



Approaching dysphoric mood: State-effects of mindfulness meditation on frontal brain asymmetry



Philipp M. Keune^{a,*}, Vladimir Bostanov^b, Martin Hautzinger^a, Boris Kotchoubey^b

^a Institute of Psychology, Department of Clinical Psychology, Eberhard Karls University, Tübingen, Gartenstr. 29, 72074 Tübingen, Germany

^b Institute of Medical Psychology and Behavioral Neurobiology, Eberhard Karls University, Tübingen, Gartenstr. 29, 72074 Tübingen, Germany

ARTICLE INFO

Article history:

Received 9 October 2012

Accepted 27 January 2013

Available online 11 February 2013

Keywords:

Mindfulness

Meditation

Depression

Alpha asymmetry

EEG

Rumination

ABSTRACT

Meditation-based interventions reduce the relapse risk in recurrently depressed patients. Randomized trials utilizing neurophysiologic outcome measures, however, have yielded inconsistent results with regard to a prophylactic effect. Although frontal brain asymmetry, assessed through electroencephalographic (EEG) alpha activity (8–13 Hz), is indicative of approach vs. withdrawal-related response dispositions and represents a vulnerability marker of depression, clinical trials have provided mixed results as to whether meditation has beneficial effects on alpha asymmetry. Inconsistencies might have arisen since such trials relied on resting-state recordings, instead of active paradigms under challenge, as suggested by contemporary notions of alpha asymmetry.

We examined two groups of remitted, recurrently depressed females. In a “mindfulness support group”, EEG was recorded during neutral rest, and rest following a negative mood induction. Subsequently, participants received initial meditation instructions. EEG was then obtained during an active period of guided mindfulness meditation and rest following the active period. In a “rumination challenge group”, EEG was obtained during the same resting conditions, whereas in the active period, initial meditation instructions were followed by a rumination challenge. A significant shift in mid-frontal asymmetry, yielding a pattern indicative of approach motivation, was observed in the mindfulness support group, specifically during the meditation period. This indicates that mindfulness meditation may have a transient beneficial effect, which enables patients to take an approach-related motivational stance, particularly under circumstances of risk.

© 2013 Elsevier B.V. All rights reserved.

1. Introduction

Due to the high prevalence of depression and the fact that it is frequently recurrent, tremendous effort has been made to develop and evaluate forms of medical and psychotherapeutic maintenance therapy (Dobson et al., 2008; Teasdale et al., 2000). With regards to psychotherapy, a particularly effective approach is to be seen in mindfulness-based interventions, i.e. interventions involving exercises of mindfulness meditation (Segal et al., 2002). The term mindfulness represents a quality of consciousness which is characterized by an open, non-judgmental attitude toward anything arising within the field of awareness, combined with refined, purposeful attention (Hanh, 1996). Mindfulness is traditionally fostered through meditation exercises in which individuals acquire the skill to redirect their attention toward physical sensations of their breath, as distracting cognitions and emotions arise (Kabat-Zinn, 1990; Keune and Perczel-Forintos, 2010). As a consequence,

patients at risk for depression may reframe phenomena which may endanger their remitted state, such as dysfunctional attitudes and sad mood, in a meta-cognitive perspective, and experience them as impermanent events, rather than facts (Teasdale et al., 2002). It has further been suggested that the non-judgmental attitude which characterizes mindfulness, is associated with a reduction in avoidant behavior and increased affect tolerance (Bishop et al., 2004). In line with these notions, structured interventions like mindfulness-based cognitive therapy (MBCT; Segal et al., 2002) and mindfulness-based stress-reduction (MBSR; Kabat-Zinn, 1990) have been shown to reduce residual depressive symptoms, trait rumination and cognitive reactivity to sad mood (Keune et al., 2011a; Kingston et al., 2007; Raes et al., 2009; Ramel et al., 2004).

1.1. EEG alpha asymmetry, motivation and affect: trait and state components

A neurophysiologic phenotype which is frequently examined in relation to depression, mindfulness and meditation, is anterior brain asymmetry, derived through the alpha band in resting-state

* Corresponding author. Tel.: +49 7171 29 78358; fax: +49 7171 29 5956.
E-mail address: pmkeune@gmail.com (P.M. Keune).

electroencephalogram (Barnhofer et al., 2007, 2010; Davidson et al., 2003; Keune et al., 2011a; Moyer et al., 2011; Travis and Arendander, 2006). The alpha band and its sub-bands have been ascribed several functional roles as neurophysiologic indices (Jaworska et al., 2011; Klimesch, 1999; Klimesch et al., 2007; Lüchinger et al., 2012). In the line of research on EEG alpha asymmetry, alpha power (8–13 Hz) is commonly regarded as an inverse indicator of underlying cortical activity (Coan and Allen, 2004). Early studies suggested a hemisphere-specific relation between alpha asymmetry and affect (*valence-hypothesis*; e.g. Wheeler et al., 1993; Silberman and Weingartner, 1986), characterized by an association between stronger relative right-hemispheric alpha power and positive affect on the one hand, and stronger relative left-hemispheric alpha and negative affect on the other. Later studies revealed that affect may have been confounded with motivational direction in these early studies. In particular, anger, a state characterized by approach motivation and negative valence was shown to be associated with stronger relative right-hemispheric alpha activity (Harmon-Jones et al., 2010). Consequently, the prevailing view of the *approach-withdrawal model* holds that stronger relative right-frontal alpha activity is indicative of approach motivation, whereas stronger relative left-frontal alpha is associated with tendencies of withdrawal and avoidance (Coan and Allen, 2004; Harmon-Jones et al., 2010; Keune et al., 2011b, 2012b).

