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TO STUDY THE EFFECT OF YOGA NIDRA ON COGNITIVE FUNCTIONS BY RECORDING P3 AND N2 LATENCY IN MEDICAL STUDENTS.

Itika Singh[1], Beena*[2] and Harminder Singh[3]

[1]Demonstrator, Dept of Physiology, B.P.S. Government Medical college for Women, Khanpur kalan, Sonipat,
[2]Professor, Dept of Physiology, Pt. B.D.Sharma PGIMS, Rohtak.
[3]Specialist, Government Regional Hospital, Rohtak.

***Corresponding Author: Beena**
Professor, Dept of Physiology, Pt. B.D.S, PGIMS, Rohtak,

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ABSTRACT

Introduction- Yoga meaning union or one pointed awareness and Nidra meaning sleep. Yoga nidra has been further proven to be the safest and surest methods to alter state of consciousness in humans.Cognition is obtaining, organizing and using intellectual knowledge. It is a sequence of mental operations involving input and storage of information along with recalling and processing relevant information from stored memory. Cognitive functions can be assessed by event related potential. **Material and method**-Study was conducted in Physiology department; Pt. B.D. Sharma PGIMS, Rohtak. Study included 30 healthy medical students in age group of 18-20 years who served as their own controls. **Observations**- In males and females P3 and N2 latency was very highly significantly reduced ($p<0.001$) in both ears after yoga nidra practice. **Discussion**-Latency of P3 and N2 waves offers insight into cognitive events leading to stimulus engagement and response selection. Female subjects showed decreased latency both before and after yoga nidra practice. Our results suggested that practice of yoga nidra leads to improvement in cognitive functions. This improvement could be due to deep relaxation during yoga nidra. **Conclusion**- Latency of P3 wave decreased remarkably after yoga nidra practice. This indicated an improvement in time taken to identify and process stimuli. Latency of N2 wave also decreased in subjects post practice. This indicated improvement in response selection.

KEYWORDS-*Yoga nidra, Cognition, Event related potential, P3, N2 latency.*

INTRODUCTION

Yoga nidra or "Yogic sleep" is a sleep-like state which yogis experience during their meditation. Yoga meaning union or one pointed awareness and Nidra meaning sleep.[1] In the practice of yoga nidra the body sleeps but the mind remains awake listening to the instructions. The main principle behind yoga nidra is deep relaxation of mind. It has been found useful in both acute and chronic conditions, especially in degenerative and stress related conditions such as hypertension, coronary disease and arthritis.[2,3] It has wide spread application as a preventive measure, to be practiced by healthy, active people as a means of relieving accumulated tensions, increasing stress resistance and overall efficiency, and preventing the development of psychosomatic diseases.[4] Yoga nidra has been further proven to be the safest and surest methods to alter state of consciousness in human beings. Cognition is the process of obtaining, organizing and using intellectual knowledge. It is a sequence of mental operations involving input and storage of information along with recalling up and processing relevant information from stored memory. Cognitive dysfunctions are characterized by the development of a range of intellectual and other mental defects, such as progressive loss of memory, disorientation in space and time, loss of autonomy and emotional depersonalization.[5] Cognitive functions can be assessed by evoked potential e.g. event related potential (ERP). Any adequate and specific stimulus given to a sensory organ evokes action potentials in the sensory pathways which could be recorded by placement of suitable electrodes at different sites of their afferents.[6] Endogenous stimuli elicit event-related potentials (ERPs) which require attention and patient's cooperation. They have longer latency, higher amplitude, lower waveform and are not influenced by frequency and intensity of stimuli.[7] The most prominent ERP components observed in the studies of selective attention, using the auditory oddball paradigm are, N100, P200, N200, P300, with peak latencies at about 100, 150, 200, and 300 ms after stimulus onset, respectively. There are two negative (N1, N2) and two positive (P2, P3) waves. With frequent tone, a negative N1 – positive P2 vertex potential is seen. With rare stimulus, a negative N1 – positive P2 – negative N2 – positive P3 complexes are seen.[8] The subject is asked to mentally count the number of target

stimuli. P3 latency increases systematically with the increase in cognitive dysfunction; therefore it has been used as an objective electrophysiological index for the assessment of the degree of cognitive dysfunction.

