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# Effect of yoga based techniques on stress and health indices using electro photonic imaging technique in managers

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## Abstract

### Background

Meditation techniques are known to elicit relaxation response in which moving meditation which combines the practice of yoga postures and guided relaxation is known as Cyclic Meditation reported helpful in reducing the sympathetic arousal and improving health of practitioners.

### Objectives

The objective of this study was to investigate the effect of Cyclic Meditation on stress and health indices in managers as measured by Electro Photonic Imaging (EPI) technique.

### Materials and methods

EPI technique was used to assess participants before and after 35 min of Cyclic Meditation (CM) and equal duration of Supine Rest (SR) session. A total of sixty six male managers, age ranges from 35 to 60 years (mean ± SD 53.97 ± 5.96) were included in the study. EPI parameters, including Activation Coefficient, Integral Area left and right and Integral Entropy, left and right were taken for statistical analyses.

### Results

Cyclic Meditation has produced a highly significant reduction in stress level, whereas this reduction was not found significant within SR group. There was a significant improvement in health index 'Integral Area' values in both left and right sides within the CM group while only IA right side showed a significant improvement within the CM group. The integral entropy value right side decreased significantly within the CM group, whereas IE left was found deteriorated within the SR group. Moreover, only IE left side has shown a significant difference between the groups.

### Conclusion

The investigations in this study suggest that Cyclic Meditation practice reduces stress and improves psychosomatic health indices more effectively than Supine Rest in managers.

**Keywords:** Cyclic meditation, Supine rest, Electro photonic imaging technique EPI, Activation coefficient, Integral entropy, Integral area

## 1. Introduction

ElectroPhotonic Imaging (EPI) technique based on Kirlian effect is a scientific method to assess stress in individuals [1]. The assessment through EPI is performed through stimulation of electrons at the finger tips by applying a short electric pulse of a high voltage (10 kv), high frequency (1024 Hz) and low current for less than a millisecond [2]; then a glow occurs. This glow is the consequence of ionization of gaseous molecules in the surrounding air through the discharged electrons from the finger tips; this glow is captured by a CCD-camera and is known as electro-photonic image [3]. These EPI images are obtained from all 10 fingers of both the hands in two ways, with filter and without filter. A filter is a specially designed thin plastic film placed between the finger and the dielectric plate during assessment. It eliminates sweat effects due to sympathetic (psychosomatic) responses and obtains only the parasympathetic (or physiological functional state of the person) response [4]. Comparison of these images acquired with and without filter forms a parameter called Activation Coefficient, which is a quantitative assessment of stress level of a person, based on evaluation of autonomic balance [5]. The experimental data correlating the findings of EPI measures with heart rate variability [6], systolic and diastolic pressures [7] and the stress level [8] suggest that EPI can be used to measure the activity of autonomic responses.

EPI also provides two more important components. The first is Integral Area (IA), which is a measure of the general health index of the person being investigated [5], [9]. The second constituent is known as Integral Entropy (IE), which is a measure of chaos/disorder in the energy pattern of human energy systems [10]. EPI provides a non-invasive, painless and almost immediate evaluation of health abnormalities [8]. Therefore, the applications of the EPI method are gaining high significance in various fields of medicine, psychology, consciousness, sports and material testing in more than 63 countries worldwide [1]. Further, the EPI readings in healthy people vary only 8%–10%, which is a clear indication of a high level of reliability of this

technique[5]. The EPI Camera Pro and compact instrument made by Kirlionics Technologies International, Saint-Petersburg, Russia were used for assessment.

