

The Presence of Memory: How Guided Attention Influences Recall and Recognition

Margaret Cease

Graduate student advisor: Spike W. S. Lee

Faculty advisor: Dr. Norbert Schwarz

### Abstract

According to the theory of grounded cognition, memory involves the reconstruction of perceptual, motor, and introspective states that were undergone during past interactions with the environment, body, and mind. Here we tested whether engaging in a three-minute guided attention exercise, which should activate simulation mechanisms, resulted in higher levels of mindfulness and improved memory of a narrative article compared with participants who either did nothing before reading the article (control) or participants who watched a three-minute video (distraction task). Although there were not significant differences between conditions in memory performance (recall and recognition), we did find that focus/attention (based on a factor analysis of manipulation check questions) was better at predicting performance on recall in the guided attention condition than in the distraction condition. Focus/attention was also better at predicting positive mood in the guided attention condition than in the distraction condition and in the control condition. Together, these data suggest that participants in the guided attention condition who underwent a brief mindfulness exercise, and who were more focused/attentive, also performed better on questions of recall and experienced better moods.

*Keywords:* grounded cognition, mindfulness, recall, recognition, mood

### The Presence of Memory: How Guided Attention Influences Recall and Recognition

Perhaps the earliest noted link between mindfulness and the formation of memories dates back to early Buddhist philosophy and Siddhartha Gautama (c. 500 BCE), or, the Buddha (Ráhula, 1974). It was he who introduced the concept of right mindfulness (also known as right attentiveness) as part of the Noble Eightfold Path, a path which consists of practices that are meant to lead man out of suffering (Carrithers, 1983). This is primarily due to the long-held notion each experience we have as humans—whether it be an experience relating to physical sensation, thoughts, or ideas—is ultimately experienced by our minds. The Pali Canon, or the earliest written document of Gautama’s teachings, has a chapter called the Dhammapada, which describes it this way:

All experience is preceded by mind,  
led by mind,  
made by mind.  
Speak or act with a corrupted mind,  
and suffering follows  
as the wagon wheel follows the hoof of the ox.

All experience is preceded by mind,  
led by mind,  
made by mind.  
Speak or act with a peaceful mind,  
and happiness follows  
like a never-departing shadow.

This ancient form of mindfulness is generally defined as being fully aware of one’s own body, feelings, and thoughts (Ráhula, 1974), and is consistent with many modern-day understandings of mindfulness, which describe it as “paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally” (Kabat-Zinn, 1994, p. 4). Mindfulness has been held, both then and now, to improve awareness of one’s internal and external

environments, and to allow one's mind to be fully open and alert in the present moment. And once one's mind is in this state, it is said that he or she will remember everything.

In order to better understand long-term memory from a scientific standpoint, we must understand how it is influenced by mindfulness on the basic level. Although the effects of mindfulness on memory comprise an important topic, inadequate attention has been directed toward it. Much of the research conducted in this area has been in either clinical contexts or amongst groups of individuals who are experienced in mindfulness meditation. The present paper aims to provide a comprehensive overview of prior studies that have looked at the effects of mindfulness on declarative memory, as well as to describe the present study, which examines the effects of a brief guided attention exercise on recall and recognition of a narrative, written article in participants who did not have prior meditation experience.

### **Review of Prior Research**

Practicing meditation or mindfulness-based exercises for extended periods of time has been shown to improve both long-term and working memory. Moore and Malinowski (2009) found that participants who had been practicing meditation for at least six weeks performed significantly better on Stroop tasks and d2-concentration and endurance tasks. The d2-concentration and endurance task measures the ability to focus and remain attentive over time. It is a timed test that requires participants to discern dissimilar targets from groups of similar ones. Overall, their findings suggest that mindfulness is related to improvements in attentional performance and cognitive flexibility.

Practicing mindfulness over time has also been shown to improve specificity of long-term, autobiographical memory. Williams, Teasdale, Segal, and Soulsby (2000) found this to be true in a clinical setting, in which patients who had overcome symptoms of depression, suicide

ideation, and posttraumatic stress disorder experienced a reduced number of overgeneral memories after undergoing mindfulness-based cognitive therapy (MBCT) in comparison with a control group of patients that did not undergo MBCT and continued psychological treatment as usual.