P3 has parietocentral scalp distribution and appears when subject pays attention to the stimuli. It appears in response to task relevant stimulation and its latency is sensitive to the cognitive events initiated by a stimulus and not to its physical characterstics. This wave recorded from scalp represents the summation of the different generators in response to sensory stimulus. N2 is negative component which is mainly seen over anterior scalp area.[9] It shows regulatory cognitive control and has been employed these days in the study of speech with production and processing of the language.[10] N2 component of event related potential depicts identification of the stimulus, attention variation, reducing stereotypical responses and mismatch detection.[9,11] Different areas of brain such as inferior parietal lobule, frontal lobe, hippocampus, medial temporal lobe, insula and other limbic structures have been reported to contribute to scalp recorded P3. [12] The latency increases as the discrimination of task becomes harder.[13]

MATERIAL AND METHOD

The present study was conducted in the department of Physiology; Pt. B.D. Sharma PGIMS, Rohtak. The study included 30 healthy, volunteer medical students in the age group of 18-20 years. The group of 30 students comprising of 16 males and 14 females served as their own controls.

Type of study: Prospective cohort study.

Inclusion Criteria

- The students residing in hostel were included in the study so that they had similar daily activities and common stressors.
- No history of any major illness.
- No previous exposure to yoga practice.
- Willingness and motivation to participate in the study.

Exclusion Criteria

- No history of any medical disorder which could affect cognitive functions.
- No history of any drug intake or alcohol.

Instructions to the participants- They were instructed to practice yoga nidra at a fixed time, in comfortable clothing and on empty stomach daily. P3 and N2 latency was recorded before and again after 3 months of yoga nidra.

Instrument used: EMG EP MK II equipment.

Steps in yoga nidra practice

Preparation (shavasna with closed eyes), sankalpa (clear, determined, positive), rotation of consciousness over different body parts in organized manner (starting from right humb and ending up in little toe of right foot, following same sequence on left side followed by back from heels to back of head and lastly on front, from forehead to face to legs), awareness of breath (in nostrils, chest movements, entry and exit of air between naval and throat), visualization (of some objects, stories, random scenes), sankalpa repeated again and ending up of practice by asking subject to focus on external environmental sounds and persons, slowing moving body parts, stretching body and opening of eyes. [14]

OBSERVATIONS

The study was conducted in Department of Physiology Pt. B.D. Sharma University of Health Sciences, Rohtak. The study was carried out on 30 medical students in the age group of 18-20 years who practiced YN for 3 months at a fixed time for 45 minutes. Out of 30 students 16 were males and 14 were female subjects. Table I and figure 1 show the effect of yoga nidra practice on the latency of P3 wave. After practice in males the P3 latency was reduced from 337.63±19.021 ms to 305.98±25.596 ms in left ear and from 331.88±22.792 ms to 299.15±21.483 ms in right ear. This reduction was found to be statistically very highly significant ($p<0.001$). Similarly in females after yoga nidra practice P3 latency got reduced to 294.62±31.351 ms from 329.86±18.236 ms in left ear and to 286.89±28.659 ms from 318.2±28.756 ms in right ear. This reduction was found to be statistically very highly significant ($p<0.001$). Similar results were obtained in all the subjects where the latency decreased from 334.00±18.755 ms to 300.68±28.508 ms in left ear and 325.49±26.222 ms to 293.43±25.410 ms in right ear after the relaxation session. This reduction came out to be statistically very highly significant ($p<0.001$). Table II and figure 2 show values of latency of N2 wave before and after the practice in both ears. In males, after yoga nidra practice the N2 latency was reduced from 238.08±36.395 ms to 201.55±27.914 ms in males in left ear ($p <0.01$, highly significant) and from 256.46±28.104 ms to 219.83±15.845 ms in right ear ($p<0.001$, very highly significant). In females, N2 latency in left ear was reduced from 242.41.31±37.201 ms to 208.31±36.609 ms ($p<0.001$, very highly significant) and from 255.42±29.183 ms to 226.92±28.605 ms in right ear ($p <0.001$, very highly significant) after yoga nidra. The mean value of N2 wave latency for all subjects showed similar effect of yoga nidra with reduction from 240.10±36.198 ms to 204.70±31.869 ms in left ear ($p<0.001$, very highly significant) and from 255. 98 ± 28.117 ms to 223.14±22.574 ms in right ear ($p<0.001$, very highly significant), respectively.

