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Immediate effect of yoga Nidra on EEG alpha rhythm of badminton players

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Abstract

Practice of Yoga Nidra is one of the best practices for physical and mental relaxation and have an impact on both physiology and psychological relaxation. This physiology and psychological relaxation is stated in alpha rhythmic state which is favourable for central and peripheral recovery of the sports person's best performances. The aim of the study was to investigate the immediate effect of Yoga Nidra on the pattern of Alpha amplitude after physical activity of sports person to enhance the psychological stress and physical relaxation. 22 (twenty-two) healthy advance badminton players aged ranged from 18-24 (male) were selected from badminton randomly from LNIPE, Badminton Match Practice Group and randomly placed into experimental and control group (11 each). Alpha amplitude was measured in Neurofeedback machine before and after the 30 minutes training session of Yoga nidra (progressive muscle relaxation followed deep relaxation with breathing awareness). ANCOVA was employed at 5% level of significance to analyze the data. Finally, Alpha amplitude was significantly increased ($p < 0.007$) after the Yoga Nidra session. So, it has been concluded that Yoga Nidra has the positive and immediate effect in central and peripheral relaxation by altering the parasympathetic and endocrinological system which aids to reduce the stress and anxiety of the athlete.

Keywords: EEG alpha amplitude, neurofeedback, yoga nidra

Introduction

Now a day Sports have been playing an increasingly important role in the society with scientific investigation to attain excellence of performance. Yoga have been used as a method to reduce stress and for faster recovery in exercise and fitness training. The practice of yoga not only help to keep the physical body healthy, supple and strong in the sense of all physiological functioning but also confirm the mental activities that help to develop attention and concentration and stimulate the creative abilities which helps to enhance the sports performance of sports man. Yoga helps to keep the body strong clear away all the mental modification enhancing the total recovery. Stress and anxiety all guided by the complex process of mind which is a psychological phenomenon and have an impact on physiological imbalanced functions.

Practice of yoga Nidra is one of the best practices for physical and mental relaxation also have the impact on both physiology and psychology (Saraswati, 1998) [1]. Yoga Nidra helps to enhance the relaxation ability and control the psychological factors. Studies shown that various neurophysiologic changes on cognition, hormonal, and autonomic systems have been operated while meditating. Evidences reveal the positive effects of meditation and Yoga Nidra as it increases the level of monoamines, parasympathetic activity, and grey matter density of brain regions (reflecting emotion regulation) and reduces oxidative effects (Kaur C. and Singh, P., 2015) [2].

Several studies demonstrated that long time regular Yoga Nidra have the effect in significant decrease in different physiological anxiety (Mangalteertham, 1998; Deepa T. *et al.*,) [4, 8]. Yoga Nidra also used with pranayama for reducing stress and anxiety of normal people resulting the alpha dominance and galvanic skin response (Kumar, K. and Joshi, 2009) [5]. After continues practice for 12 months Yoga Nidra training have an impact in reduction of blood pressure and Alpha- EEG in hypertensive patients (Amornpan, A. *et al.*, 2018) [3]. During the waking state with closed eyes the alpha wave range is dominant and indicates conscious attention and relaxation. Alpha is strongest over the occipital cortex and also over the frontal cortex when

the person is alert with relaxed mind and mainly responsible for creative solution to a problem and mental work but not actively processing information. Enhanced synchronised alpha rhythm from the brain are usually associated with meditation that mainly responsible for all sense of relaxation and fatigue. This relaxed alpha rhythmic state is favourable for central and peripheral recovery of the sports person's best performances.

So, this study was investigated the immediate effect of Yoga Nidra on the pattern of Alpha amplitude after physical activity to enhance the psychological stress and physical relaxation. It was hypothesized that there would be significant effect difference of mean alpha amplitude between Yoga Nidra (experimental) and control group.

Methods and materials

Subjects

22 healthy advance badminton players aged ranged from 18-24 (male) were selected from badminton using simple random method techniques (as the group was homogenous) from LNPE, Badminton Match Practice Group and again randomly placed into experimental and control group (11 each) by numbering them up randomly in even (experimental) and odd number (control group).

Variables and design of the study

For the purpose of the study alpha rhythm spectrum was analysed of the badminton player immediately after the Yoga Nidra training. Pre-test-post-test randomized group design was used (Shown Figure 1). Subjects were tested immediately after the badminton match in the Neurofeedback machine and again tested after 30 minute of training intervention immediately of both the groups (experimental and control group).

Criterion measures: EEG Alpha Amplitude was recorded in Neurofeedback machine. Neurofeedback is a type of biofeedback which help to record the brain's electrical activities and to change the electrical activity of brain by getting the real time feedback activity from the machine.

