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Research paper

Changes in electrophotonic imaging parameters associated with long term meditators and naive meditators in older adults practicing meditation

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ABSTRACT

Introduction: Anapanasati meditation is one of the techniques, practiced in the initial part of Vipassana in Theravada School of Buddhism. In this method, practitioners focus their entire attention on the incoming and outgoing breath. Study aims to observe effect of Anapanasati meditation and gender related differences on the electrophotonic imaging (EPI) parameters at physiological and psychophysiological level in long-term meditators and naive meditators.

Methods: The study consisted of 309 subjects: 199 long-term and 110 naive meditators. Subjects were divided into two groups, long-term meditators (LTM) practicing for 12 months or longer (mean months of practice 79.22 ± 49.10, daily 1.68 ± 1.02 h) and naive meditators (NM) practicing for the first time, for seven days daily for 2.30 h. A total 266 subjects were included in the analysis after excluding 43 outliers. Comparisons were between long-term meditators and naive meditators on EPI parameters: Activation Coefficient (AC, stress parameter), Integral Area (IA, general health parameter) and Integral Entropy (IE, disorderliness parameter).

Result: Comparison between groups yielded-less disorderliness (IE) at the psychophysiological level in NM group. The gender related results showed highly significant improvements in the health related parameter (IA) at the physiological and psychophysiological level in LTM and NM females compared to males.

Conclusion: The findings showed larger health related (IA) advantages in LTM and NM group at the physiological and psychophysiological level. Stress (AC) was LTM and NM females compared to males. Moreover, naive meditators also exhibited positive trends on parameters of EPI after seven days practice of meditation which was similar to LTM.

1. Introduction

Meditation originally developed as a spiritual practice in India, having close associations with Yoga Philosophy. Later these practices spread widely and underwent transformations in different places and gave rise to a new tradition within Buddhist spiritual lore such as Zen [1]. In the tradition of spirituality, meditation has been practiced as a tool to develop spirituality, gain inner peace, improve concentration and enhance positive emotions like love and kindness. It has been used to reduce negative emotions such as fear, anger and hatred [2]. Western scientists involved in meditation research, define it as group of self-regulatory processes focussed to maintain one's attention and awareness [3]. Meditation is defined as a mental conscious process that induces integrated psychophysiological changes, is also termed as relaxation responses [4].

There are different techniques of meditation used to study the changes at the body and mind level. In all the techniques of meditation, regulation of attention plays important role [5]. Meditation has been widely accepted as a potential method of overcoming stress and enhancing over all well-being [1]. The techniques of meditation can be practiced by people of any religion, age, educational background and culture, irrespective of any belief or life style. Older people may also practice meditation who may have less mobility, finances or will power to adjust their routine [6].

One of the most popular meditation techniques used in research is mindfulness meditation. It has its origin in Buddhist meditation of mindfulness and insight, known in Pali literature as "satipatthana-vipassana" [2]. Anapanasati meditation is one of the techniques, practiced in the initial part of Vipassana in Theravada

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School of Buddhism. In this meditation practitioners focus their entire attention on the incoming and outgoing breath. The result of such attention induces clarity, calmness and stability of mind [7,8].

Now attention is focused on assessing effect of meditation on those who practice regularly over a long period of time [9]. Meditation has been traditionally conceived to be a part of life long practice, the benefits of which were not expected to be profound in a short-term practice. A report studied EEG patterns in long-term meditators and naive meditators (seven days) with loving-kindness-compassion (Tibetan Buddhist Tradition) as an intervention. This study found that meditation impacts emotion processing irrespective of if the technique focuses on cognition or emotion [10].

Studies have shown that even 5–7 days of meditation practices can provide benefit, improving attention and eliciting changes in brain activity [11,12]. There are findings in which 5 days of 20 min per day meditation practice has shown improvement in attention, lower anxiety, depression anger and fatigue and a significant decrease in stress [12]. Electrophysiological studies with meditation intervention has shown increased theta activity which is related to heighted attention, decreased activity and less thought content [14–16].

Several studies have reported and identified the risk factors related to elderly people [17–20]. Research findings suggest that alternative and complementary therapies including meditation play a very important role in coping and reducing concerns related to well-being in older people [2,6,7,9,20–22].

In the earlier studies however, there were differences in age, intervention and duration of practice and the methods of measurements used to understand the effects on older adults.