Overgeneralization of memories is a cognitive style that many people who struggle with depression, suicide ideation, and posttraumatic stress disorder experience even after they recover and undergo increases in mood. MBCT is an eight-week treatment technique that teaches patients to recognize and be mindful of specific aspects of events in nonjudgmental ways. Generality of autobiographic memory was measured with the Autobiographical Memory Test. Participants responded to 18 cue words, which were then categorized as being specific, categoric, or extended. These findings are relevant to the present study because they suggest that mindfulness practice can alter the way information is encoded and retrieved, resulting in more specific memories being formed.

There is also evidence that mindfulness training lasting just a few days, rather than a few weeks or years, can improve performance on working memory tasks. Zeidan, Johnson, Diamond, David, and Goolkasian (2010) found that participants inexperienced with meditation who undergo a few days of Mindfulness Meditation (MM) training demonstrate results that are consistent with participants who have meditated for years. This provides support for the idea that long-term practice of mindfulness/guided attention exercise may not be necessary in order to see improvements in memory.

Participants who took part in a four-day-long MM training program not only reported higher levels of mindfulness in comparison with an active control group, but also experienced enhanced sustained attention. MM was conceptually defined as “focusing on the sensations of

the breath/body while maintaining a relaxed state of mind” (p. 598). Participants were told to relax, with eyes closed, and pay attention to the flow of breath at their noses. In the case that a distracting thought arose, the participant was to acknowledge the thought and then dismiss it by bringing attention back to the breath. MM was assessed by the Freiburg Mindfulness Inventory: a fourteen-item questionnaire that measures mindfulness through self-report responses to such questions as, “I am open to the experience of the present moment.” The use of self-report methods (rather than more observational methods) has been legitimized by other researchers, such as Salomon and Globerson (2002), who say that because mindfulness is an *intentional* process, and because it is not automatic or implicit, it lends itself to self-report.

Zeidan et al. (2010) found that participants in the experimental condition demonstrated more accurate and sustained working memory, as exemplified by their performance on the two-back task, than the active control group. Although this study did not explicitly look at mindfulness’s role on *declarative* memory, it is informative to the present study because many theories hold that in order for information to be stored in long-term memory, it must first be experienced via the senses, where it is accessible to working memory before being stored (Shiffrin & Atkinson, 1969).

The notion that information must first be experienced via working memory and then be stored is supported by findings suggesting that being in a state of mindfulness results in increased openness to novel situations and ideas as well as more active construction of categories and distinctions (Langer, 1992). Thus, individuals in states of mindfulness may not only have improved working memory, but, consequently, may also be more likely to store the information in long-term memory and be able to better consciously retrieve it later on.

A limitation of these findings, however, is that participants were assigned to intervention groups based on the week they enrolled in the experiment. This could have influenced the results, as external factors may have caused certain subjects to enroll in certain weeks. For example, subjects who enrolled in the study earlier may have done so because they heard about the study through their place of living, organizations they were involved in, or because their professors advertised the study earlier, and may have been qualitatively different than subjects who enrolled later. Additionally, participants who enrolled earlier may have had stronger motivations to participate in the study.

Wagstaff, Brunas-Wagstaff, Cole, and Wheatcroft (2004) also looked at the effects of a short mindfulness exercise on participants who were untrained in meditation. They conducted a study in which forty-four undergraduate students were either randomly assigned to “control” or “meditation” conditions and were then presented with five photos of faces. Afterwards, participants in the meditation condition completed a ninety-second-long focused breathing meditation (FM). These participants were then told to continue to focus their attention during a task in which they had to identify the five previously seen faces out of a sheet with thirty faces on it. Participants in the meditation condition identified significantly more faces than participants in the control condition.

Although the authors tell us that they used the FM technique as the manipulation in this study, they do not clearly conceptually nor operationally define the procedure. All we know is that participants were told to sit comfortably, keeping their backs straight, and focus on their breathing in a natural rhythm. If their attention wandered, subjects were told to “gently but firmly bring it back to their breathing” (p. 27).

Additionally, this study, with only twenty-two subjects in each condition, has limited statistical power. However, its findings are of interest to the present study because they support the theory that a very brief, focused meditation can influence declarative memory in subjects who are not particularly trained in meditation or mindfulness.

An important distinction to make with this study by Wagstaff et al. is that subjects in the experimental condition completed the ninety-second FM exercise *after* they had already viewed the five faces that they would later have to recognize and identify as familiar. Thus, this study could not capture any effect of simulation on processing and storage of information, but rather just on retrieval of information.

### **The Role of Simulation in Memory**

Much of the literature concerning memory and mindfulness involves long-term or mid-term meditation or mindfulness practices. This is because mindfulness is thought to improve cognitive flexibility over time (Heeren, Van Broeck, & Philippot, 2009). However, what if an extremely brief mindfulness practice (i.e. a practice that is merely a few minutes in length) also improved declarative memory?

The theory of grounded cognition, and more specifically the mechanism of simulation, purports that memory involves the reconstruction of perceptual, motor, and introspective states that were undergone during past interactions with the world, body, and mind (Barsalou, 2008). According to this theory, cognition shares processing mechanisms with perception and action (Pecher, Boot, & Van Dantzig, 2011). During an experience the brain captures the body's states (perceptual, motor, and introspective) and brings them together into a multimodal representation that is then stored in memory. Later, when the memory is reconstructed, this multimodal representation is reactivated and consequently simulates how the moment was originally



experienced. Thus, grounded cognition states that the building blocks of thought are not words or symbols, but instead are visual and motor images that are based in the sensory-motor system.

For example, when a person thinks of an object such as sandpaper, the neurons in areas of the brain that are devoted to processing sensory-motor information are reactivated in a similar manner as they were during past experiences with sandpaper. As a result, visual, motor, and all other relevant systems simulate past experiences with sandpaper, and we know and remember what sandpaper is by our brains' behaving like they are interacting with it.

These simulations can be described as a set of related perceptual symbols that represent a certain concept (Barsalou, 1999). The simulations are not complete reenactments of prior experiences, but rather are subsets of what has been captured during these experiences. This also helps to account for why the same concept can seem different depending on what context it is recalled in. For example, sandpaper may be thought of differently depending on whether it is recalled in the context of building a house or in relation to someone's rough skin. The reason that these two forms of the same concept can be recalled in such different ways is because perceptual symbols are integrated dynamically to create simulations.

Thus, a very brief guided meditation exercise, in which an individual brings unconscious information to the conscious mind may activate processes of simulation, which may carry over to subsequent tasks and result in more accurate declarative memory.

### **The Present Study**

The purpose of the present study is to look at whether a brief mindfulness exercise that engages simulative processes improves accuracy of declarative memory. For our purposes we will conceptually define mindfulness as the process of bringing a nonjudgmental quality of awareness to the present moment.

In taking the above research into consideration, our hypotheses are that participants who engage in a three-minute, eyes-closed guided attention exercise in which they spend the first minute focusing on their environment, the second minute focusing on their thoughts, and the third minute focusing on their feelings, will experience (1) higher levels of mindfulness (as measured by a ten-item self-report questionnaire) and (2) more accurate remembering of a narrative article (as measured by a nineteen-item test that involves answering both multiple-choice questions and identifying old versus new sentences from the article).

If supported, the first hypothesis would suggest that the state of mindfulness is not something that needs to be practiced over the course of long periods of time in order to be actualized, but rather can be attained by those inexperienced with mindfulness or meditation. Support of the second hypothesis would imply that taking part in a very brief guided attention exercise activates simulative processes that carry over to later tasks and enhance memory of a narrative written piece.

## **Method**

### **Participants**

Participants were seventy-six students from the University of Michigan in Ann Arbor (45 women, 30 men;  $M_{\text{age}} = 19.32$  years,  $SD = 3.39$ ). Sixty-two participants identified their country of origin as the US, and forty-three participants identified as being white or European American. Participants' areas of study spanned the natural sciences, social sciences, and humanities.

All participants received a half-hour credit through Introductory Psychology Subject Pool for completing the study.

### **Materials**

Participants in the control condition did not complete any tasks prior to reading the memory article. Participants in the distraction task watched a short video (three minutes and fifty seconds in length) about whales hunting krill, and participants in the guided attention condition completed a three-minute-long exercise in which they spent one minute focused on their thoughts, one minute focused on their feelings, and one minute focused on the surrounding environment.

All subjects subsequently read the memory article, watched the time delay video, completed the article questionnaire (Appendix A), manipulation check (Appendix B), and demographics form, all of which are described below.

**Memory article.** All participants read *South African Goes from Never A Sip to Vineyard Fame*, a narrative, 1250-word article from *The New York Times*. The article documented a woman's journey from growing up in a rural village to becoming a renowned producer of wine.

**Time delay video.** This is a two-minute and fifty-five-second video on the lyre bird. All participants viewed it after reading the memory article.

**Article questionnaire.** Participants then filled out a questionnaire with nineteen items relating to the article, fourteen of which measured recall and five of which measured recognition (Appendix A). Written responses for questions of recall were granted either 0, 1, or 2 points. If responses fully answered the question they were granted 2 points. If responses showed some understanding of the question but did not fully answer it they were granted 1 point. If responses did not correctly answer any part of the question they were granted 0 points. Written responses for questions of recognition were granted either 0 or 2 points, based on whether the participants correctly identified the sentences as "original" or "new."

**Manipulation check.** A ten-item self-report form was created to measure the mindfulness manipulation (Appendix B). Participants rated their experience on a scale of 1 (Strongly Disagree) to 7 (Strongly Agree) for each item.

**Demographics.** This was a form that collected information on mood, gender, age, year in college, major, ethnicity, country of origin, political orientation, sexual orientation, religion, amount of time in the US, and amount of time speaking English.

### **Procedure**

Participants were randomly assigned to one of three conditions: control ( $n = 27$ ), distraction task ( $n = 26$ ), or guided attention ( $n = 23$ ). To participants in all conditions, the experimenter first said, “This is a study that looks at mental experience as it relates to different activities. You will be asked to think about environmental factors, thoughts, and feelings. You will also watch a short video and read a short article. You will then be asked to answer some questions about these experiences.” The experimenter then handed the participants the informed consent.

Participants in the control condition did not complete a task between signing the informed consent and reading the article. Participants in the distraction task condition watched the distraction task video and then were given the article.

Participants in the guided attention condition were told, “For this part of the study we’re going to have three minutes to do a guided attention exercise. For the first minute you’ll close your eyes and imagine the physical environment you’re in. For the second minute, you’ll keep your eyes closed and focus on your thoughts. For the third minute, you’ll keep your eyes closed and focus on your emotions” (Appendix C).

Before the first minute participants were told to picture the physical space they were in, including the tables, the chairs, the temperature of the room, and the feeling of sitting. They were also reminded to maintain focus and dismiss any irrelevant or distracting thoughts.

Before the second minute participants were told to shift their attention to their thoughts and to become aware of what their thoughts were centered on. They were also told to notice what pace their thoughts were moving from one topic to the next.

Finally, before the third minute, participants were told to focus on their emotions, how they were feeling, and what their mood was like. All participants were subsequently given an article to read and told to pay attention to its details and fully focus on its content. They were told that they would have eight minutes to read the article.

After the eight minutes were up, participants were shown a three-minute time delay video. Participants were then given the article questionnaire and told they would have ten minutes to complete it. Then, after the experimenter collected the article questionnaire, he or she administered the manipulation check. Participants were allowed as much time as necessary to complete the manipulation check, and then filled out a demographics page. Participants were then debriefed verbally, handed a debriefing page, and dismissed.

## **Results**

### **Hypotheses Tests**

Overall, the data do not support the two original hypotheses. Participants in the guided attention condition who engaged in a three-minute eyes-closed guided attention exercise did not experience (1) higher levels of mindfulness (as measured by a ten-item self-report questionnaire) ( $F(2, 73) = 0.44, p = .65$ ) or (2) more accurate remembering of a narrative article (as measured

by a nineteen-item test that measured both recall and recognition) ( $F(2, 73) = 0.01, p = .99$ ) than participants in the control condition nor participants in the distraction task condition (Table 1).

### **Exploratory Analyses**

However, significant differences were found between conditions when factor scores were correlated with memory performance on the article questionnaire. A factor analysis with varimax rotation was performed on the ten manipulation check items, with three factors extracted. This suggests that the manipulation check questions actually operationally defined mindfulness as composed of three underlying components: focus/attention (factor 1), openness to objectively observing internal processes (factor 2), and separation of the self from thoughts and feelings (factor 3).

Items 8, 9, and 10 from the manipulation check (Appendix A) all loaded positively on factor 1 (Table 2). All of these items pertained to attention and focus. Items 6 and 7 from the manipulation check loaded negatively on factor 1, and were items measuring distraction. Items 2 and 5 loaded positively on factor 2 and measured observation and awareness of feelings. Item 4 measured separation from thoughts and feelings, and loaded positively on factor 3.

Correlations between the factor scores and results of the memory test differed between conditions. Table 3 shows the correlations between scores for factor 1 (focus/attention) and mean scores for recall, recognition, and all memory questions overall. Factor 1 scores predicted performance on questions of recall more strongly in the guided attention condition than in the distraction task condition at the trend level ( $Z = 1.39, p = .08$ ). However, factor 1 scores did not more strongly predict performance on questions of recall in the guided attention condition than the control condition ( $Z = 0.69, p = .25$ ). The marginally significant finding between the guided attention and distraction task conditions suggests that participants in the guided attention

condition may have been able to more accurately evaluate their focus and attention than participants in the distraction task condition. The lack of significance in factor 1 scores predicting improved recall scores in the guided attention condition over the control condition is also of interest here, because we would expect self-reports of attention and focus to better predict performance on questions of recall in the guided attention condition than in either the distraction task or control conditions.

Factor 1 scores were also found to more strongly predict performance on questions of recognition in the control condition than the guided attention condition at the trend level ( $Z = -1.26, p = .10$ ). Performance on questions of recognition in the control condition was not more strongly predicted by factor 1 scores than in the distraction task condition, however ( $Z = -0.18, p = .42$ ). This is surprising, as we would expect the relationship between self-report of focus/attention and performance to be consistent between questions of recall and questions of recognition. This result could suggest that participants in the guided attention condition rated focus/attention as it pertained to recall (i.e., in a more general, big-picture sense, such as major events and characters), whereas participants in the control condition rated focus/attention as it pertained to recognition (i.e., in a more specific, detail-oriented sense, such as sentence structure).

Additionally, factor 1 scores more strongly predicted mood scores in the guided attention condition than the distraction task condition ( $Z = 2.27, p = .01$ ), as well as marginally more strongly predicted mood scores in the guided attention condition over the control condition ( $Z = 1.25, p = .11$ ). This indicates that participants in the guided attention condition who rated themselves as more focused and attentive also reported higher mood scores than participants in the distraction task or control conditions. This could either suggest that participants in the guided

attention condition in better moods may have been able to more easily focus on thoughts, feelings, and environment, or that those who were able to focus on thoughts, feelings, and environment were resultantly in better moods.

Within each condition, each of the three factor scores did not have zero correlation with each other. Although in the control condition all three factor score correlations approached zero and there was no notable relationship between them, in the distraction task condition factors 1 (focus/attention) and 3 (separation of the self from thoughts and feelings) had a weak negative relationship ( $r(26) = -0.20, p = .33$ ) and in the guided attention condition factors 1 and 3 had a moderate positive relationship ( $r(23) = 0.33, p = .13$ ). Thus, in the control condition the factor scores behaved as we would expect them to and did not have a positive or negative relationship, but in the distraction task condition higher scores on factor 1 correlated with slightly lower scores on factor 3, and in the control condition higher scores on factor 1 correlated with moderately higher scores on factor 3. This means that in the control condition the three factor scores were separate entities that measured focus/attention (factor 1), openness to objectively observing internal processes (factor 2), and separation of the self from thoughts and feelings (factor 3). In the distraction task condition, however, an increase in focus/attention meant a slight decrease in separation of the self from thoughts and feelings. In the guided attention condition, an increase in focus/attention meant a moderate increase in separation of the self from thoughts and feelings.

Overall, factor 1 scores predicted factor 3 scores more strongly in the guided attention condition than in the distraction task condition ( $Z = 1.77, p = .04$ ), or the control condition ( $Z = 1.5, p = .07$ ). This suggests that for participants in the guided attention condition, as levels of focus/attention increased so did the ability to separate oneself from one's own thoughts and



feelings. Thus, for participants in the guided attention condition who focused on the environment, their thoughts, and their feelings, the ability to focus was linked to the ability to separate oneself from thoughts and feelings. Because people who practice mindfulness exercises over long periods of time experience increased focus/attention as well as increased ability to separate themselves from thoughts and feelings, this link between the two qualities in guided attention participants suggests a nascent development of mindfulness.

### **Discussion**

The present findings suggest that, among inexperienced meditators, engaging in an eyes-closed guided attention exercise conducive to simulation does not lead to higher self-reported levels of mindfulness nor improved recall or recognition of a narrative article. This could suggest either that engaging in a guided attention exercise, and, consequently, simulation, does not actually carry over to subsequent tasks, that simulation does carry over to subsequent tasks but that they must be related tasks, or that the guided attention exercise that participants completed did not successfully engage them in simulation.

