Short Communication

Zen meditation and access to information in the unconscious ☆

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ABSTRACT

In two experiments and two different research paradigms, we tested the hypothesis that Zen meditation increases access to accessible but unconscious information. Zen practitioners who meditated in the lab performed better on the Remote Associate Test (RAT; Mednick, 1962) than Zen practitioners who did not meditate. In a new, second task, it was observed that Zen practitioners who meditated used subliminally primed words more than Zen practitioners who did not meditate. Practical and theoretical implications are discussed.

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"Ideas are like fish. If you want to catch little fish, you can stay in the shallow water. But if you want to catch the big fish, you've got to go deeper"

David Lynch

1. Introduction

The capacity of consciousness is small. We can consciously think a myriad of different thoughts, but we can only think about one thing at a time. We can read and thereby occupy consciousness with a book, but as soon as we inadvertently switch our mental searchlight onto something else – let's not forget to get some groceries before the shop closes! – the book is temporarily "erased" from consciousness.

Conversely, the capacity of the unconscious mind is, presumably, vast. Several different things can be accessible or temporarily primed at the same time (Wegner & Smart, 1997). That is, multiple thoughts can be unconsciously active simultaneously, for instance the answer to a question we were asked earlier that day (Yaniv & Meyer, 1987), the solution to a problem we have been mulling over for a while (Poincaré, 1913), the thought of a cold drink on a hot day (Aarts, Dijksterhuis, & De Vries, 2001), or an embarrassing memory we try to suppress (Wegner, 1994) can most likely all be accessible, but not conscious, simultaneously.

Under most (though not all) circumstances, better access to unconscious processes is useful. The opening quote by film-maker Lynch (2006) represents the notion that better access to the unconscious fosters creativity (see also Bowers, Regehr, Balthazard, & Parker, 1990; Zhong, Dijksterhuis, & Galinsky, 2008). In addition, goals (and needs and other motives) lead things that are instrumental for fulfilling these goals to become more accessible or unconsciously activated (Aarts, Custers, & Holland, 2007; Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trötschl, 2001). This means that better access to the unconscious

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may, in principle at least, foster goal pursuit. Indeed, the idea that improved access to unconscious, "inner" processes is functional is at the heart of various theories about self-regulation (Brown, Ryan, & Creswell, 2007; Carver & Scheier, 1981; Duval & Wicklund, 1972).

The capacity to access unconsciously activated information differs between individuals (Crawley, French, & Yesson, 2002). For instance, research on transliminality (Thalbourne, 2000) – defined as the tendency for psychological material to cross (*trans*) the threshold (*limen*) into or out of consciousness (Thalbourne, 2000, p. 31, see also Crawley et al., 2002, p. 887) – shows that some people use subliminally primed information more than others.

Here, we aim to investigate whether we can intentionally improve access to the unconscious. One potential way is to engage in Zen-meditation. Zen-meditation, or *Zazen*, is a technique rooted in Buddhist psychology (Brown et al., 2007). During Zen-meditation, people usually sit in the lotus position with the goal to regulate their attention. Concretely, people focus their attention "inwards" to their breathing and count (generally from 1 to 10) each time they exhale. We hypothesize that Zen-meditation not only leads to diminished attention to the surroundings (as shown by Kubose, 1976; and by Travis, Tecce, & Guttman, 2000), but also to heightened receptiveness to unconsciously activated or accessible ("inner") information. Indeed, popular notions of meditation sometimes emphasize improved access to our inner mental world as one of the most important – or even as the single most important – effect of meditation.

However, there is no direct evidence for the hypothesis that meditation fosters access to accessible but unconscious information. Recent reviews (Brown et al., 2007; Cahn & Polich, 2006) have listed a number of well-documented positive consequences of meditation that, explicitly or implicitly, are at best suggestive to the idea that meditation improves access to unconscious information. As alluded to above, we know that meditation increases the ability to concentrate (Kubose, 1976; Travis et al., 2000) but this primarily shows that people become better at ignoring distracting stimuli in the environment. However, it does not necessarily mean that access to the unconscious is improved. Likewise, meditation decreases experienced stress load (Davidson, Goleman, & Schwartz, 1976) and leads to a faster decrease in heart rate after exposure to stressful filmclips (Goleman & Schwartz, 1976), but it is not clear whether improved access to unconscious processes is (one of the) mediating processes.

