Effect Of Kundalini Meditation On Some Physiological Variables Indicating Relaxed State & Parasympathetic Dominance

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Abstract: Background: Meditation is now recognized as a different physiological state scientifically as relaxed & calm mind with parasympathetic dominance.This study is performed on two expert meditators of sahaj yoga kundalini meditation. Objectives of this study is to find out whether regular meditation practice could lead to rapid "stress reduction" & control over autonomic nervous system. Method: Various physiological variables like heart rate, respiratory rate , galvanic skin response are measured before, during & after meditation & electroencephalography is performed during meditation. The following physiological parameters were assessed respiratory rate , heart rate & GSR by physio-pac instrument &elecroencephalography by neuropage plus before, during & after meditation. Result: Heart rate , respiratory rate are reduced during meditation session & GSR is increased suggesting parasympathetic dominance .EEG findings suggest relaxed state. Conclusion: This study shows a relaxed & calm state of mind during meditation with parasympathetic dominance.

Key words: EEG , GSR , Beta-endorphin

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Introduction: Meditation is recognised as a calm state of mind with parasympathetic dominance in the body .Kundalini meditation is different from other types of meditation . In sahaj yoga kundalini meditation it is believed that kundalini resides in the sacrum bone.[1]

Regular meditators may experienced a calm & hypo-metabolic state with parasympathetic dominance. Some studies shows beneficial effects in controlling blood pressure in hypertensives . Asthmatics & diabetics have been shown to be benefitted by regular meditation practice.[2,3,4,5,6]

This study is conducted in the physiology department of Pcms&Rc (bhanpur, Bhopal) (m.p) in two expert sahaj yoga meditators utilising neurophysiology laboratory equipments for conducting EEG & galvanic skin response study & their respiratory rate , heart rate & blood pressure is monitored before during and after meditation.

EEG is recorded by neuropage plus &physio-pac is used to record respiratory rate, heart rate & GSR before during & after meditation.

Objectives: Objectives of this study is to find out whether meditation practice could lead to relaxation of mind & control over autonomic nervous system.

Material and Method: The study is conducted at the peoples college of medical sciences & research centre in bhanpur , Bhopal in two expert sahaj yoga meditators. They are practicing meditation practices regularly each day for more than two hours since more than last ten years.

The following physiological parameters were assessed respiratory rate, heart rate & GSR by physio-pac instrument &elecroencephalography by neuropage plus before, during& after meditation.

Blood pressure is measured after ten minute rest in the sitting posture before & immediately after meditation by sphygmomanometer method.EEG is done by 16-lead standard EEG machine (neuropage plus) .The above physiological parameters are recorded before , during 20-minutes meditation session & immediately after meditation.

Procedure of meditation:- Meditation is performed in the neurophysiology laboratory with cool & calm surroundings.

In sitting posture with both their hands on the lap & palm facing forward subjects goes into meditation .Neuropage plus is connected for EEG recording with 16-leads on scalp. For assessing respiratory rate, heart rate & GSR physio-pac instrument is connected to the subjects.

Statistical analysis :- "One Way ANOVA" is used for comparison of heart rate & respiratory rate before , during & after meditation & "Difference of Mean Z- test" are used for comparison of blood pressure & GSR. SPSS 20.0 (Software) is used for data analysis.

The interpretation of "P–value" are as follows:- P>0.05 - not significant. P<0.05 - Significant.P<0.01 - Highly significant.P<.001 – Very highly significant.

Result:

Table 1: Effect of meditation on Heart rate and Respiratory rate

Parameters	Control Group (N = 60)	Prediabetic Group (N = 60)	P-Value
Age (Years)	45.3 ± 9.1	45.2 ± 8.9	N.S.
WC (cm)	83.1 ± 6.6	92.3 ± 9.7	< 0.0001
BMI (kg/m²)	22.1 ± 1.4	26.1 ± 2.8	< 0.0001
SBP (mm Hg)	116.9 ± 8.7	131.5 ± 8.2	< 0.0001
DBP (mm Hg)	76.6 ± 5.5	87.1 ± 6.8	< 0.0001
Pulse Rate (RPM)	81.2 ± 8.1	82.2 ± 7.7	N.S.

One way anova

There was significant variation in heart rate ($p < 0.05$) and according to mean heart rate decrease during process and that decrease after meditation

There was no significant difference in respiratory rate ($p > 0.05$) .