### 1.1. Cyclic Meditation

Cyclic Meditation (CM) is a yoga based relaxation method. The foundation for CM is from Mandukya Upanishad [11]. The verse emphasizes that the human mind is either in agitation or in drowsiness states; with this in focus, the CM concept was developed. CM practice is to stimulate the mind when it is drowsy and to pacify the mind in case of agitation and to maintain the settled mind in perfect equilibrium [12]. These two cyclical phases of the mind can be altered at one's own will. Studies have found that the asana phase of the CM is associated with sympathetic activation, whereas relaxation phase with parasympathetic activation [13]. Many of the meditation practices yield a relaxation response, where the moving meditation practice which combines a practice of asanas (yoga postures) and guided relaxation known as 'cyclic meditation' has been found more effective in reducing physiological arousal in comparison with Supine Rest (SR) [13], [14]. The effect of CM has been studied using many tools and instruments in both ways, objectively and subjectively. The documented findings showed that CM reduces occupational stress, autonomic arousal, reduces anxiety, oxygen consumption, P300 peak amplitude, improves memory, attention, sleep and quality of life [14]. CM is an efficient relaxation technique which provides immediate effect and may be carried out 'on the spot' for achieving a quick relaxation response.

In the present study, we have compared the CM practice with an equal duration of Supine Rest 'SR' (*Shavasana*). It is evident that the CM practice reduces autonomic arousal, and the EPI technique measures autonomic functions; however, there is no such study which applies EPI technique to study the effect of CM. Thus, the current experiment is aimed at investigating the effect of CM on stress and health indices using EPI technique.

## 2. Material and methods

### 2.1. Study protocol

One hundred and fourteen managers participated from a series of programs called Self Management of Excessive Tension (SMET) which is conducted periodically at S-VYASA

University, Bangalore, India. All the participants were from three companies in India viz., Hindustan Aeronautics Limited (HAL), Oil and Natural Gas Corporation (ONGC) Limited and Canara Bank.

**Inclusion**: Age ranges 30–60 years males, managers (having lifestyle related health issues), and willing to participate in the study.

**Exclusion:** People with cut in fingers and absent fingers, undergoing any other wellness strategy and those who have smoked or taken alcohol or substance abuse on the day before the measurement were excluded.

**Ethical consideration:** The protocol was approved by the Institutional Ethics Committee. A written informed consent was obtained from all participants before the assessment, and their confidentiality was maintained.

## 2.2. Interventions

### 2.2.1. Cyclic Meditation (CM)

The basis of this Cyclic Meditation is stimulation followed by relaxation, which gives profound rest in periodic cycles. Previous studies have used the CM practice which lasts for 22 min and 30 s [14]. Present study involves 35 min of CM practice, divided into 8 steps. Step-1: Opening prayer (1 min), the practice began with lead and follow of verse from a yoga text, the *Mandukya Upanishad*[12]. Step-2: Instant Relaxation Technique (IRT, 1 min), it is done by isometric contraction of the muscles of the body and ends with supine rest. Step-3: Centering (4 min); coming to standing position to *Tadasana* with both feet planted firmly on the ground. Step-4: Standing posture called *Ardhakatichakrasana* (6 min), from*Tadasana* bending towards the right (1 minute and 30 s); a gap of 1 minute and 30 s in *Tadasana*, then bending towards the left (1 minute and 30 s); a gap of 1 minute and 30 s in *Tadasana* again. Step-5: Quick Relaxation Technique (QRT, 5 min), in the Supine Rest (SR) with guided instructions and ends with the chanting of AAA (*A-Kara*) with an open mouth. Step-6: Sitting Postures, *Vajrasana*, *Shashankasana* and*Ushtrasana* (6 min), coming to *Vajrasana* (1 min), bending forward (*Shashankasana*, 1 minute and 30 s) a gap of 1 minute and 30 s in *Vajrasana*, bending backward (*Ushtrasana*, 1 minute and 30 s); a gap of 1 minute and 30 s. Step-7: Deep Relaxation Technique (DRT, 10 min) slowly coming to the supine position for further relaxation

of different parts of the body in a sequence as per instructions. Step-8: Closing Prayer (2 min), the practice is concluded with a prayer for the welfare of one and all.

### 2.2.2. Supine rest (SR)

The second group was given an equal duration of 35 min of SR in which participants simply lay down on the mat in the corpse posture (*Shavasana*). This is done with eyes closed, hands away at half feet from the body, palms facing upwards, legs apart at one and half feet distance and adopting a comfortable posture for 35 min.