Other psychological experiments have demonstrated that meditation (or other ways to increase mindfulness) leads to a greater concordance between unconscious and conscious reports of self-related attributes (Brown & Ryan, 2003; Trash & Elliot, 2002), but again, whether increased access to the unconscious is the cause of this greater correspondence is not yet clear. Koole and colleagues (Koole, Govorun, Cheng, & Gallucci, 2009) recently showed that meditation led to increased congruence between implicit and explicit self-esteem, but this can have different causes. It is possible that the increased congruence is caused by people relying more on implicit self-esteem when assessing their own explicit self-esteem, because they have better access to their implicit (i.e., unconscious) self-esteem. However, there are other possible explanations. We know that the correlation between implicit and explicit self-esteem increases when people complete the questionnaire assessing explicit self-esteem faster (Koole, Dijksterhuis, & Van Knippenberg, 2001) and even after participants are primed with the concept of honesty (Dijksterhuis, Albers, & Bongers, 2009). It is very well possible that the effects reported by Koole et al. (2009) were caused by greater honesty among meditators rather than increased access to unconscious processes per se. In sum, a strict test of this assumed important effect of meditation has not yet been reported. Finally, there is also suggestive evidence from EEG studies. Aftanas and Golocheikine (2001) measured delta, theta and alpha bands among (relatively experienced) meditators. They found that meditation led to changes in local theta and lower alpha power as well as to theta coherence changes. These changes are associated with both a positive emotional state, and, more importantly here, with internalized attention.

We conducted two experiments in which we invited Zen-meditators to participate. Some were asked to meditate immediately prior to the experiment, whereas others were not. Hence, we only investigated short-term effects of meditation. We made sure that the people who did not meditate also engaged in a relaxing activity just prior to the experiment.

We used two different research paradigms. In both experiments, meditators and non-meditators completed a number of RAT (Remote Associates Test; Mednick, 1962) trials. In RAT trials, participants are presented with three words and asked to report an associated fourth word – e.g., the words *book*, *maps*, and *world* are given and participants have to report *atlas*. In this paradigm, participants activate (or not) an answer unconsciously, but it has to be accessed before it can be reported consciously. In Experiment 2, we extend the procedure with a second, new paradigm. In this paradigm, participants are subliminally primed with words, after which the probability that these words appear (semi-spontaneously, more information follows) in consciousness is assessed. Whereas the accessible information in the RAT is derived from an associative process of the participant herself, in Experiment 2 the source is external. However, in both paradigms the key process – the probability that accessible information appears in consciousness – is the same.

2. Experiment 1

2.1. Method

2.1.1. Participants

Sixty-three Zen practitioners (30 males and 33 females, age $M = 47.81$, $SD = 11.55$) were recruited through a national network of Zen meditation centers (Zen.nl) to participate in the study. Their experience with Zen meditation ranged from 6 months to over 5 years. The Zen practitioners were randomly assigned to either a meditation or a control condition.

2.1.2. Procedure and materials

All participants were tested in the lab in groups of 4–10 participants between 6 and 9 PM. They were randomly assigned to one of the two conditions. Those assigned to the meditation condition were asked to meditate in a quiet lab room furnished with meditation mats. The meditation sessions lasted for 20 min and were led by a professional Zen master. Those assigned to the control condition were asked to relax – and not to meditate – for 20 min. The same lab room as in the meditation condition was used, however, the meditation mats were replaced with regular chairs and various magazines were provided for the participants to read (similar to Zeidan, Gordon, Merchant, & Goolkasian, 2010). In both conditions, the participants were asked not to talk to each other during the meditation/relaxation.

After having meditated/relaxed, participants were led to individual cubicles for the remainder of the experiment. They completed the RAT on a computer. The participants were instructed to link three words presented on the screen by a fourth, associated word. They were asked to type their answer as quickly as possible. Two examples of RAT trials and their solutions were provided followed by three practice RAT trials that the participants had to answer themselves. The actual task consisted of three sets of five RAT trials increasing in difficulty, resulting in a total of 15 trials.

After completion of the RAT, participants were asked to answer some questions concerning their Zen meditation experience and practices. Finally, they were thanked for their participation and debriefed.

3. Results and discussion

3.1. Correct RAT answers

Confirming the predictions, the number of correct solutions to the RAT items was higher in the meditation condition ($M = 7.00$, $SD = 1.98$) than in the control condition ($M = 5.94$, $SD = 1.98$), $F(1, 61) = 5.48$, $p = .02$, $\eta^2 = .08$.