The reference value of heart rate was 73.2 beats / min and decreased by 20 minutes of practice to 66.3 beats / min. It was also noted a decrease in respiratory rate. It is well known that the respiration rate and heart rate determined by the balance between excitatory and inhibitory effects of sympathetic and parasympathetic divisions of the autonomic nervous system. GSR is increased during meditation session & immediately after meditation ascompared to resting state. The combined changes between galvanic skin resistance and galvanic skin potential make up the galvanic skin response. Galvanic skin resistance(GSR) refers to the recorded electrical resistance between two electrodes when a very weak current is steadily passed between them. The electrodes are normally placed about an inch apart, and the resistance recorded varies in accordance with the emotional state of the subject. Galvanic skin potential(GSP) refers to the voltage measured between two electrodes without any externally applied current. This is conducted by connecting the electrodes to a voltage amplifier. Similarly, this voltage varies with the emotional state of the subject.

Due to the response of the skin and muscle tissue to external and internal stimuli the conductance can vary by several microsiemens. When correctly calibrated, the device can measure these subtle differences. There is a relationship between sympathetic activity and emotional arousal, although one cannot identify which specific emotion is being elicited. These autonomic sympathetic changes alter sweating and blood flow, which in turn affects GSR and GSP. If the sympathetic branch of the autonomic nervous system is highly aroused, then sweat gland activity will also increase, which in turn increases skin conductance. In this way, skin conductance can be used as a measure of emotional and sympathetic responses.

Table 2: Effect of meditation on Blood pressure and Galvanic skin resistance

Group	Duration	Mean	SD	N	p
SBP	Before	114.5	0.71	2	0.0077*
	After	109	1.41	2	
DBP	Before	71	1.41	2	0.1679
	After	68.0	1.42	2	
GSR	Before	408.42	8.42	2	0.0210*
	During meditation	523.93	22.52	2	

Difference of Mean Z test , SPSS 20.0

- There was significant Difference in Systolic BP ($p < 0.05$) and according to mean Systolic BP is Decrease after Meditation .
- There was no significant Difference in Diastolic BP ($p > 0.05$).
- There was significant Difference in GSR ($p < 0.05$) and according to mean GSR is Increase During Meditation.

Electroencephalography (EEG) is the recording of electrical activity along the scalp. EEG measures voltage fluctuations resulting from ionic current flows within the neurons of the brain.[1]In clinical contexts, EEG refers to the recording of the brain's spontaneous electrical activity over a short period of time, usually 20–40 minutes, as recorded from multiple electrodes placed on the scalp.

Patterns observed in EEG are anterior & frontal midline theta & lower alpha during the meditation session showing a relaxed & calm state of the meditator during the session. These alpha waves continued to appear, and their amplitudes increased. And as meditation progressed, the decrease of the alpha frequency was gradually manifested at the later stage. Further the rhythmical theta train with the amplitude modulated alpha-background was observed.

It is known that the hypothalamus, as the substance of the limbic system, anatomically associated with the nuclei of the thalamus, which direct the activity of the frontal and occipital regions of the cerebral cortex.This explains the increased percentage of alpha activity in the frontal and occipital cortex during meditation.[3]

Table 3: EEG pattern progressively observed during meditation

Site (electrode placement	Amplitude (µV)	Frequency (Hz)
Frontal (Fz, Fpz1, Fpz2 F3, F4,)	70 – 100 120 – 250	8- 10 4 -5
Central (Cz, C3, C4, T3, T4, P3, P4, T5, T6)	50 – 100	8- 12
OccipitalO1, O2	80 – 100 160 – 300	8- 14 4-7

As evident from the observation, coexistence of metabolic syndrome and prediabetes has increased the future diabetic and CV risk significantly.

Discussion: Blood pressure readings are not done during the meditation session as it may interrupts with the meditative state. Blood pressure is measured before & immediately after meditation. Heart rate & respiratory rate is measured before , during & after meditation .