Training protocol

Yoga nidra with guided imagery was given for 30 mins to the subjects of experimental group immediately after the badminton match. First the subjects of experimental group were asked to lie down in shavasana. Then the subjects were instructed by the researcher for progressive muscle relaxation by continuous muscle contraction and relaxation followed by deep relaxation with abdominal deep breathing awareness (Guided imegery). Group of muscles tension were scanned by

progressive muscle contraction and relaxation. Stretching and passive relaxation was given to the control group.

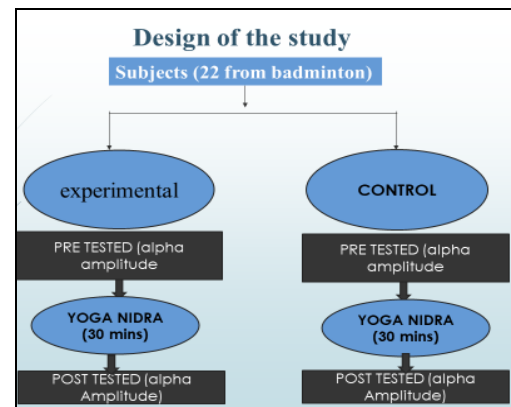


Fig 1: Layout of the pre-test post-test Experimental research design

Administration of the test

Subjects were immediately seated for recording the alpha rhythm after badminton match. After best of five matches the data were collected from the subject in Neurofeedback machine one by one. First the student were asked to sit in very comfortable position in the chair and EEG electrodes were placed in patient's head. First the ground electrode was placed with the help of EEG mud paste gel in ear lobe region of forehead and E1 and E2 Were placed at O1 and O2 position of posterior head.

To remove the artifact of EEG data, ensure that actual value of EEG data should be less than or covered by under the selected sensitivity $50 \mu\text{V}$ and positive response limiter was set between the value of base and higher value. After setting all the protocols neurofeedback test was run of 2 minutes which is consist of 2 rounds (1 minute in each round). The recording done by pressing the 'start' button and after 2 minutes of test the data spectrum of alpha amplitude was displayed on the screen in μV . After 30 minutes of yoga nidra intervention the subjects were again tested in the same testing protocol.

Statistical analysis

ANOCVA was employed at 5% level of significance to analyze the result as the pre-test-post-test randomized group design was used by using SPSS 20.

Results

After applying the ANCOVA test it was found that the mean value and SD of experimental and control group were 36.21 ± 6.27 and $30.17 \pm 6.01 \mu\text{V}$ respectively (table 1).

Table 1: Descriptive Statistics of Alpha rhythm spectrum of both groups

Yoga Nidra Treatment Group	Mean	Std. Deviation	N
Experimental Group	36.21	6.28	11
Total	30.16	6.02	11
	33.19	6.75	22

Table 2: ANCOVA table for the data alpha amplitude of different groups

Dependent Variable: post alpha					
Source	Type I Sum of Squares	df	Mean Square	F	Sig.
Pre_alpha	479.112	1	479.112	28.234	.000
yoga_nidra	155.324	1	155.324	9.153	.007
Error	322.417	19	16.969		
Corrected Total	956.853	21			

a. R Squared = .663 (Adjusted R Squared = .628)

Table 2. Shows the F-value computed for alpha amplitude is significant because p-value is less than 0.05, ($p < .007$). Thus, the null hypothesis is rejected.

Table 3: Pairwise Comparisons between Experimental and Control Groups

(I) yoga nidra	(J) yoga nidra	Mean Difference (I-J)	Std. Error	Sig.
treatment group	experimental group	5.331*	1.762	.007
experimental group	treatment group	-5.331*	1.762	.007
Based on estimated marginal means				
*. The mean difference is significant at the .05 level.				

As the F-statistics is significant, effect of pair-wise comparison between two treatment groups has shown in table 4. Yoga Nidra group has shown significant effect ($p < 0.007$)

with mean and SD $36.21 \pm 6.27 \mu\text{V}$ than control group $30.17 \pm 6.01 \mu\text{V}$.

Table 4: Adjusted Value of Alpha Amplitude in both The Groups

Yoga Nidra	Mean	Std. Error	95% Confidence interval	
			Lower Bound	Upper bound
treatment group	35.856 ^a	1.244	33.252	38.460
experimental group	30.524 ^a	1.244	27.920	33.128

a. Covariates appearing in the model are evaluated at the following values: Pre_alpha = 27.6409.

The mean of Alpha has been obtained in all groups after adjusting for the covariate (pre alpha amplitude). The effect of co-variate or pre alpha mean is eliminated in comparing the effectiveness of treatments on the criterion variables.

S., Matias, JP. *et al.*, 2007) [6]. The neurobiological changes occur due to yoga can also have implications on mood, anxiety.