DISCUSSION

The study was carried out in the department of Physiology in Pt. B.D. Sharma, PGIMS, Rohtak. A total

of 30 healthy, volunteer medical students (16 males and 14 females) of age group 18-20 years were included in the study. They practiced yoga nidra daily at a fixed time for 45 minutes for a period of 3 months. Event related potential (ERP) was recorded before and after yoga nidra and changes in latency of P3 and N2 waves were compared and analyzed. Latency helps to evaluate the speed of discrimination of one event from another. It is basically an indicator of processing time.[10] Therefore, latency of P3 and N2 waves offers insight into cognitive events leading to stimulus engagement and response selection. Female subjects showed decreased latency both before and after yoga nidra practice when compared to males. Polisch found that latency increases as the discrimination of task becomes harder.[13] A study by Golob EJ found that P300 latency was significantly longer in mild cognitive impairment.[15] Our results suggested that practice of yoga nidra leads to an improvement in the cognitive functions. This improvement could be due to the deep relaxation achieved during yoga nidra practice. Study by Duncan CC and Donchin E suggested a relation between P3 component variability and alpha waves in EEG.[11] Literature survey reveals some studies indicating a gender difference in cognitive and neurological processing with females showing better results.[16] Studies have reported decreased latency in females than males where P3 component was considered.[16,17] Females have improved cortical processing associated to stimulus, working memory and better activation of certain areas of the brain even during stress. So, may be that's why yoga nidra practice led to improved results for females subjects. Further studies are needed to explore the gender differences and their reasons.

Table I- Latency of P3 wave (ms) before and after yoga nidra practice.

		Before	After	P value
Males	**Left ear**	337.63±19.021	305.98±25.596	<0.001
	Right ear	331.88±22.792	299.15±21.483	<0.001
Females	**Left ear**	329.86±18.236	294.62±31.351	<0.01
	Right ear	318.2±28.756	286.89±28.659	<0.001
Total	**Left ear**	334.00±18.755	300.68±28.508	<0.001
	Right ear	325.49±26.222	293.43±25.410	<0.001

Table II-Latency of N2 wave (ms) before and after yoga nidra practice.

		Before	After	P value
Males	**Left ear**	238.08±36.395	201.55±27.914	<0.01
	Right ear	256.46±28.104	219.83±15.845	<0.001
Females	**Left ear**	242.41±37.201	208.31±36.609	<0.001
	Right ear	255.42±29.183	226.92±28.605	<0.001
Total	**Left ear**	240.10±36.198	204.70±31.869	<0.001
	Right ear	255.98±28.117	223.14±22.574	<0.001

