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The cost of paying attention
Is focused attention meditation less relaxing than emptiness meditation?

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Abstract. Sustained attention may create mental fatigue and a narrow focus has been associated with stressful situations. Meditation instructions encouraging a narrow focused attention toward a visualized object were hypothesized to show less relaxation than an open focus directed toward the background of a visualized scene. Heart Rate Variability (HRV) data was collected from 24 subjects with some previous meditation experience. Among those who meditated more than 30 minutes per week (n=19) there was a significant difference for low HRV coherence and for high HRV coherence. 20 of the 24 subjects reported experiencing the open focus type of meditation as nicer or more relaxing. In conclusion experienced meditators may reach a more harmonious state during an open focus emptiness meditation while subjects with less meditation training react more inconsistently.

Meditation may be described as a group of various attentional and emotional regulatory strategies (Lutz, Slagter, Dunne, & Davidson, 2008). Murata, Takahashi, Hamada, Omori and Kosaka (2004) define meditation as a specific state of consciousness where deep relaxation and increased internalized attention coexist. In the present study the relationship between attention and relaxation is investigated.

Lutz et al. (2008) describe two types of meditation practice. Focused attention (FA) meditation involves top-down attention and the voluntary focusing on a chosen object. Open monitoring (OM) meditation enhance a monitoring awareness without the focusing on any explicit object. FA meditation is characterized by sustained attention (on eg. the sensations around the nostrils caused by breathing), and involves the detection of distractions (eg. noticing an involuntary shift of attention towards the pain in one's knee), disengagement from distractions, and a redirection of attention to the intended object. Lutz et al. state that these types of meditation involves a rather narrow focus, and therefore might also result in a lowered ability to identify stimuli outside this focus.

OM meditation practices involve an initial use of FA practice in order to reduce distractions and to calm the mind. This stage is followed by a gradually reduced focus on the object. Slagter, Lutz, Greischar, Francis, Nieuwenhuis, Davis and Davidson (2007) describe the first step as a focusing or stabilizing concentration on the breath or some other "object" and the next step as a broadening of one's focus to a non-reactive sensory awareness or "bare" attention. Lutz et al. (2008) describe how the focused attention can be replaced by a "reflexive" awareness with greater access to the rich variety of features accompanying the experience of each moment until no explicit focus remains. Background features of the primary focus will be continuously monitored in OM meditation, although now there is no longer an actual primary focus. The effortful "grasping" of objects in selective attention will be replaced by an effortless sustained awareness. One aim of this practice is a clear awareness of usually implicit features of one's mental life, and a heightened sensitivity to body and environment is said to arise together with a decrease in the mental reactivity that creates mental distress. Segal,

Williams, and Teasdale (2002) propose a difference between a "doing-mode" and a "being-mode", where the doing-mode is characterized by its relation to a desired goal state while the being-mode is multidimensional and responsive to the richness and complexity of each new moment. When focused on problem-solving as in a depressed state, or when focusing on any goal when in "doing mode", the attention is narrowed to the issues at stake and our concepts around our goals (Williams, Teasdale, Segal, & Kabat-Zinn, 2007). To, as suggested by Segal et al., shift from doing-mode to being-mode seems to involve the shift from a narrow to a broad focus; *"This [the core skill] involves moving from a focus on content to a focus on process, away from cognitive therapy's emphasis on content of negative thinking, toward attending to the way all experience is processed."* (2002, p75). It is most likely this same shift away from a narrow focus that has also been referred to as a shift from "self-as content" to "self-as context" (Luoma, Hayes & Walser, 2007).

Meditation instructions

Meditation instructions involve parts that may seem unclear and hard to understand for the non-meditator. For example Thich Nhat Hanh (1988) writes: *"Emptiness is important because without emptiness, nothing is possible. So we should also say, 'Long live emptiness!' Emptiness is the basis of everything."* To make it possible to test any hypothesis about meditation, instructions need to be translated into a language that is closer to the language used within the cognitive neurosciences. Perhaps one main difference between FA and OM meditations can be understood in terms of the cognitive shift between figure and ground. Lutz et al. (2008) pointed out how background features of the primary focus will be monitored in OM meditation. The function of background metaphors like "emptiness", "space" and "a panoramic perspective" in emptiness meditation instructions seem to be to draw interest towards the background of the phenomenal field. The general disinterest in cognitive content within the mindful approach, as put forth by Segal et al., could also be understood this way. Mental objects that appear as the foreground figure of the experience can be associated with feelings, values, judgments and memories. Attending to background features will instead be a way to take a voluntary break from automatic conceptual thinking and judging. A non-grasping open focused meditation is not concerned with the focused thinking about mental contents, but about the background features of conscious awareness.