During meditation and mindfulness practice alpha activity increased in the beginning and theta activity towards the end of meditation practice is appeared. In yoga nidra parasympathetic nervous system is activated and decrease the desynchronized activities of cerebral cortex. High and slow Alpha amplitude is appeared when parasympathetic nervous system is activated as brain functions and thought processing are eliminated. Furthermore, during relaxed wakefulness, the human brain exhibits pronounced rhythmic electrical activity with highest power in the alpha frequency band (Desai, R., *et al.*, 2015) [10]. In Yoga Nidra alpha activity beta waves are replaced by slow synchronized alpha wave and also reduces the physical and mental anxiety (Kamakhaya, 2008) [7]. High amplitude slow alpha rhythm is raised in closed eyes which enhance the relaxation of conscious mind.

The observed increase in alpha-band rhythms may be associated with a decrease in cortical activity with associated increase in signalling from the thalamus, which may be associated with stress-reduction and deep relaxation (Tellus, S. *et al.*, 2009) [9]. Neural oxygen consumption also increases in slow and deep abdominal breathing which enhance the slow alpha rhythm (Raghuuraj, P.; Ramakrishnan, AG. *et al.* (1998) [14]. Slow and deep breathing are known to increase the parasympathetic tone and are associated with a calm mental state (Kaushik, *et al.*, 2006) [11] and periods of slow-electroencephalogram (EEG) frequencies (Novak, Lepicovska, & Dostalek, 1992) [12].

Moreover, during yoga nidra parasympathetic system is activated and cortisol hormone (responsible for stress) releases from the hippocampus of the brain is decreased resulting the physiological and mental fatigue and stress (Morse, Donald, 1993) [13]. During Yoga Nidra dopamine secretion increases associated with parasympathetic activation which is mainly responsible for relaxation (Kjaer, T. W., Bertelson, C., *et al.*, 2002).

Thus, Yoga Nidra enhance the alpha activity by eliminating the thought process and driving the consciousness in one direction which results in the mental and physical and physiological relaxation of the athletes. This is how regular practice of Yoga Nidra can enhance the performance of the athletes as the high alpha amplitudes make the athletes more calm, relaxed and focused but alert.

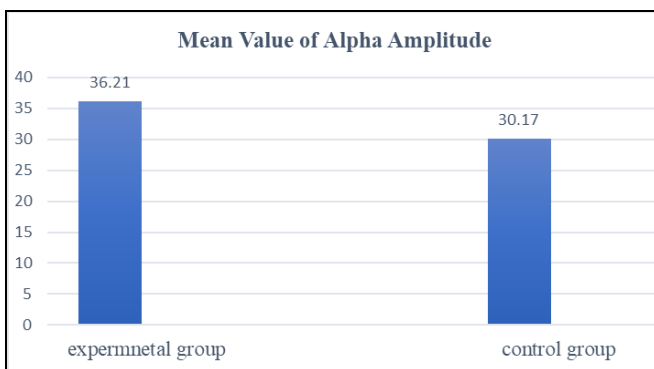


Fig 2: Mean and SD of Alpha Wave Amplitude

Discussion on the findings

The significant difference was found between the experimental group and control group of alpha amplitude. The findings could be attributed due to that during Yoga Nidra in progressive relaxative technique muscles tension was scanned by continuous isometric muscle contraction and relaxation in different muscles group repeatedly which is consciously released and also assisted with deep breathing simultaneously. Yoga Nidra is the state of mindful where one is on the border line between the sleep and wakefulness. Yoga Nidra relaxes the whole body and mind reduce the anxiety where the physical body is become reclusive and the senses are withdrawals in a particular centre. (Saraswati, 2008) [11].

With the changing state of mind the alteration in the brain wave pattern is occurred. Normally in the conscious state of mind and in stress the beta waves are dominant. But in relax state of mind, mental fluctuations are less and alpha activity are more prominent during the close eyes condition (Deepa T. *et al.*, 2012) [14]. High alpha amplitude represents the relaxed and alert state of mind where no thought and mental fluctuations are there. Alpha brainwave activity has been correlated with decreased degree of pain and distress, cognitive performance such as retrieving data from memory and fast decision making. These physiologic and cognitive benefits were correlated with elevated alpha wave amplitude activity enhancing increased perception of calmness (Palva,

Conclusion

So, it has been concluded that Yoga Nidra has the positive and immediate effect in central and peripheral relaxation by altering the parasympathetic and endocrinological system which aids to reduce the stress and anxiety of the athlete. Practice of Yoga Nidra helps to maintain the slow alpha rhythm of the brain which is the relaxed, focused, concentrated but alert state of mind that might lead to higher performance capacity.

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