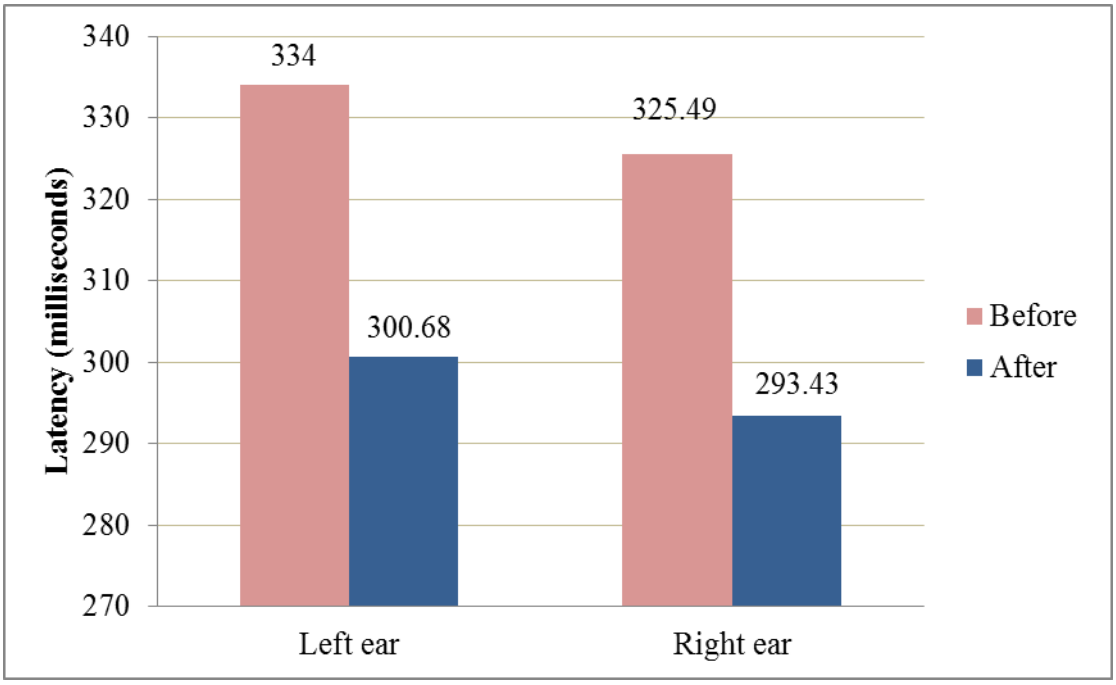

Figure 1. Mean latency of P3 wave in left and right ears before and after yoga nidra.