### 2.2.3. Procedure

The study had two groups: control design in which the Cyclic Meditation was compared with the same duration of Supine Rest (*Shavasana*). To find out the reproducibility of the stress reduction, four independent studies were conducted on CM and another four on SR. Participants completed a baseline assessment, comprising self-reported measures of health status. EPI readings were carried out before and after 35 min of interventions, with 10 min for pre assessment and 5 min for post assessment. Thus the total session was for 50 min. For easy follow up during post readings, all participants were given a sequence number so that they can stay relaxed until post measurement. It could be done easily with the help of a few volunteers. Readings were taken from all 10 fingers of both the hands in two ways, with a filter (WF) and without filter (NF) during the pre-assessment, whereas only without filter during post assessment. It was earlier observed that ‘with filter’ changes of EPI parameter were found to be consistent over a short duration [5]. Therefore, WF data from pre assessment was kept as a baseline to compare both NF pre and NF post data. This comparison of ‘with filter’ data with ‘without filter’ data provides Activation Coefficient (AC) parameter values. This method was adopted since the immediate effect of an intervention sustains only for a short duration. Thus, it was required to complete the post assessment as soon as possible after the intervention so that the real effect could be measured. Finally, Activation Coefficient, Integral Area, left and right sides, and Integral Entropy, left and right sides parameters were taken in consideration for statistical analysis.

### 2.2.4. Guideline for acquiring data

To obtain reliable and reproducible data, we followed an established guideline [9]. It is recommended to collect data after 3 h of food intake and after 5 h of any prescribed medications.

No other diagnostic procedure was to be held at the same time. They were assessed before and after the respective interventions and the EPI readings were taken by the same expert, at the same place. There were identical conditions of psychological and physical comfort for all participants in a quiet and calm environment. Calibration of EPI device was performed routinely as per the guidelines. Participants were instructed about finger placement on the glass at 45° angles with a gentle but firm touch. They were asked to remove all metallic ornaments which they do not wear for entire 24 h. Further, a few more things were followed for acquiring consistent readings: 1. The participants stand on an electrically isolated surface while making a measurement, 2. The measurements were taken first with the filter, then without filter, 3. An alcoholic solution was used to clean the glass plate after every participant and, 4. A distance of 3 feet was maintained between EPI and a dedicated laptop computer while collecting data.

### 2.2.5. Temperature and humidity aspects during the study

Environment variables like humidity and temperature influence the emission pattern if this variation is greater than ±2.5% [8]. Thus it is essential to measure these atmospheric variables. We noted these variables and found both humidity and temperature were almost same from the time of calibrating the instrument till the end of the measurement in both the groups. The average temperature during all 4 CM experiments was pre 28.28 ± 0.64 and post 27.86 ± 0.89, and average humidity was pre 58% and post 58%. The average temperature during all 4 SR experiments were pre 26.58 ± 0.30 and post 26.18 ± 1.14, and average humidity pre 53% and post 54% (measured using Thermo/Hygrometer - Equinox, EQ 310 CTH).

### 2.2.6. Data extraction and analysis

Out of a hundred and fourteen managers, a total of 66 male managers from different batches of SMET program and who were elegible for inclusion and exclusion criteria were selected for the study. Finally, all the participants were divided into two groups (CM – 33, and SR – 33), age range from 35 to 60 years (mean ± sd 53.97 ± 5.96 years) were taken in consideration for analysis.

**Data extraction:** EPI software has inbuilt facility to export the collected data to excel file. We used an EPI diagram program to extract all parameters being analyzed. Data analysis was carried out using ‘R statistical package’ [15] and Microsoft Excel program. To compare the baseline

demographic details, we have performed independent samples t-test for continuous variables. Both groups showed similarities in most of the demographic details except age and diastolic blood pressure as presented in Table 1. There was a few missing information in the demographic data sheet for which we carried out missing value analysis using the Amelia package in the R Statistic Software. Further, within group analysis was carried out using paired sample t-test and between the group analyses using independent sample t-test, correcting for any possible mismatch at baseline by considering pre-post differences.