It is estimated that approximately 60% of the alpha asymmetry phenotype is attributable to trait characteristics, while 40% is subject to state influences (Hagemann et al., 2005). Coan et al. (2006) have provided an integrative model which takes these state and trait components into consideration. According to this capability model, alpha asymmetry is indicative of the capability to regulate emotions under challenging circumstances. It is assumed that the salience of individual differences in alpha asymmetry is increased for recordings obtained under challenge. Consequently, the association between alpha asymmetry and relevant criterion variables (i.e. variables predicted by alpha asymmetry), as well as its test–retest reliability, is assumed to increase for such recordings. These assumptions have received initial support in several studies (Coan et al., 2006; Keune et al., 2011a; Stewart et al., 2011). Coan et al. (2006) observed increased reliability of the relationship between frontal asymmetry recorded during mood challenges and relevant criterion variables. Similarly, Keune et al. (2011a) have reported elevated test–retest reliability for alpha asymmetry derived from recordings under mood challenge. Importantly, it has been shown that challenges that manipulate subjects to attain a certain motivational (e.g. approach-related) stance, are also able to change alpha asymmetry in the corresponding direction and to predict subsequent behavior in accord with the motivational stance (Harmon-Jones and Sigelman, 2001; Verona et al., 2009).

1.2. Frontal brain asymmetry, depression and mindfulness

With regard to currently depressed, as well as remitted individuals, an asymmetry pattern indicative of withdrawal has repeatedly been observed, and cognitive vulnerability for depression has been linked to this pattern (Davidson, 2004; Nusslock et al., 2011), albeit some studies failed to replicate the finding of abnormal asymmetry in depression (Davidson, 1998; Reid et al., 1998; Carvalho et al., 2011; Segrave et al., 2011). Despite these inconsistencies, treatment approaches involving methods such as repetitive transcranial magnetic stimulation (rTMS) have provided indirect support for the involvement of anterior brain asymmetry in depression, as it has been shown that stimulation of particularly left-frontal cortical areas may be associated with improvements in clinical symptoms, superior to placebo treatment (George et al., 2010).

In contrast to healthy participants for whom structured mindfulness-based interventions have been shown to affect alpha asymmetry (Davidson et al., 2003; Moyer et al., 2011), randomized trials involving recurrently depressed patients, have provided mixed results. An initial study was conducted by Barnhofer et al. (2007) who reported that participation in an MBCT course was associated with the retention of a stable asymmetry pattern in previously suicidal patients, compared to a wait-list control group, for which a shift toward stronger relative left-frontal alpha power was observed during a period of two months. Results were interpreted in terms of a neurophysiologic correlate of the prophylactic effect of MBCT. A second trial was conducted by Keune et al. (2011a) with the intention to replicate and extend findings by Barnhofer et al., using a considerably larger sample. Nevertheless, the protective effect was not replicated and the shift toward stronger relative left-frontal alpha activity was observed for the whole sample (MBCT and wait-list control). Although both studies have provided insight with regard to temporal dynamics of alpha asymmetry in patients with an extremely high relapse risk, it remains unclear whether alpha asymmetry may be affected by mindfulness meditation in such high-risk patients.

Barnhofer et al. (2010) published preliminary results, which suggest that mindfulness meditation may have a state-effect on frontal asymmetry in previously depressed patients. EEG recorded prior to and following 15 min of meditation revealed a change in alpha asymmetry, suggesting that meditation enabled patients to take a more approach-related motivational stance. In the context of the capability model, it is therefore conceivable that state mindfulness, associated with active periods of meditation, is related to alpha asymmetry indicative of approach. To date, this issue remains to be addressed in detail.

1.3. Purpose of the current study

Based on the inconsistencies between studies by Barnhofer et al. (2007) and Keune et al. (2011a), the purpose of the current study was to examine state-effects of mindfulness meditation on frontal alpha asymmetry in a sample of high-risk recurrently depressed patients. Since alpha asymmetry is subject to state influences, and since in neither of the two studies results were reported for assessments conducted during active mindfulness meditation, it is possible that random state influences might be accountable for the inconsistencies. It is also possible that putative modulations in alpha asymmetry were partly transient and state-specific, and as such not necessarily detectable on a trait level via recordings during resting periods. An initial step to show that structured mindfulness-based interventions might affect alpha asymmetry is to show that mindfulness meditation does indeed have state-effects on frontal alpha asymmetry, as previously suggested by Barnhofer et al. (2010).

In the current study we addressed this issue by examining alpha asymmetry during several resting-state conditions and active periods under challenge in 57 recurrently depressed women in remission. In a “mindfulness support group” ($n=25$), an initial EEG assessment took place during neutral rest, i.e. a resting condition which was not preceded by any experimental manipulation. Following this baseline recording, a negative mood induction occurred, which was followed by a second resting-state recording. Thereafter, participants were instructed to focus on their breath and EEG was obtained during an active period involving supportive instructions of mindfulness meditation (mindfulness support). Finally, a third resting-state EEG recording occurred, following this active period.

In a “rumination challenge group” ($n=32$), the first two conditions, i.e. neutral and negative mood were the same. Following these conditions, participants were also instructed to continuously

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات