that the pattern reversal visual evoked response has been defined as a reproducible cortical response upon stimulation of the eyes. This response depends on the intensity of the stimulus and distance from the eyes and is not affected by simultaneous tactile or auditory stimulation [5]Present study is to find the effect of auditory stimulus given simultaneously at the time of VEP and to restate the hypotheses that noise can modulate the VEP recording thus auditory stimulation can affect the visual processing.

Materials & Method

This study was carried out in Department of Physiology (Neurophysiology laboratory) in L.N.Medical College and Research Center, Bhopal. 200 healthy candidates (F=98 & M=102) were enrolled for the study after approval from Institutional Ethical committee. Candidates were aged between 17yrs -21yrs of both sex.

Exclusion criteria for selection of the candidates were

H/O eye surgery

Color-blindness.

H/O seizures.

Candidates on anti-depressants.

Device used for recording of VEP was EMG Octopus by Clarity Medical Private Limited ISO9001 & ISO13485.

Daily 5-7 candidates were called for recording between 10AM to 1PM.

All subjects were instructed for –

- Washing of hairs to make hairs oil free and not to apply oil or any type of lotion before test.
- To take good sleep and normal meal.
- To remove contact lenses during procedure.

Technical setting for recording of VEP used was –

Channels –

- Active – Mid-Occiput - Oz.
- Reference – Mid Frontal - Fz.
- Ground – On hair line of fore-head - Cz.

Band Pass –

- Low Filter = 2Hz.
- High Filter = 200 Hz.

Number of epochs given = 200.

Rate of stimulation was 2Hz.

After fulfilling exclusion criteria and history and examination along with written consent candidate was asked to sit on a comfortable chair facing in opposite direction from the recording monitor. Candidate was well informed about the procedure. Electrodes were placed with the gel over the positions mentioned above after cleaning the area before hand.LED goggle has been worn to the candidate and impedance check was done which was maintained below 5KΩ. Stimulation was given to eyes one after another at above mentioned rate and epochs. VEP recording was done first at rest then after half an hour interval recording of VEP was started for one eye and after 50 epochs a bell, which was kept about 10cm from ipsilateral external acaustic meatus, started ringing till 200 epochs. Recording done for both eyes one by one.

Statistical analysis done by using two tailed independent Student t-test to find the significant difference of the basic characteristic of both eyes of both groups. Software used for analysis was Graph-pad Online Calculator and JMP software. Microsoft word and Microsoft excel have been used to generate tables and graphs.

Result –

Normative value for latency of P100 for LED goggle recording is 87.3ms (as per manual of device).

Table No – 1

Right N75 (ms)		
	At rest	During noise
Mean	64.254	63.733
SD	11.586	11.917
SEM	0.819	0.843
N	200	200
p-Value 0.6539 not statistically significant.		

Table No – 2

Right P100 (ms)		
	At rest	During noise
Mean	87.045	88.007
SD	12.860	13.973
SEM	0.909	0.988
N	200	200
p-Value 0.4253 not statistically significant.		

Table No – 3

Right N75-P100 amplitude (µV)		
	At rest	During noise
Mean	0.852	0.715
SD	0.672	0.577
SEM	0.048	0.041
N	200	200
p-Value 0.0030 statistically significant.		

Table No– 4

Left N75(ms)		
	At rest	During noise
Mean	68.104	66.981
SD	13.619	12.621
SEM	0.963	0.892
N	200	200
p-Value 0.3616 not statistically significant.		

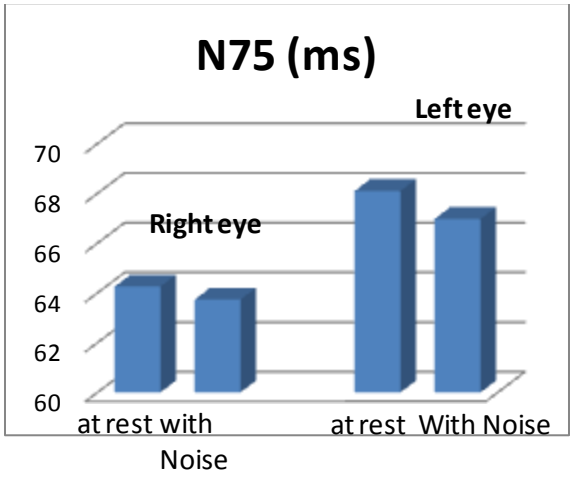
Table No – 5

Left P100(ms)		
	At rest	During noise
Mean	91.678	91.811
SD	17.978	15.302
SEM	1.271	1.082
N	200	200
p-Value 0.9339 not statistically significant.		