Heart rate & respiratory rate are reduced during meditation.GSR is markedly increased indicating diminished sympathetic activity. According to Sahaj Yoga literature, actualization of Kundalini awakening (by Sahaj Yoga) takes place in the Limbic system, giving rise to bliss, deep relaxation and vibratory awareness of cool breeze flowing from the palms and top of the head.[9]

It is well known that limbic system has hypothalamus as its major substation. Probably, Kundalini awakening conditions the limbic system which modulates the activity of hypathalamic-hypophyseal-adrenal axis.[7] The practice of meditation leads to hypometabolic states (lowered metabolic rates) and proposed to call it the fourth state of consciousness, different from sleep yet metabolically equivalent or even below metabolic rates seen during sleep. Similarly results were also reported by Johnson &Lubin in their research that states of relaxation are accompanied by high skin resistance, which reaches its maximum during sleep.[10]

Reduction in heart rate shows the relaxation during meditation. In an article by Davis , she refers to a quote by the well-known cardiologist and founder of Harvard's Mind/Body Institute[11]
Herbert Benson, who strongly asserts "Any condition that's caused or worsened by stress can be alleviated through meditation".[8]

Thus on the basis of above findings and discussions, it can be concluded that the meditation affect the galvanic skin response of an individual.Meditation is now a day a topic of research as many medical ailments shows beneficial effects in patients who are doing meditation practice regularly. Diseases like Diabetes Mellitus Type -2 , hypertension , asthma, psychiatric conditions like schizophrenia , epilepsy have been assessed by meditation studies & some researchers find beneficial effects in patients doing

regular meditation practices as compared to control groups.[2,3,11].

Some research shows an elevated beta-endorphin levels in persons doing regular meditation that may be responsible for relaxed & calm state of regular meditators & it also boost immunity.[12] Further researches are undergoing in meditation physiology to unearth rest of the benefits

Conclusion: The results of this study demonstrated a reduction in systolic blood pressure, respiratory rate & significantly increased GSR indicating parasympathetic nervous system dominance during & immediately after meditation.

References:

1. Leander Crock.Method and apparatus for stimulating the healing of living tissue using aura therapy.2000; US Patent 6016450
2. Manocha R, Marks GB, Kenchington P, Peters D, Salome CM. "Sahaja yoga in the management of moderate to severe asthma: a randomized controlled trial.", Thorax. 2003 Sep;58(9):825-6
3. Eisenberg DM, Delbanco TL, Berkey CS, Kaptchuk TJ, Kupelnick B, Kuhl J, et al. Cognitive behavioral techniques for hypertension: are they effective? Ann Intern Med 1993;118: 964-72
4. L.I. Aftanas, S.A. Golocheikine “Non-linear dynamic complexity of the human EEG during meditation” Neuroscience Letters2002; 330: 143–146.
5. Panjwani U, Selvanurthy W, Singh SH, Gupta HL, Thakur L, Rai UC. (1996) Effect of Sahaja Yoga practice on seizure control & EEG changes in patients of epilepsy. Indian Journal of Medical Research 103(3): 165-172.
6. Stam, C.J., Brain dynamics in theta and alpha frequency bands and working memory performance in humans,Neurosci. Lett., 286 (2) (2000) 115–118.
7. Panjwani U, Gupta HL, Singh SH, SelvamurthyW, Rai UC. Effect of Sahaj Yoga practice on stress management in patients of epilepsy Indian J PhysiolPharmacol 1995; 39(2): 111–116
8. Kabat-Zinn J, Massion AO, Kristeller J, Peterson LG, Fletcher KE, Pbert L, Lender king WR,Santorelli SF. Effectiveness of a meditation-based stress reduction program in the treatment of Anxiety Disorders Am J Psychiatry 1992; 149:936–94 .
9. V.K Sharma,S.Das , S. Mondal , U. Goswami& A. Gandhi. Effect of sahaj yoga on neuro-cognitive functions in patients suffering from major depression. IJPP 2006; 50 (4)375-383.
10. Jonhson L C and LubinA(1966)SPONTANEOUS ELECTRODERMAL ACTIVITY DURING WAKING AND SLEEPING.Psychophysiology,3: 8–17. doi: 10.1111/j.1469-8986.
11. Davis, J. L. (2005). Meditation balances the body’s systems. Retrieved from www.webmd.com/content/Article/99/105340
12. Harte JL, Eifert GH, Smith R.The effects of running and meditation on beta-endorphin, corticotropin-releasing hormone and cortisol in plasma, and on mood..Biol Psychol. 1995 Jun;40(3):251-65.

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