The narrow focus on foreground figures as the origin of mental stress

The mind of the meditator in open monitoring awareness seems quite different from the mind of an individual in distress. Highly stressful situations have been associated with an attentional narrowing, sometimes referred to as "tunnel vision" (Dirkin, 1983). Similarly, Williams et al. (2007) describe the depressed state as one of attention via tunnel vision, where everything except for the problems to be solved drop out of awareness. Kallái, Kosztolanyi, Osvath and Jacobs (1999) describe how agoraphobic individuals become too focused on physiological reactions and therefore fail to process

external information in order to form a cognitive map of the environment. Andreassis have argued that a "closed attentional stance" is associated with an accelerated heart-rate compared to an "opened attentional stance" (referred to in Kállai et al. 1999). Clinicians also points out how intensified emotions lead to a narrow focus (Kåver, 2006).

While a narrow focus is often characteristic of a state of pressure and stress, an open focus may be associated with a relaxed state of mind. The hypothesis to be tested in the present study is that an open focus "emptiness meditation" will be associated with an opened attentional stance and that this open focus will be associated with a higher degree of relaxation than that of focused attention. The open focus will then have a direct causal effect on the level of mental stress, and this effect is thought to be detectable by a physiological variable (Heart Rate Variability, see below). This hypothesis rests on two assumptions. The first one is that meditation instructions for FA meditation are aiming to create a type of concentration that on a cognitive, experiential and physiological level is different from the state of mind aimed at by instructions for emptiness meditation or OM meditation. The second assumption is that this difference can be connected to the cognitive operation involved in the shift from foreground to background.

Heart Rate Variability

To test this hypothesis simplified OM meditation-like instructions were constructed along with instructions that demand a slightly higher level of focused concentration. The instructions pointed either towards the background of a visualized scene or towards an object in a similar scene. The two different conditions were then compared by the recording of Heart Rate Variability (HRV). When measuring HRV one records beat-to-beat changes in heart rate. Such changes in cardiac activity are affected by how the heart is modulated by the sympathetic and parasympathetic (vagal) divisions of the autonomic nervous system. During stress, sympathetic activity regulates the balance between the sympathetic and parasympathetic nervous system (Wu & Lo, 2008). Negative emotions such as anger, frustration or anxiety, reveal patterns of HRV which are erratic or disordered (McCraty, 2002). These HRV patterns reflect the changes in heart rate over time and are related to respiration. The heart rate increases during inspiration and decreases during exhalation. When cardiac activity is dominated by the parasympathetic (vagal) division the heart rate is regulated by respiration (Wu & Lo, 2008). Therefore, under parasympathetic predominance regular respiration will reveal a regular pattern of changes in heart beat, a high HRV coherence. High HRV coherence is associated with positive emotions, such as the feeling of appreciation (McCraty, Atkinson, Tiller, Rein & Watkins, 1995).

To sum up, studies comparing negative and positive stimuli (Jönsson & Hansson-Sandsten), or the emotion of anger with appreciation (McCraty et al.), indicate that stress, fear and anger result in irregular patterns and low HRV coherence while positive emotions result in high HRV coherence reflecting regular HRV patterns. The present study compared HRV coherence during two different meditation conditions in a within-subjects design. The hypothesis was that an open focus meditation would be associated with higher coherence than the focused attention meditation.

Method

Participants

In a pilot study HRV data was collected from 19 American subjects. Anyone willing to participate on the day of the study was included in the data set. In the main study subjects with some previous meditation experience were contacted through different meditation groups and networks. HRV data was collected from a total of 24 subjects, 23 Swedish and one Finnish subject, via a sensor attached to the left earlobe. These 24 subjects had experience of a range of different meditation techniques like vipassana, zen, Thich Nhat Hahn inspired exercises, Qigongmeditation etc. 11 of the subjects reported using some form of vipassana meditation. Some of the techniques practiced by the subjects may be defined as concentration-based and some of them, like vipassana (which means insight), may be defined as OM meditation techniques. As have been mentioned earlier, OM meditations also involve an initial use of concentration-based FA meditation. Hence OM practitioners also have experience of FA techniques. The subjects were 14 women and 10 men aged 24-73 years (M= 34,2 years, SD = 10,0). They started meditating between 0,5 and 20 years ago (M = 8,1, SD = 4,9) and the current meditation practice reported was M = 132,0 minutes per week (SD = 112,9). Subjects were asked if they had consumed any coffee, alcohol or nicotine previous to the study.

Measurements

A sensor (Freeze Framer 2.0 USB, HeartMath, Boulder Creek, CA) that was attached to the earlobe measured heart rate and software from HeartMath (Boulder Creek, CA) was used to calculate HRV coherence. Every 5-seconds the HeartMath software calculates the coherence level and after four minutes of recording the cumulative amount of time spent in either high, medium or low coherence was recorded. Then the procedure was repeated during the second type of meditation condition. In this study I analyzed only the low and high levels of coherence. The two meditation conditions were compared using a within-subject paired t-test.

Instructions and procedure

The intention when constructing meditation instructions for this study was to capture the dichotomy of a narrow object-based focus versus a letting go of the focused object. Optimally the two sets of instructions constructed should not differ in any other way than on this dimension. For example, if the set of instructions involved a sky, then the open focused version of the instruction would be directed towards the sky while the focused attention instruction would involve a focus on the clouds. If the set of instructions involved a visualization of a natural scene, then the open focused instruction would involve horizons and open air while the focused attention involved a particular tree, etc. Four different pairs of instructions were chosen, partly because different individuals may be triggered by certain words in unpredictable ways, (someone may be scared of rivers

due to a bad memory etc.), and partly because the giving of several instructions, rather than just one, was thought to make it easier even for the novice meditator to actually follow the instructions without being left in silence with enough time to get distracted. In this study instructions were given at the beginning of every new minute for four minutes. This short time between instructions was supposed to artificially replace the first step in any mindfulness practice where the subject herself or himself must have gained the skill of choosing what to attend to and to maintain sustained attention herself/himself. The instructions came to read as follows:

A "Open focus" 1: Imagine that your mind is like a clear sky. Compare your thoughts to clouds passing by. If you see thoughts then just let them pass and try to direct your attention towards the clear sky.

B "Narrow focused attention" 1: Imagine a blue sky with clouds. Try visualizing the clouds turning into figures of different kinds. Try to focus on these images, their shapes and patterns.

A "Open focus" 2: Please keep your eyes closed. Direct your attention towards the room around you. Imagine the walls disappearing and leaving just the space around you. Direct your attention towards that space around you.

B "Narrow focused attention" 2: Imagine a box in front of you. Focus on the shape of the box. Visualize the box and direct your attention towards whatever colour it may have and whatever material it might be made out of or whatever content it might have.

A "Open focus" 3: Imagine being at a lookout. Maybe this is a place you have visited. You can see the horizons far away. Just direct your attention towards the open air around you.

B "Narrow focused attention" 3: Imagine a place in nature. Maybe this is a place you have visited. You can see a tree in front of you. Imagine the size and colours of this tree. Focus on its shapes and what the bark and branches might look like.

A "Open focus" 4: Visualize a broad river slowly floating by. You are on the shore looking out over the river. Just direct your attention towards the motion of the water slowly moving by.

B "Narrow focused attention" 4: Visualize a small pond. Visualize the shape of it. Imagine walking around this pond looking at whatever objects you might find around it.

One set of instructions, either A 1-4 or B 1-4, were given during four minutes and after a short break the next set of instructions were given during another four minutes (either B 1-4 or A 1-4). To be sure that not only an increased stress-reduction as a result of sitting still and relaxing would be measured, every second participator begun with the four minutes of open focus instructions A 1-4 followed by the B's while every second person started with the four minutes of narrowed focus instructions B 1-4 followed by the A's.

In the pilot study subjects were given the instructions in English. Subjects in the main study were given instructions in Swedish, except for the Finnish subject whom was given the instructions in English.

After the two times four minutes of meditation subjects in the main study were asked to write down their experiences of the two different sets of instructions, whether or not one type of instructions was experienced as "eg. easier, harder, more relaxing, stressful, energizing, tiring, no difference, or…?" They were also encouraged to write down any additional verbal comments about the tasks.

In the pilot study data was collected in a non-sound proof room and some outer distracting sounds did disturb some data since the HRV coherence measure is very sensitive. In the main study data was collected in a relatively sound-proof room at the bottom floor of the Psychology department at the University of Gothenburg.

Results

Pilot study

When the pilot study was conducted, one assumption was that an inner sense of having gained control over one's attention could be replaced with instructions given every minute. The idea was that although it is a common thing to begin meditation practice with some kind of attention training, it should still be possible to test effects of open focused instructions on any subject if just giving enough external input that could help stabilizing focus. For each individual the two conditions were compared by the use of a paired t-test. Fig. 1 shows that there was no significant within-subject difference between the two types of instructions, $t(18) = -0{,}60$, $p = 0{,}56$ for low HRV coherence (open focus $M = 37{,}6$, $SD = 21{,}8$, narrow focus $M = 41{,}5$, $SD = 31{,}0$) and $t(18) = -1{,}78$, $p = 0{,}09$ for high HRV coherence (open focus $M = 18{,}1$, $SD = 27{,}2$, narrow focus $M = 25{,}0$, $SD = 33{,}5$).

If anything these data would suggest a non-significant tendency towards a greater amount of time spent on the high coherence level during the narrow focused attention meditation which points in the opposite direction of what that was hypothesized. As additional comments as well as the main study suggest, there may be such a relationship among subjects without meditation experience.

Additional data, which unfortunately was not collected in any structured way in the pilot study, gave hints about an open state maybe resulting in anxiety or increased uneasiness instead of stress-reduction in novice meditators. A few subjects who had never before tried any meditation exercises commented on the open focus instructions as being extra hard and also unpleasant. These subjects instead found focusing on an object to be a better and easier to grasp kind of exercise. Eg. *"It was hard not to focus on anything in particular"* or *"I liked the river one, though the [B] one was much easier where I had something to focus on"*. A few subjects who on the contrary did happen to have some former experience of visualization techniques and/or meditation techniques expressed liking the instructions for an open focus. Eg. *"I liked the [A] clear sky one!"*, and someone else reported; *"I felt the [A] one was more calming. The [B] one where I*

had to visualize objects felt more like thinking than meditating. The space-one and open skies where more meditative. The pond one had me thinking about a pond from my childhood, it made me remember things".