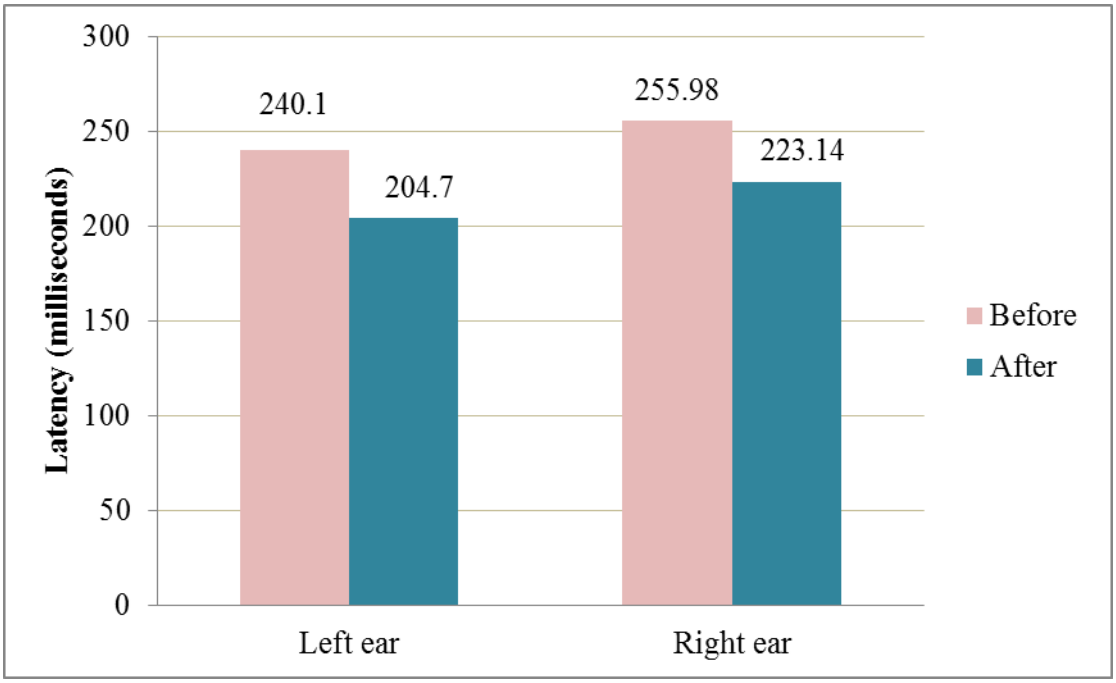

Figure 2. Mean latency of N2 wave in left and right ears before and after yoga nidra.

CONCLUSION

Latency of P3 wave decreased remarkably after YN practice for all subjects. This indicated an improvement in time taken to identify and process the stimuli. Latency of N2 wave also decreased for all subjects post YN practice and this change was also very highly significant. This indicated an improvement in response selection.

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REFERENCES

1. Saraswati SS. Yoga Nidra. 6th ed. Munger (India):Yoga Publication Trust, 2012.
2. Stone RA, De LJ. Psychotherapeutic control of hypertension. N Engl J Med, 1986; 294: 80-4.
3. Orth GK, Ahlbom A, Theorell T. Impact of pattern: A behavior on ischaemic heart disease when controlling for conventional risk indicators. J Hum Stress, 1980; 6: 6-13.
4. Carrington P, Collings G, Benson H. The use of meditation–relaxation techniques for the management of stress in a working population. J Occup Med, 1980; 22(4): 221-31.
5. William H, Francoise F, Marie LS, Ji GW, Jan A. Blood pressure, cognitive functions and prevention of dementia in older patients with hypertension. Arch Intern Med, 2001; 161: 152-6.
6. Tandon OP. Average evoked potentials-clinical applications of short latency responses. Indian J Physiol Pharmacol, 1998; 42: 172-88.
7. Misra UK, Kalita J. Clinical Neurophysiology. 3rd ed. Gurgaon: Reed Elsevier India Pvt. Ltd, 2014.
8. Goodin DS, Micheal JA. Electrodiagnosis in clinical neurology. 4th ed. New York: Churchill Livingstone, 1999.
9. Hoffmann JE. Event-related potentials an automatic and controlled processes.In:Rohrbaugh JW, Parasuraman R, Johnson R Jr,editors. Event related brain potentials.New York:Oxford university press, 1990; 145-57.
10. Duncan CC. P300 latency: A new metric of information processing.Psychophysiol, 1981;18: 207-15.
11. Duncan CC, Donchin E. The P300 component of the event-related potential as an index of information processing. Biol Psychol, 1982; 14: 1–52.
12. Duncun CC, Kosmidis MH, Mirsky AF. Event-related potential assessment of information processing after closed head injury. Psychophysiol, 2003; 40(1): 45-59.
13. Polisch J. Task difficulty, probability, and inter-stimulus interval as determinants of P300 from auditory stimuli. Electroencephalogr Clin Neurophysiol, 1987; 68: 311.
14. Singh H, Singh I, Yadav M. Fundamentals of Medical Physiology.1st ed.New Delhi: Elsevier India Pvt. Ltd, 2018. Chapter 96,Topics of special interest; p:695.
15. Golob EJ, Johnson JK, Starr A. Auditory event-related potentials during target detection are abnormal in mild cognitive impairment. Clin Neurophysiol, 2002; 113(1): 151–61.
16. George MS, Kelter TA, Parekh PI, Herscovitch P, Post RM. Gender differences in regional cerebral blood flow during transient self induced sadness or happiness. Biol Psychiat, 1996; 40(9): 859-71.
17. Deldin PJ, Duncun CC, Miller GA. Season, gender, and P300. Biol Psychol, 1994; 39: 15-28.