The current study sought to address some of these problems and further study gender related issues in energy pattern, stress, psychophysiological status and well-being, in age-matched older long-term meditators and naive meditators using Electrophotonic Imaging. First, the study expected that those older adults who regularly practice meditation for long periods of time would benefit more than naive meditators. Second, it was expected that even naive meditators with one week of practice would have positive trends similar to long-term meditators in the electrophotonic imaging parameters. In addition, the study expected that females would experience more positive effect due to meditation practice in comparison to males in overall energy pattern observation.

Moreover, our intent was to discover both in the area of meditation and EPI Assessment. We limited our discovery process in this trial to one particular form of meditation not because of a bias to that form of meditation, but as a starting place to explore and better understand all meditation techniques. In addition, given electrophotonic imaging analysis is an emergent methodology, it is intended that this trial would contribute to the growing base of references on the methodology.

2. Application of electrophotonic imaging (EPI)

Electrophotonic imaging (EPI), also termed as gas discharge visualization, works on the Kirlian effect. It is used in the measurement of electron availability due to an impressed electromagnetic field. It provides both physiological and psychophysiological information of the test subject [23]. EPI works through the impression of high electric field which draws electrons from the body. Unlike the homeostatic state which is fairly stable, the characteristics of electron emission vary in humans dependent on different internal and external conditions [24]. In EPI measurement, low electrical current which is in microamperes with high voltage (10 KV) and high frequency (1024 Hz) is applied to the fingertips for less than a millisecond as a stimulant to draw electron from the body [25]. In response to the given stimulation, there is a formation of glow around the finger, which is captured by an optical CCD camera [26]. The image taken by camera is known as GDV gram. In this process due to the effect of electromagnetic field, electrons and photons are drawn from the cutaneous layer of skin [27]. The images of EPI can be quantified and reproduced in diverse areas of scientific research. There are ten images taken from fingers of both hands' which reflect the individual's health. If an image is not symmetrical, it shows an energy imbalance in a related area of the human body [28]. There are changes in images according to the person's current psycho-emotional state. Every image with health information is analyzed by the inbuilt software of EPI. The interpretation is derived based on acupuncture meridian theory [29]. To know the physiological and psychophysiological functioning of human system, two measurements are carried out, namely with filter and without filter [26]. The filter is a specially designed plastic sheet which changes the propagation of electron avalanches along the surface existing on the tip of the finger; thus, a measurement with filter is related to status at physiological level while one without the filter is related to psychophysiology.

Bioelectrographic application of EPI has been used in a different area of research and diagnosis. It is also used to study liquids and different materials. EPI readings for metallic object have variability around 8–10% [28] whereas in healthy subject the variability is 4.1–6.6%.[26] EPI is noninvasive, safe and gives quick assessments and analysis about a physiological and psychophysiological state of humans [26].

3. Methods

The study consisted of 309 subjects: 199 long-term and 110 naive meditation practitioners. Subjects were recruited from two meditation centers: The Pyramid Spiritual Trust, Kailaspuri, Hyderabad and Pyramid Valley International, Bangalore, India. Subjects were divided into two groups, long-term meditators (LTM) practicing from 12 months or longer (mean months of practice 79.22 ± 49.10, daily 1.68 ± 1.02 h) and naive meditators (NM) practicing daily 2.30 h (5.00–7.30 AM) for seven days. A total of 266 subjects were part of the analysis after excluding 43 outliers (25 from LTM and 18 from NM respectively). 105 males (mean age 56.10 ± 7.26 years) and 69 females (mean age 54.38 ± 5.91 years) in LTM and 53 males (mean age 54.21 ± 6.94 years) and 39 females (mean age 54 ± 5.97 years) in NM group, constituted the study population. The subjects having health issues or extreme values, with only one measurement (either with or without filter measurement only) and defective images, were considered outliers [30]. Signed informed consent was obtained from subjects for voluntary participation in the study. Ethical approval was obtained from the Institutional Ethical Committee to carry out the study. The research design was cross-sectional and data were collected using electrophotonic imaging (EPI).

The included subjects were; healthy volunteers, age range from 45 to 70 years, both genders and willing to participate in the study and included either in LTM or NM group, subjects were required to have either at least 12 months of prior meditation practice experience or able to participate in a seven days meditation program. Exclusion criteria were; subjects with missing or partially missing fingers, smokers or having alcohol on the test day, having any other disease or on prescription drugs.

Demographic questionnaires were administered to all subjects to obtain self-reported health status, age, meditation practice experience and for assigning to a groups. During measurement, nostril dominance was checked manually by keeping a finger close to the nose and asking subjects to breathe out with closed mouth.