These comments encouraged the collection of written comments in the main study where subjects with at least some previous experience of meditation practice participated.

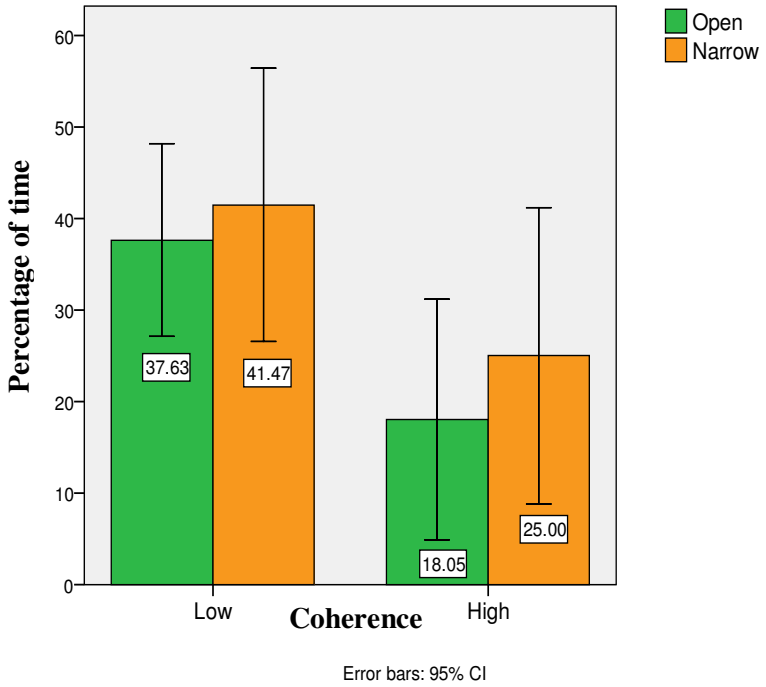

Fig. 1. Percentage of time spent in low and high HRV coherence. Subjects participating in the pilot study showed no significant difference regarding the amount of time spent in the low or high HRV coherence level.

Results for experienced meditators

In the main study 24 subjects with some previous meditations experience were given the two different types of open vs. focused attention instructions, and for each individual the difference between the A-open condition and the B-narrow focus condition was compared. This within-sample t-test showed no significant difference between the two sets of instructions; $t(23) = -2{,}02$, $p = 0{,}06$ for low HRV coherence (open focus M =33, 8, SD = 31,0, narrow focus M = 45,5, SD =31,1) and $t(23) = 1{,}479$, $p = 0{,}15$ for high HRV coherence (open focus M = 24,3, SD = 31,2, narrow focus M = 16,7, SD = 18,0).

However, as shown in Fig. 2. a significant difference was found among those 19 subjects who meditated more than 30 minutes a week, $t(18) = -4{,}11$, $p = 0{,}00$ for low coherence (open focus M = 29,6, SD = 30,8, narrow focus M = 47,2, SD = 30,2) and $t(18) = 2{,}33$, p = 0.03 for high coherence (open focus M = 29,5, SD = 33,0, narrow focus M = 16,6, SD = 19,4).

