Just a minute meditation: Rapid voluntary conscious state shifts in long term meditators

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ARTICLE INFO

Keywords:
Meditation
Consciousness
Cognition
State changes
EEG

ABSTRACT

Meditation induces a modified state of consciousness that remains under voluntary control. Can meditators rapidly and reversibly bring about mental state changes on demand? To check, we carried out 128 channel EEG recordings on Brahma Kumaris Rajayoga meditators (36 long term; median 14240 h meditation; 25 short term: 1095 h) and controls (25) while they tried to switch every minute between rest and meditation states in different conditions (eyes open and closed; before and after an engaging task). Long term meditators robustly shifted states with enhanced theta power (4–8 Hz) during meditation. Short term meditators had limited ability to shift between states and showed increased lower alpha power (8–10 Hz) during eyes closed meditation only when pre and post task data were combined. Controls could not shift states. Thus trained beginners can reliably meditate but it takes long term practice to exercise more refined control over meditative states.

1. Introduction

Meditation is a set of diverse cognitive-affective techniques that allow voluntary, reversible shifts in mental states that can be objectively characterized by corresponding brain states. The brain state during meditation is distinct from other wake mental states such as rest and alertness (Tang, Rothbart, & Posner, 2012). A trained meditator can enter into a modified state of consciousness at will or on demand, which makes meditation a valuable subject of study. Meditation is known to bring about cognitive enhancements (Delgado-Pastor, Perakakis, Subramanya, Telles, & Vila, 2013; Teper & Inzlicht, 2013; Zeidan, Johnson, Diamond, David, & Goolkasian, 2010), enhance emotional management (Farb et al., 2010), regulate sleep and neuro-endocrine function (Nagendra, Maruthai, & Kutty, 2012), reduce anxiety symptoms (Chen et al., 2013), and contribute to an overall sense of well-being (Shapiro, Oman, Thoresen, Plante, & Flinders, 2008). While meditation is often practiced in silent and peaceful environments, the benefits of meditative practice would be especially valuable if the meditator can enter meditative states quickly and under normal work conditions. Indeed, it has been suggested that proficient meditators can meditate in non-ideal environments and that it becomes easier with long term practice (Lutz, Jha, Dunne, & Saron, 2015).

A growing body of evidence suggests that long term meditation practice brings about experience dependent neuro-plastic changes
in specific cortical areas involved in emotion regulation and cognitive control (Hölzel et al., 2011; Kang et al., 2013; Lazar et al., 2005; Luders et al., 2012). These trait effects of long term meditative practices have been explored both in sleep (Pattanashetty et al., 2010; Sulekha, Thennarasu, Vedamurthachar, Raju, & Kutty, 2006) and waking states (Brefczynski-levi, Lutz, Schaefer, Levinson, & Davidson, 2007; Cahn, Delorme, Polich, Diego, & Jolla, 2013; Cahn & Polich, 2006; Manna et al., 2010). Indeed, state changes in long term meditators can be considered to be a combination of state and trait effects (Davidson & Kaszniaik, 2015). The extent of clinical efficacy and details of underlying mechanisms are however still under debate and discussion (Chiesa & Serretti, 2011; Goyal et al., 2014; Holzel et al., 2011; Raffone & Srinivasan, 2010; Tang, Holzel, & Posner, 2015; Tomasino, Chiesa, & Fabbro, 2014).

An important consideration is that meditation is an umbrella term. Meditative techniques may be classified into three broad families (Attentional, Constructive and Deconstructive) based on the primary cognitive mechanisms involved (Dahl, Lutz, & Davidson, 2015). In brief, the attentional family involves self-regulation of attentional scope to foster meta-awareness; the constructive family uses cognitive and affective methods such as perspective taking and reappraisal to foster well-being; and the deconstructive family involves self-inquiry into affective and cognitive processes in order to yield insights. Interestingly, a few common state and trait changes emerge at the neural and behavioral levels (Cahn & Polich, 2006; Fingelkurts, Fingelkurts, & Kallio-Tamminen, 2015b, 2016; Sedlmeier et al., 2012). This commonality suggests that meditative techniques can be grouped into one overarching category. However, meditation techniques are very diverse in their detailed practice and philosophical inclinations and these differences need to be taken into account while researching a particular meditative practice (Awasthi, 2013; Lutz, Dunne, & Davidson, 2007; Nash & Newberg, 2013). Attempting to understand the neurobehavioral mechanisms underlying meditation needs to be in the context of the school of meditation under study.