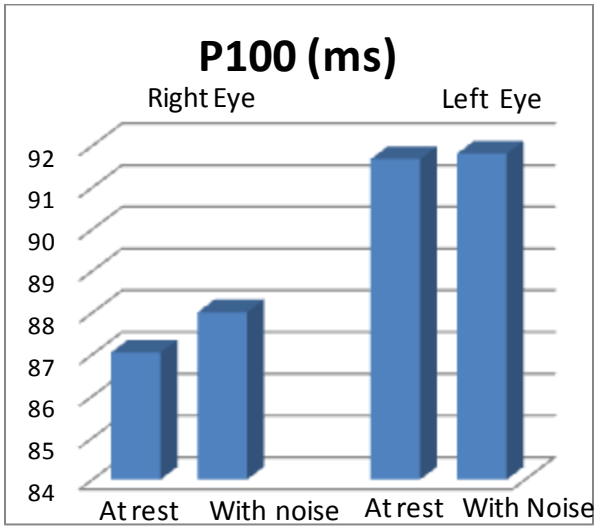
Table No. – 6

Left N75-P100(µV)		
	At rest	During noise
Mean	0.706	0.629
SD	0.468	0.510
SEM	0.033	0.036
N	200	200
p-Value 0.0380 statistically significant.		

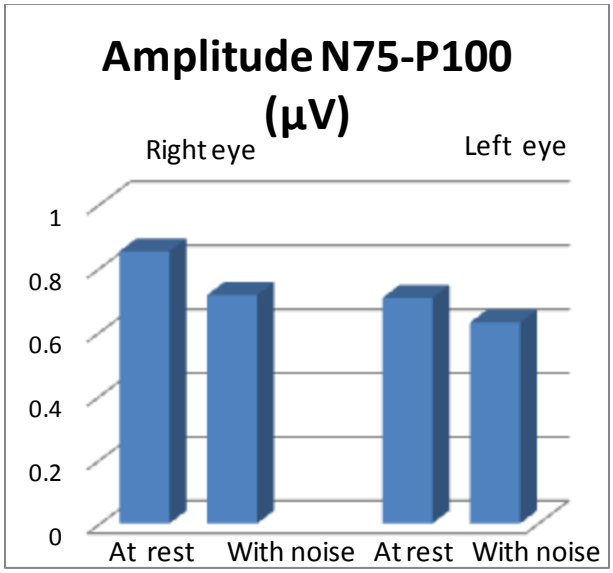
Graph – 1



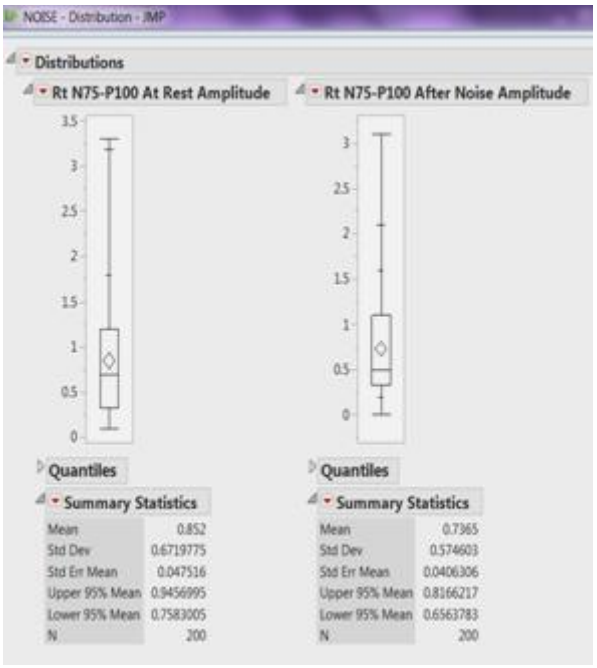
Graph – 2



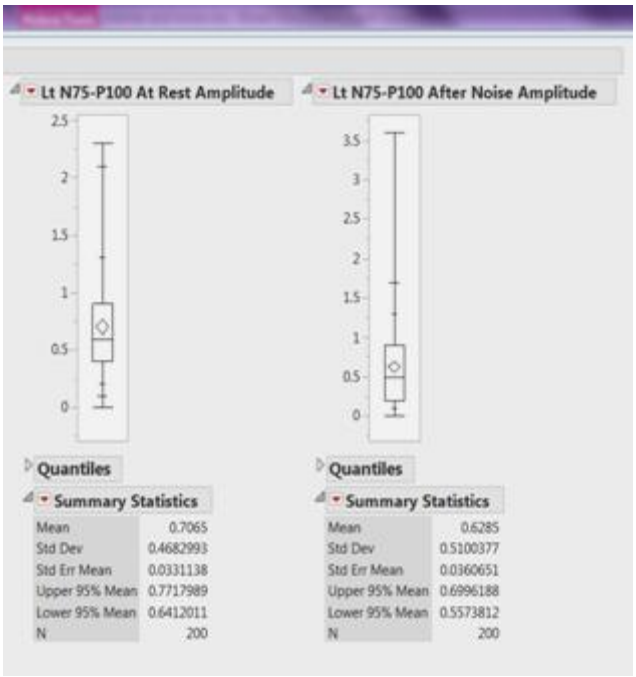
Graph – 3



Graph – 4



Graph – 5



Discussion –

In study of effect of noise while recording of visual evoked potential showed that there was no significant difference in conduction as there was no significant change in the latency of N75 and P100 both. It is supported by study done by Sawaya R et al when they studied with pattern reversal evoked response with song listening.

There was no effect on latency or amplitude . On contrary in this study significant changes in amplitude has been observed [5]. Oray S supported that the pairing of auditory noise burst with visual stimulus has been shown that there was reduction in amplitude [7]. G. B. Arden's showed by his study that if visual stimulus is paired with a brief click there was visual illusion recorded in evoked cortical response. They had supported that only click has not given any activity at visual area but click paired with pattern stimulation modified the evoked response. Though those changes were of less amplitude[3]. Ladan Shams had quoted about his study that there was modulation in visual evoked potentials when compared in absence and in presence of sound [4]. Information processing in auditory and visual modalities interact in many circumstances. Spatially and temporal co-incident acoustic and visual information are often bound together to form multisensory percepts [8]. Claudia Amezcua also gave the findings that fast tempi music induced faster stimuli evaluation than the slow tempi music.[9]

Conclusion –

The activation of exogenous attention system can change the amplitude of response while performing VEP. Sound activate thalamo-cortical input can rapidly produce extra activity in primed visual cortex. Information processing in auditory and visual modalities interact to each other and affecting the response. By this study it is been concluded that at the time of recording of VEP distraction by noise can change the amplitude which shows that visual perception is not working as single modality and it can be affected by other input to the brain. Thus recording of VEP should be done in room which is noise free and patients are not to be disturbed by any type of sound.

References –

1. John Coulter. Electroacoustic Music with Moving Images: the art of media pairing.Cambridge Journals online 2010Apr, Volume 15, issue 01 : pp 26-34.
2. Naveen k Yadav, Diana P. Ludlam, Kenneth J Ciuffreda. Effect of different stimulus configuration on the visual evoked potential(VEP). Doc. Ophthalmol, published online ; March 2012.
3. G. B. Arden, J. E. Wolf, C Messiter. Electrical activity in visual cortex associated with combined auditory and visual stimulation in temporal sequences known to be associated with a visual illusion, Vision Research Vol.43,issue 23,October 2003: pp 2469-2478.
4. Shams, Laden , Kamitani. Sound alters visual evoked potentials in humans. Cognitive Neuroscience and Neuropsychology; Dec 2001. Vol.12 issue 17: pp 3849-3852.
5. Sawaya R, Kanso MI. sound listening does not affect pattern reversal visual evoked potentials. Ann Saudi Med. 2012 may-june;32(3):293-5.
6. L Shams, S. Iwaki, A Chawla, J Bhattacharya.Early modulation of visual cortex by sound : an MFG study, Neuroscience letters, April2005, Vol. 378 ; issue 2: pp 76-81.
7. Oray S, Lu ZL, Dawson ME. Modification of sudden onset auditory ERP by involuntary attention to visual stimuli, International Journal of Psychophysiology, Mar 2002;43(3):213-24.
8. Tobias S. Anderson ,Kaisa Tiippana, Milko Sams. Factors influencing audiovisual fission and fusion illusions, Cognitive Brain Research . Nov 2004,Vol. 21(3):301-308.
9. Claudia Amezcua, Miguel Angel Guevara & Julieta Ramosloyo. Effects of Musical Tempi on visual attention Erps. International Journal of Neuroscience, 2005; Vol115(2):196-206.