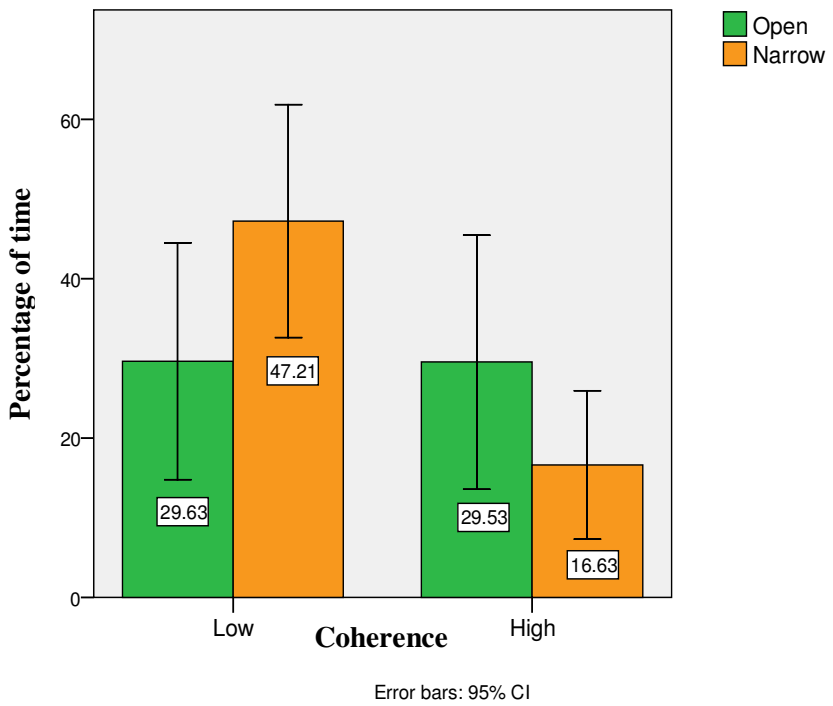

Fig. 2. Percentage of time spent in low and high HRV coherence. During the open meditation condition subjects meditating more than 30 minutes per week spent more time in the high HRV coherence level and less time in the low HRV coherence level as compared to the narrowly focused condition.

The subjective experiences of the different instructions varied, but 20 of 24 subjects reported that they experienced the open focused meditation as relatively nicer or more calming, relaxing or restful then the focused attention meditation. One of these 20 subjects used the word relaxing in combination with the words *"positive, energy-enhancing, alertness"*.

While 15 subjects used the specific words "calm", "relaxing" or "restful" to describe the open meditation, only two subjects described the focused meditation this way. HRV coherence was still lower during the focused meditation for one of these two subjects, whom described the focused meditation using the word calming in combination with the words *"feeling alert and engaged, less intellectualizing and less demanding"*. Six subjects described the focused meditation with words like creative, surprised, surprising & cheerful, encouraged imagination, fun & moving, created more images and thoughts. One more subject wrote that the focused meditation created more thoughts and another seven subjects described the focused meditation as more demanding or stressful.

Descriptions of the two different conditions may be viewed in table 2. Of course the two different types of meditations were not labeled as "open meditation" or "focused meditation" during the test, but simply referred to as "the first one" and "the second one". All comments in Swedish (n=23) have been translated to English.

Table 2. Written comments about the two different meditation conditions.

NARROW FOCUSED ATTENTION	OPEN FOCUS / OPEN AWARENESS
"slightly stressful, more demanding"	*"felt more open, free-er, nicer"*
"slightly confusing, created some worry/distress"	*"more liberating, easier to let go, less of demanding a performance"*
"demanding, more work, less relaxing"	*"more clear, present here and now"*
"more like concentrating on a work task"	*"opening, restful"*
"created some stress about 'being able' to visualize"	*"experienced being in open air/space, spirituality"*
"more like trying to achieve something"	*"enjoyed feeling the space"*
"not as restful for the intellect"	*"stillness"*
"down to earth, I as a 'person' is part of the meditation"	*"very meditative and mind expanding, feelings of emerging to the surroundings"*
"uninteresting"	*"warmer, a feeling of holding"*
"difficult when the head is already full of details"	*"more physical, 'bodily' because of the feeling of space"*
"distracting to create many active images"	*"to direct attention outwards towards something bigger was calming, easier to let go of thoughts"*
"concrete, ordinary"	*"sometimes slightly scary with the space around"*
"creative"	*"pleasant, the mind is resting which gives space for a more transformative process"*
"surprising and cheerful"	*"emotionally interesting experiences, dizzy when walls disappeared, tiring when it's happening, wanting to escape feelings coming up"*
" encouraged imagination"	
" fun and moving"	
" created more images and thoughts"	

The words easier and harder were used ten vs. eight times, both evenly distributed to the two conditions. Someone also expressed liking one type of instruction while someone else thought the opposite one was the best one. One subject reported feeling sleepy already before the test and wrote the following comment about the open condition; *"calming, almost had me falling asleep and disappearing away, had to keep trying to focus"*. For this subject HRV coherence was lower during the open meditation, perhaps mirroring the state of "trying" to stay awake. Another subject described the open meditation as *"slightly more demanding in terms of concentration, more memories from places I've been turned up"*. Another subject wrote that the open meditation was *"more complicated"* and that it was easier not to float away when there were instructions given. Yet another subject, whose HRV coherence was also lower during the open meditation condition, wrote that it was *"harder to focus during the open meditation but when it succeeded a greater feeling of relaxation and well-being – 'feeling of infinity' appeared. Once used auditory cues to stay focused, might need more meditation experience"*.

Discussion

Focused attention, emotional attention and involuntary attention

The present study focused on the relationship between the regulation of attention in meditation and associated effects on HRV coherence. In previous studies high coherence HRV has been connected to positive emotions while low coherence has been associated with negative emotions (McCraty, 2002). Jönsson and Hansson-Sandsten (2008) found similar relationships between heart rate patterns and positive versus negative stimuli. Results from the present study showed that experienced meditators practicing more than 30 minutes per week show higher HRV coherence when relaxing focus as compared to when focusing attention. The high HRV coherence state reached by these meditators during "emptiness meditation" may be described as a more harmonious state since these regular (coherent) heart patterns associated with a predominance of parasympathetic activity (Wu & Lo, 2008) generally seem to correlate with a more pleasant mental state. Apart from the previous studies suggesting this correlation between HRV coherence and emotions (McCraty, 2002; Jönsson & Hansson-Sandsten, 2008), most experienced meditators in the present study described the emptiness meditation as more relaxing or relatively nicer. Further, the attainment of a relaxed open focus or an "opened attentional stance" (Kállai et al. 1999) in emptiness meditation can be connected to the cognitive operation involved in the shift from foreground to background. This connection has not previously been shown.