We were interested in evaluating if it is possible to achieve a meditative state quickly and reversibly under a variety of conditions. The Brahma Kumaris Rajayoga meditation recommends one minute meditation techniques that are practiced during different times of the day. Some of the one minute meditations can be found on the ‘Just a minute meditation’ website (Brahma Kumaris, 2016b) while more detailed introductions to Rajayoga meditation can be found on the organization’s main website (Brahma Kumaris, 2016a). Rajayoga can be considered to be in the ‘constructive family’ of meditation as it employs contemplation and directed thinking in order to reach experiential states for self-development (Kiran, Behari, Venugopal, Vivekanandhan, & Pandey, 2005; Ramesh, Sathian, Sinu, & Kiranmai, 2013). There are several types of meditations that are practiced within this tradition and soul conscious meditation (experiencing the self as a soul, visualized as a star behind the forehead) forms the starting step in all these meditation forms (Hassija, 2001). Rajayoga meditation is typically practiced with open eyes, in contrast to most techniques where meditation is practiced in eyes closed condition.

We wanted to examine if it is indeed possible to attain the benefits of meditation while dealing with day to day challenges where limited time is available. We incorporated both eyes open and closed conditions in the protocol so that participants would have to meditate in familiar (eyes open) and unfamiliar (eyes closed) situations. EEG power spectral density measures were used to ascertain if the participants were able to make the state changes as instructed. Additionally, we wanted to check if the duration of meditation training brought any trait advantages over and above a state effect of following the instructions. We designed a simple rest and meditation EEG protocol that involved both eyes open and closed conditions which we applied before and after a challenging cognitive task (Nair, Sasidharan, John, Mehrutra, & Kutty, 2016). We used this task to simulate real world practical challenges that can keep us engrossed, providing us with the opportunity to realistically test the ability to meditate in different conditions.

2. Materials and methods

2.1. Participants

We recruited three groups of participants (n = 86) between the age range 27–65. The Long Term Practice group (LTP, n = 36) had a median of 14,240 h of meditation experience and a minimum of ten years of regular meditation practice. The Short Term Practice group (STP, n = 25) had a median of 1095 h of meditation with a range of 6 months to 2 years of regular meditation practice. The Zero Term Practice group (ZTP, n = 25) had no meditation exposure. None of the participants had exposure to any other form of meditation.

The participants were matched for age, gender, education and monthly family income. Meditation is practiced by people with diverse socio-economic conditions. Our study included participants with diverse education levels. Over a quarter of the participants had less than 12 years of formal education. Though there was a range, most practitioners were from the ‘middle-class’ as per Indian living standards though two of the meditators (1 LTP and 1 STP) had a very low monthly income at present. Most participants were multilingual. All had basic literacy in at least one language - English, Hindi or Kannada. All participants were right-handed and non-smokers. There were no differences between the groups in terms of exercise levels (p = 0.67) or sleep quality (p = 0.32). Two of the STP and eight of the ZTP occasionally consumed alcohol and the rest were teetotalers. Participation of pre-menopausal female volunteers was planned to ensure that they were in the follicular phase (within one week after menstruation) at the time of the study to minimize variation in alpha frequency with progesterone levels (Bazanova & Vernon, 2013). All participants provided written informed consent as approved by the NIMHANS Institute Human Ethics Committee and in accordance with the Declaration of Helsinki (1964). Financial compensation was not provided to the meditators and most of the ZTP participants. Towards the end of the study, a token amount of INR 250 (less than USD 5) was offered to the ZTP participants to encourage participation.

Permission for meditator recruitment was obtained from the Spiritual Applications Research Center (SpARC), Mt. Abu, India and the three administrative offices of Brahma Kumaris, Bangalore. LTP and STP were recruited with the help of Brahma Kumaris centers
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