The data clearly supported our hypothesis. Zen meditation improved access to the unconscious. Experiment 2 served multiple goals. First, we wanted to replicate our findings and to investigate whether increased transfer of accessible information to consciousness could be found in a different paradigm. Performance on RAT can be divided into two different stages (Zhong et al., 2008). First, the correct answer needs to be found, and second, the correct answer needs to be transferred to consciousness. Strictly speaking, only the second stage pertains to our hypothesis, as the first stage is indicative of associative processing. It is possible that meditators are outperforming control participants in associative processing rather than in access to the unconscious and hence, that they benefited mostly during the first stage. Hence, in Experiment 2 meditators and control participants completed, in addition to a RAT, a new task that was devised to solely assess transfer of accessible information to consciousness.

Our new task served another goal. The RAT task is sensitive to motivation, as people who do their best may perform better. We wanted to rule out the alternative explanation that participants who meditated were more motivated to do their best or to please the experimenter or Zen master. Hence, our new task was a task whereby there were no right or wrong answers. Effects of our manipulation found in this task cannot be attributed to differences in motivation or to sensitivity to experimental demands.

We made two more changes. First, in the RAT we not only recorded participants' solutions but also their response times. Second, we altered our instructions regarding meditation. Exit questions in Experiment 1 indicated that 84% of all participants had meditated on the same day before entering the lab and may have weakened our manipulation. In Experiment 2, participants were asked not to meditate on the day of their participation.

4. Experiment 2

4.1. Method

4.1.1. Participants

Thirty-four Zen practitioners (17 males and 17 females, age $M = 48.06$, $SD = 7.71$) were recruited through Zen.nl to participate in the study. Their experience with Zen meditation varied from less than 6 months to 10 years. The Zen practitioners were randomly assigned to either a meditation or a control condition. Exit questions indicated that two participants from the control condition had meditated beforehand on the same day, even though we had instructed all participants to refrain from meditating that day. These participants were excluded from the analyses.

4.1.2. Procedure and materials

The procedure of Experiment 2 was similar to Experiment 1 except that the participants completed an additional, new, task. In this task participants were instructed to answer twenty questions to which three or four answers were possible (e.g., "*Name one of the four seasons*"). They were asked to give an answer as fast as possible and were given the opportunity to practice with two examples.

Before each question a fixation cross was presented (1000 ms) at the centre of the screen. The cross was followed by a premask that appeared for 48 ms (&&&&&&&&&&). Immediately afterwards a prime was displayed subliminally (16 ms). The primed word was always one of the possible answers ("*Spring*") to the question presented at the end of that trial. A

post-mask (64 ms, identical to the premask) covered the primed word, after which the question appeared on the screen until the participants had typed the answer that first came to mind. The parameters of the task were based on Radel and Dijksterhuis (submitted for publication), who established that these parameters indeed led to subliminal stimulus presentations.

5. Results and discussion

5.1. Correct RAT answers

As in Experiment 1, the number of correct solutions to the RAT was higher in the meditation condition (M = 6.82, SD = 1.55) than in the control condition (M = 4.87, SD = 2.29), $F(1, 30)$ = 8.16, $p < .01$, η^2 = .21.

5.2. Response latencies of RAT answers

The difference between conditions in response latencies of the RAT were analyzed using the number of correct RAT answers as covariate. As expected, participants in the meditation condition exhibited shorter response latencies (M = 13.22 s, SD = 4.93) than did participants in the control condition (M = 16.37 s, SD = 6.72), $F(1, 29)$ = 4.21, $p < .05$, η^2 = .13.

5.3. Priming

Across the 20 questions, the average chance of giving a prime-congruent answer (i.e., an answer that matched the prime) was higher in the meditation condition (M = .35, SD = 0.10) than in the control condition (M = .28, SD = 0.07), $F(1, 30)$ = 4.50, p = .04, η^2 = .13. A separate pilot test[1] among participants who were not primed indicated that across the 20 questions, the average chance of guessing a prime-congruent answer was .30 (SD = .24). The number of prime-congruent answers was marginally above chance level in the meditation condition, $t(16)$ = 2.01, p = .06, and did not differ from chance level in the control condition, $t(14)$ = −0.94, p = .36.

5.4. Correlations

We used priming, correct responses on the RAT, and the response latencies on the RAT all as indicators of accessibility of unconscious processes. If it is true that these measures tap at least partly into the same underlying process, we may find significant correlations between them. Indeed, a higher number of prime-congruent answers correlated with faster response latencies on the RAT, $R(32)$ = −.42, p = .02. However, the number of prime-congruent answers did not correlate with the number of correct answers on the RAT, $R(32)$ = .21, p = .25. This could be explained by the fact that correct answers on the RAT are dependent not only on transfer of accessible information to consciousness, but also to the associative process aimed at finding the answer in the first place (Zhong et al., 2008) and/or by the relative insensitivity of the RAT measure.