The focused meditations resulted in more thoughts and memories and were reported to feel more demanding and more like a work task. When a subject reports that the pond made me remember things and that "the one where I visualized things was more like thinking", this can be related to the "doing mode" where Segal et al. (2002) suggest that the attention is narrowed to our concepts around our goals. Experienced meditators have the ability to enter "being mode" by relaxing focus. As a result they will experience a more harmonious physiological state.

Segal et al. developed Mindfulness-Based Cognitive Therapy (MBCT) when searching for efficient ways to prevent people suffering from depressive episodes to relapse. At first Segal et al. were mainly interested in how focusing on for example the breath would take up limited resources so that thought-affect cycles in depressed individuals could no longer be maintained, and phrased their approach as an "attention control training". Later on they came to look upon this phrase as not fully capturing what that instead became their "mindfulness-based" approach. The mindful approach is an invitational one, encouraging an attitude of gentleness and an "opening" to the difficult. This is quite different from Attention Training (AT) techniques described by Tang and Posner (2009). Such techniques involve control and focused attention accompanied with sustained cognitive effort, and will easily produce mental fatigue. While mindfulness is the opening to all experience, the focused selective attention during specific tasks quite contrary involves the blocking out any task-irrelevant information (Reisberg, 2001). To stop trying to employ the mechanisms that blocks out stimuli might create less mental stress or fatigue. The present study showed upon one cognitive operation that seems

crucial in the shift from stressful and demanding narrowed attention to a mindful approach.

The fully mindful mind might be described as empty of conceptual thoughts and judgments, but it must also involve an element of control over focus. Novice meditators may find it easier to focus on a chosen object than to relax the focus. If easily distracted, the subject will easily loose the sense of control over focus when trying to "let go". In the pilot study some novice meditators expressed disliking this lack of something to focus on in the open condition. HRV coherence was not higher during the open focus condition for this group of subjects, rather the opposite. The lower HRV coherence for novice meditators indicates the presence of more negative emotions during the openness condition.

One subject in the main study meditating less than 30 minutes per week described how it was easier "not to float away" when there were instructions given. To give instructions more often than at the beginning of every minute as in this study, could perhaps result in a different response to openness meditation instructions among novice meditators. This would probably be the case in guided imagery, which by Olivio (2009) was reported to have anti-stress effects. Thus one implication of this study is that when giving mindfulness instructions to novice meditators this should be done with short intervals to help maintaining control over focus. Emotional sensory input may be detected independently of current attentional goals and attention may be redirected towards this new emotionally charged focus of attention without there being any volitional attempt to do so (Vuilleumier, 2005). In this way emotional attention competes with but also complements voluntary top-down attention. The ability to notice events outside and parallel to the focus of voluntary attention can be beneficial and this ability may stretch beyond perception and involve emotional biases on higher levels of representations including memories and thoughts suggests Vuilleumier. The description of a neural process where preconscious stimuli is somewhat activated and has a potential to gain access to conscious processing (Dehaene, Changeux, Naccache, Sackur, & Sergent, 2006) ties in well with this suggestion of parallel processing. If considering these descriptions of a preconscious and of emotional attention mechanisms, one can easily understand how emotional sensory input or cognitions may get automatically attended to when the novice meditator fail to sustain top-down attention. When emotional bottom-up stimuli grabs attention, stress-levels may rise instead of decrease and novice meditators may very well experience this loss of control over what content that becomes conscious as anxiety-provoking.

Experienced meditators may also find that emotional stimuli or cognitions tend to appear in phenomenal consciousness when focused attention is relaxed. One subject explicitly wrote about tiring but emotionally interesting experiences and about a tendency to want to escape feelings *"coming up"* during the open meditation condition. When Tang and Posner (2009) compared Attention Training (AT) Techniques with different Attention State Training (AST) techniques they reported that in one such AST technique the induction of a state of restful alertness in integrative body-mind training (IBMT) would *"influence emotional processing and facilitate retrieval of autobiographical memories"*. This could be compared to the FA meditation techniques where

concentration is thought to correlate with a decrease in emotional reactivity and where *"the ability to identify stimuli outside that field of focus might be reduced"* (Lutz et al., 2008).

Once attention has been stabilized and brought under voluntary control, the focus may be relaxed and whatever that might come with this broader awareness may then be welcomed with an ever greater acceptance. This greater acceptance is likely to be associated with a more harmonious state. If on the other hand an opening of the focus takes place without a sustained focus then this may increase the feeling of unease.