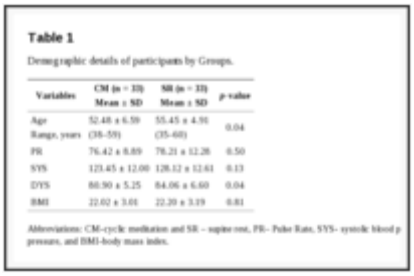

**Table 1**

Demographic details of participants by Groups.

| Variables | CM (n = 33) Mean ± SD | SR (n = 33) Mean ± SD | *p*-value |
|---|---|---|---|
| Age | 52.48 ± 6.59 | 55.45 ± 4.91 | 0.04 |
| Range, years | (38–59) | (35–60) | |
| PR | 76.42 ± 8.89 | 78.21 ± 12.26 | 0.50 |
| SYS | 123.45 ± 12.00 | 128.12 ± 12.61 | 0.13 |
| DYS | 80.90 ± 5.25 | 84.06 ± 6.60 | 0.04 |
| BMI | 22.02 ± 3.01 | 22.20 ± 3.19 | 0.81 |

Abbreviations: CM–cyclic meditation and SR – supine rest, PR– Pulse Rate, SYS- systolic blood pressure, and BMI-body mass index.

Table 1

Demographic details of participants by Groups.

## 3. Results

Table 1 presents demographic details of both the groups. The groups were different only in age and diastolic blood pressure measurements, whereas all other variables, namely, pulse rate, systolic blood pressure and body mass index were not different in both the groups.

The results in Table 2 show that AC reduced highly significantly with 14.51% within the CM group while this reduction was not significant within SR group with 7.21% showing that CM is better than SR in decreasing stress. Entropy on the right side improved significantly by 3.76% within CM while deteriorated within SR by 1.11%. On the left side, entropy had no significant change of 0.92% within CM group while it significantly deteriorated with 8.36% in SR group leading to a significant change between groups. This shows that CM is better than SR in terms of changes in entropy. Both IA right and left showed a significant increase (IAR 18.48% and IAL 30.56%) within the CM group, whereas only IA right showed a significant increase and no significant change of IA left (IAR 23.59% and IAL 3.03%) within the SR group.

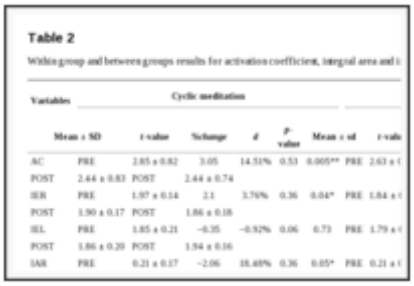

Table 2

Within group and between groups results for activation coefficient, integral area and integral entropy values.

## 4. Discussions

The three parameters used to compare the effect of CM and SR groups were AC (stress levels), IE on right and left (entropy showing the level of disorderliness) and IA on right and left (integral area showing general health status of the managers).

The results showed the following:

- 1. Stress level in CM group reduced by 14.51% ($p = 0.005$) and no significant decrease of 7.21% (p = 0.15) in SR group.
- 2. Entropy parameter (disorderliness) right reduced by 3.76% ($p = 0.04$) and no significant change of 0.92% left side in CM group. In the SR group there was more deterioration of 8.36% ($p < 0.005$) left side and no significant change of 1.1% on right side.
- 3.Integral area (health status) also showed a significant improvement 18.48% ($p = 0.05$) & 30.56% ($p = 0.03$) right & left sides in CM group. In SR group there was 23.29% increase on right side ($p = 0.02$) and no significant change of 3.03% on left side.