6. General discussion

The findings of our experiments show that a period of 20 min of meditation increases access to the unconscious. As access to the unconscious is important in many psychological domains, our data are potentially highly relevant in a wide array of areas. The RAT, the paradigm we used in both experiments, is one of the paradigms most often used to study creativity, and hence, one may conclude on the basis of our findings that meditation increases creativity. However, the effects shown are relevant for all psychological domains for which the transfer from accessible information to consciousness is important, such as decision making and problem-solving. That being said, it is important to realize that we did our experiment only among experienced meditators and our experimental design only allows conclusions about short-term effects of meditation. Furthermore, it is possible that the participants who meditated were more motivated to perform well than the participants in the control group. Although enhanced motivation cannot increase performance in the priming task (as there are simply no right or wrong answers), it may lead participants to be better able to perceive the subliminal stimuli. More experiments with other paradigms and other groups of participants should shed further light on the generalizability and underlying processes of the effects.

It is tempting to speculate about a central common psychological mechanism underlying the many different effects of meditation. The fact that meditation improves access to the unconscious may hint at a related, but broader process that could be the driving force behind other salutary effects of meditation. Recently, various researchers have emphasized the distinction between attention and consciousness (Dehaene, Changeux, Naccache, Sackur, & Sergent, 2006; Dijksterhuis & Aarts, 2010; Koch & Tsuchiya, 2007). Whereas attention is best seen as the degree to which our brain processes a stimulus (leading this stimulus to be more or less accessible), consciousness is the subjective experience of a stimulus. In daily life, attention and consciousness often go together in that things we pay attention to are more likely to enter consciousness. However, theoretically they are distinct and indeed, attention and consciousness can be dissociated when we pay attention to things that do not appear in consciousness (such as "hidden" concerns and stressors) and when we consciously think about something we hardly pay attention to (such as fleeting daydreams).

It is consistent with a wide array of findings to assume that the reason meditation temporarily changes several psychological processes is that it leads to a greater correspondence between attention and the contents of consciousness. Further research may reveal the (in)validity of this idea.

Appendix A

Questions and answer alternatives used in priming task, Experiment 2. Chance levels according to pilot study are between brackets.

	Primed answer	Alternative 1	Alternative 2	Alternative 3
Name one of the four seasons.	Spring (.42)	Winter (.11)	Summer (.33)	Fall (.14)
Name one of the three (Dutch) articles.	Het (.08)	De (.87)	Een (.05)	
Name one of the three medals (metals).	Silver (.03)	Gold (.91)	Bronze (.06)	
Name one of the three colors of the Dutch flag.	Blue (.22)	Red (.70)	White (.08)	
Name one of the four most common colors of a paprika.	Red (.78)	Orange (.05)	Green (.16)	Yellow (.00)
Name one of the four even numbers below the number 10.	Six (.06)	Two (.36)	Four (.19)	Eight (.39)
Name one of the three types of (basic) cutlery.	Fork (.38)	Knife (.32)	Spoon (.30)	
Name one of the three nephews of Donald Duck (in the Netherlands).	Kwek (.11)	Kwik (.77)	Kwak (.11)	
Name one of the four basic kinds of tastes.	Sweet (.50)	Salty (.22)	Sour (.11)	Bitter (.17)
Name one of the four parts of the day.	Morning (.81)	Afternoon (.14)	Evening (.03)	Night (.03)
Name one of the three types of wine (color).	White (.11)	Red (.76)	Rose (.14)	
Name one of the four elements.	Fire (.24)	Earth (.29)	Wind (.12)	Water (.35)
Name one of the three countries of the Benelux.	Belgium (.57)	The Netherlands (.38)	Luxembourg (.05)	
Name one of the four (natural) hair colors.	Brown (.19)	Black (.22)	Blond (.53)	Red (.06)
Name one of the three valid identification documents.	Driver's license (.11)	Passport (.70)	ID card (.19)	
Name one of the three colors of the German flag.	Red (.08)	Black (.58)	Yellow (.33)	
Name one of the four members of The Beatles.	John Lennon (.56)	Paul McCartney (.03)	Ringo Starr (.31)	George Harrison (.11)
Name one of the three primary colors.	Yellow (.17)	Red (.60)	Blue (.23)	
Name one of the three cardinal directions.	East (.46)	North (.24)	South (.27)	West (.03)
Name one of the three big European rivers flowing through the Netherlands.	Waal (.14)	Rijn (.78)	Maas (.08)	
Average chance level of primed answers	.30			

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