Involuntary attention does not necessarily create a state of uneasiness associated with conscious access to emotional stimuli. Tang and Posner (2009) also described exposure to nature as an AST technique that creates mental restoration. Here mental fatigue is thought to be avoided by heightened levels of involuntary attention. One could guess that whether involuntary attention helps restoring mental capacities or tend to create anxiety could depend on what kind of stimuli that involuntary attention gets directed towards. Negative emotional stimuli activating the "doing mode" or an already high level of anxiety could be hypothesized to increase distress, while pleasant nature scenes would be something to "rest one's eyes at".

When interacting with nature, individuals are hypothesized to restore directed voluntary attention and mental effort by the encouragement of involuntary attention (Tang & Posner, 2009). Mental restoration is also a component of early stages of IBMT, but in this type of training breath adjustment and mental imagery are used to produce an increasingly deep (relaxed) mental state. That is; the difference between meditation and the involuntarily attention in exposure to nature is that meditation techniques may offer an even deeper relaxation (ibid).

Another obvious difference between exposure to nature and other AST techniques that was not mentioned by Tang and Posner (2009) is of course that meditation-like techniques may be used anywhere, even in the absence of calming nature. Meditation may create a mind that is both awake and calm at the same time, without the use of any external equipment.

Clinical implications and ethical considerations

The relationship between focused attention and relaxation holds many clinical implications. Segal et al. (2002) initially hypothesized that sustained attention would take up limited resources so that stressful ruminative thought-affect cycles would have to fade. Kállai et al. (1999) showed that Attention Fixation Training and the voluntary redirection of attention lowered the heart rate and panic anxiety among agoraphobic subjects. At the same time it was shown by Tang and Posner (2009) that attention training (AT) techniques easily creates mental fatigue while OM meditation (Lutz et al., 2008) is associated with an effortless lack of focused attention and a decrease of mental distress. Hence it seems like focused attention may create both relative calm but also mental fatigue. The present study showed that the initial gaining of control over focused attention may be appreciated by novice meditators, while more experienced meditators would be able to reach an even more harmonious state if instead relaxing focus.

The Attention Fixation Training proposed by Kállai et al. (1999) involved the direction of attention to the *external* environment. Another study has on the contrary shown that the direction toward *internal* stimuli in inward-attention meditation induced regular oscillations in heart rate and a sympathovagal balance toward parasympathetic activity as measured by HRV (Wu & Lo, 2008; article in press). One way to interpret these seemingly contradictory descriptions of the relationship between relaxation and direction of attention is that a narrowly and voluntary directed focus, towards external *or* internal stimuli, would be preferred over an open state of anxiety. Anxiety is "an emotion without a specific object" while fear is related to a specific object, writes May (1977) whom, along with Kierkegaard, make a distinction between *the open state of anxiety* and fear. May describes anxiety as a vague and unspecific apprehension and as something attacking from all sides at once, while in fear our attention is narrowed to the object. Perhaps the open anxious state is characterized by emotional attractors gaining access to our conscious experience through exogenous bottom-up attention as described by Vuilleumier (2005). That a narrow directed focus is likely to be preferred over the state of plain anxiety could be explained by reference to the basic need for control emphasized by Grawe (2004). Grawe also described how *"attention is directed away from inconsistency-creating perceptions, memories, and thoughts"* (2004, p. 486), and connected this mechanism which allow us to stay focused on our present behavior to the clinical concept of defense mechanisms.

The general sense of control is likely to be a more important factor when making a shift from very unpleasant pure anxiety to a relatively nicer doing-mode, than whether or not the voluntary attention is directed inwards (Wu and Lo, 2008; article in press) or towards external stimuli (Kállai et al., 1999). The fact that FA meditation is also included as an initial part of OM meditation in order to reduce distractions and to calm the mind (Lutz et al., 2008), could show that the general need for control has been recognized by many generations of meditation teachers.

Sustained attention may be achieved through practice, but meditation teachers may recommend the practice of several different techniques (Weissman, 1999). Others even make warnings about a continued practice of nothing but sustained, voluntary attention (Wallace, 1999). I believe that such warnings can be directly related to warnings made by some clinicians about eg. breathing techniques turning into safety behaviors where clients use the technique to further avoid anxiety and to block out negative stimuli instead of learning how to cope with the current situation. Focusing on the breath has been associated with fewer negative thought intrusions among clients with generalized anxiety disorder (Hayes, Hirsch, Krebs & Mathews, in press), but selective attention has also been shown to become a part of the problem in panic anxiety (Westling, 2006).

If meditation practice is restricted to the training of narrow focused attention it could possibly teach practitioners to get used to the blocking out of emotional stimuli instead of the adopting of an opening and welcoming attitude. Increased anxiety can be the initial goal in treatment of social phobia and insight is the primary goal of insight therapies. The therapist responsible for therapeutic processes might use free associations or may encourage an explorative stance through guided imagery in order to increase insights into mental functioning and emotional processing. Here the therapist will help the patient to maintain a sense of control so that emotional insights will not get overwhelming.