### 4.1. Stress levels (activation coefficient)

Earlier studies have shown 32.1% reduction in oxygen consumption after CM compared to 10.1% after SR[16]. Another study has also shown the same trend of reduction in oxygen consumption of 19.3% in CM and 4.8% in SR group [17]. Evidence suggests that a significant reduction in AC parameter with percent change which ranged from 6% to 83% just after the treatment was found with osteopathy treatment monitored through EPI technique in healthy

volunteers [4]. The observations from our study also showed the similar decrease in stress level, where we found CM produced a highly significant reduction in AC with 14.51%, and non-significant in the SR group by 7.21%. This change is reflected in an increase of the EPI glow image area which could be due to relaxation as a consequence of meditation. In one of the pilot studies, EPI image glow area was found having inverse relationship [8] with a sensitive stress marker, namely Salivary Alpha Amylase (sAA) [18]. They found that during relaxation the EPI glow image area increased, whereas sAA decreased. It is well known that when a person is under stress condition, the excitation of sympathetic nervous system causes constriction of blood vessels and increase in secretion of sweat fluids [19] which inhibits electro photonic emission pattern, resulting in decreased EPI image glow area.

The findings from another study revealed that both focused (*Shamatha*) and distributed (*Vipassana*) attention meditation from the Theravada tradition produced an increase in high frequency (HF) and decrease in low and high frequency (LF/HF) components of heart rate variability (HRV) which enhances parasympathetic activation and is an indication of a relaxation response [20]. Two days of CM program have also shown a reduction in low frequency (LF) and increase in high frequency (HF) of HRV components in 26 managers, which indicates a reduction in occupational stress level, suggesting a significant decrease in sympathetic activity [21]. The same observation of increase in HF power through CM was also observed in another study[13], suggesting an increase in vagal tone.

Findings of many researches on various meditation techniques explore the relaxation response as one outcome of meditation. From this we conclude that the reduction in AC is because of activation of parasympathetic system inducing relaxation and also a reduction of sympathetic activation through CM practice.

### 4.2. Disorderliness (integral entropy)

Earlier study with reconnective healing has shown a reduction in entropy values which suggest a significant harmonization of the participant's conditions [22]. Present study also shows same significant reduction in entropy values within CM group. This may be because of lowering in stress levels. It is postulated that any living organism produces negative entropy [8] and reduces its own entropy by using energy from the environment. Assimilation of energy from environment

tends to be better with good mind-body relaxation. This interaction with the environment reduces during stress condition causing an increase in entropy. Hence significant reduction in entropy values from higher to lower levels may be a sign of a decrease in stress level and more ordering in the human energy system. The exception to this observation is found in IE left side values which increased significantly within SR. This implies that SR practice may not be effective in bringing positive changes in entropy.

### 4.3. Health status (integral area)

Meditation practices lead to positive health [23], improved concentration [13], memory, and reduced anxiety[14]; all these lead to better psychosomatic health of the organism. The current study has shown a significant improvement in integral area values within the CM group; however, similar significant change was found only for IA right side within SR group. In one of the previous studies this Integral Area values were found more in healthy people in comparison to Asthma patients [9]. From this we may state that the improvement in integral area parameter in the current study may be an indication of improvement towards good psychosomatic health.

Further, except IE left side, there were no significant group differences between CM and SR in the measured variables viz., AC, IE right and IA left side and IA right side.

## 5. Limitations of the study

Data were collected on two occasions for each experiment, namely morning and evening which may be one of the limitations of the study. The interventional data and control data were collected from different batches of SMET program conducted in different periods and this study limits to males only.

## 6. Strength

A short term intervention could produce a highly significant reduction in stress level within the CM group which was double in comparison to reduction within the SR group and general health indices also showed significant improvement, which are noteworthy feature of this study.

## 7. Further suggestions

Though the results are well supported by the previous studies, it could be an interesting research direction to explore if further study includes some other objective checklist. These could be HRV or some biochemical tests, viz., salivary alpha-amylase and cortisol etc. along with EPI assessment to correlate the findings of CM meditation on stress level in individuals.

## 8. Conclusion

The investigations from the current study conclude that the cyclic meditation practice reduces stress and improves psychosomatic health indices better than supine rest in managers.

## Footnotes

Peer review under responsibility of Transdisciplinary University, Bangalore.

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