Koch and Tsuchiya (2006) concluded that top-down attention must be differentiated from conscious awareness. Consciousness is likely to have substantially different functions from attention, including the summarizing of relevant information about the inner state and the environment that the organism is currently exposed to. Baars (2002) among others suggest that consciousness has largely an integrative function. Insight meditation (vipassana) as well as insight therapy may operate through the employment of the integrative functions of conscious awareness, and a shift from narrow selective attention to an open focus might be necessary for this process.

The present study aimed at pin-pointing a cognitive mechanism involved in the shift from the employment of functions of selective attention to the employment of conscious awareness. What became evident is that people react differently to this shift away from focused attention towards a relaxed focus. Kåver (2006) reported that to some clients the use of relaxation techniques cause discomfort and a higher rather than lower level of anxiety. Other clinical reports are those of increased restlessness, palpitation, intrusive thoughts and of a fear of loosing control associated with the introduction of relaxation techniques. What these clinical reports make clear is that the instructor of mindfulness and/or relaxation techniques must be aware of these kinds of reactions from clients. If experiencing acute anxiety, practicing meditation may cause overwhelming emotional material to appear (Shapiro & Giber, 1978). McGee even point out that *"meditation can actually be harmful, it can precipitate psychosis or release a debilitating flood of painful affect in seriously disturbed individuals"* (p. 32, 2008). The ethical imperative never to cause harm must be reflected upon before encouraging certain clinical subgroups to practice certain meditation techniques.

Future research

Lutz et al. (2008) have already pointed out how the heterogeneity of meditative states studied and a lack of clear definitions pose one problem for meditation research. For one thing they suggest that there is data supporting the notion that meditators with an extensive (44 000 hours) FA meditation training are able to achieve a state of effortless concentration where only a minimal effort is needed for sustained attentional focus. Lutz et al. conclude that a comparison between effortless concentration and objectless meditation is needed. Whether or not results from the present study would apply to meditators whom have achieved this effortless concentration needs to be explored through further studies. What cognitive operations that are involved in attentive but relaxed states of mind are not fully understood.

The present study may not provide any information about the immediate causes behind the suggested difference between novice and more experienced meditators. In general it seems like the experienced meditator would not get as easily distracted. This might be a result of having gained a more stabilized sustained focus and control over what outside stimuli that will get consciously accessed. The difference could also be a result of a change in mood or in the level of anxiety as a secondary effect by primary changes in attentional mechanisms caused by extensive meditation practice. Due to a change in mood there might simply be less of preconsciously activated emotional stimuli

"begging for attention". A lower level of anxiety may also cause the open state to be interpreted differently. A visualized scene without any explicit objects to attend to may be directly interpreted as a relaxed state, although one subject who did have some meditation experience reported that the sense of "space around" was sometimes perceived as slightly scary. Perhaps participants must be "relaxed enough" before relaxing focus, or otherwise the open state will be interpreted as anxiety. Murata et al. (2004) refer to a study (by Delmonte, 1984) where psychologically "healthy" subjects and subjects with a capacity for "relaxed absorbed attention" were reported to be more favorably disposed to meditation. Future research could ask question about how differences in personality or anxiety level could be related to differences in response to openness meditation instructions. Future studies could further answer questions about which groups of subjects that might benefit from emptiness meditation instructions, as well as to what extent certain contexts and surroundings would influence the outcome. While guided imagery with a somewhat open focus could be led by a therapist in a secure and relaxing setting, the instructions in the present study were given in an experimental setting in a fully lit room. Instructions were given with a neutral voice accompanied by a slightly noisy computer. Context is likely to influence how instructions are perceived.

Another area of future research which the present study may call upon is the relationship between physiological harmony and spiritual experiences. Apart from the fact that many of the more experienced meditators described the openness instructions as relaxing and nice, there were also descriptions that could be associated with descriptions of altered states of consciousness (Farthing, 1992). Descriptions of liberation, of a sense of being present here and now, experiences of stillness or of a state of "mind-expanding and emerging with the surroundings" were used for the open meditation condition. Someone also reported experiencing how "I as a person" participated in the focused meditation. In Buddhist philosophy thoughts are described to split the conscious experience in an experiencing subject and an experienced object (Jacobsen, 2002). Conceptual thinking based on a separation of subject from object may be opposed to experiences of "oneness". Feelings of loosing the sense of self and of "unity" has been associated with mystical experiences (Farthing, 1992), and whether a deeply relaxed state and/or a totally open focus may induce such experiences could be scientifically investigated. Anecdotal comments reported in this study suggest that an exploration of cognitive mechanisms involved in an attentional shift from figure to background might be a way to carry through with such investigations.

Different meditation techniques, therapies and strategies are likely to be beneficial for different persons. General physiological arousal, anxiety and general mental stress may influence the outcome. Which technique to be used and when can ultimately not be answered experimentally since the question of what goal that is worth aiming for is a question about value that can not be answered empirically.

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