The body of literature surrounding mental imagery and visualization suggests that the mental processes behind grounded cognition would carry over to subsequent tasks. In order to know whether simulation carries over to related subsequent tasks, future research needs to be conducted in which the subject of the simulation and the subject of the test of memory are parallel. In the present study the guided attention exercise (focusing on environment, thoughts, and feelings) was unrelated in content to the test of memory (a narration of a South African woman's wine-making career).

It is possible that the present study's guided attention exercise did not engage participants in a form of simulation that would carry over to tests of memory. The guided attention exercise

asked participants to focus on aspects of the *present* moment, however, had participants been asked to focus on aspects of the past, the form of simulation may have been different and may have translated more directly to our tests of memory.

Another possible limitation concerns the sensitivity of the tests of memory. Questions pertaining to recall were open-ended, and the scoring system was such that participants could either receive zero, one, or two points for each response. This discrete scoring system for continuous response variables may not have reflected participants' ranges in responses in meaningful ways. For example, participants had to have fully answered the questions correctly in order to receive two points, whereas many different partially correct answers could have earned subjects one point for partial credit. For questions pertaining to recognition, participants received either 0 or 2 points, meaning that the scoring system for questions of recognition differed from questions of recall, and that comparisons made between the two types of questions may not be truly representative of performance on them. Additionally, there were fourteen questions pertaining to recall and just five pertaining to recognition, meaning that there may be more variability and sensitivity in the scores for recall over recognition.

The fact that factor 1 scores more strongly predicted mood scores in the guided attention condition than the distraction task condition, and marginally more strongly predicted mood scores in the guided attention condition over the control condition, suggests that in the guided attention condition mood plays a role in how participants rate their ability to focus on their environment, thoughts, and feelings.

The finding that factor 1 scores predicted performance on questions of recall in the guided attention condition more strongly than the distraction task condition at the trend level, but that factor 1 scores were also found to predict improved performance on questions of recognition

in the control condition over the guided attention condition at the trend level is of interest. This could suggest that participants in the guided attention condition rated focus/attention as it pertained to recall in a more general, big-picture sense, such as major events and characters, whereas participants in the control condition rated focus/attention as it pertained to recognition in a more specific, detail-oriented sense, such as sentence structure. In taking levels of processing ( Craik & Lockhart, 1972) into account, these differences between conditions could indicate that participants in the guided attention condition who rated themselves as more focused/attentive underwent lower levels of processing than participants in the distraction task condition, and that participants in the control condition who rated themselves as more focused/attentive underwent higher levels of processing.

### **Conclusion**

Although the present study did not find significant differences in (1) levels of mindfulness nor (2) long-term memory between conditions, factor analysis indicates that mindfulness can be broken down into different factors, that these factors can predict performance on questions pertaining to recall and recognition, and the predictive patterns differ between conditions. Overall, our results suggest that a very brief mindfulness exercise can result in participants' self-evaluations of focus/attention, openness to objective observation of internal processes, and separation of the self from thoughts and feelings to predict performance on tests of recall and recognition in significant ways.

## References

- Armstrong, K. (2001). *Buddha*. New York, NY: Penguin Putnam Inc.
- Barsalou, L. W. (1999). Perceptual symbol systems. *Behavioral and Brain Sciences*, 22, 577-660
- Barsalou, L. W. (2008). Grounded cognition. *Annual Review of Psychology*, 59, 617-45. doi: 10.1146/annurev.psych.59.103006.093639
- Bishop, S., Lau, M., Shapiro, S., Carlson, L., Anderson, N., Carmody, J., Segal, Z., Abbey, S., Speca, M., Velting, D., & Devins, G. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice*, 11(3). doi: 10.1093/clipsy/bph077.
- Bodhi, B. (1994). *The Noble Eightfold Path: Way to the End of Suffering*. Onalaska, WA: Pariyatti Publishing.
- Carrithers, M. (1983). *The Buddha*. Oxford, UK: Oxford University Press.
- Chiesa, A., Calati, R., Serretti, A. (2010). Does mindfulness training improve cognitive abilities? A systematic review of neuropsychological findings. *Clinical Psychology Review*, 31, 449-464. doi: 10.1016/j.cpr.2010.11.003
- Craik, F. I. M., & Lockhart, R. S. (1972). Levels of processing: A framework for memory research. *Journal of Verbal Learning and Verbal Behavior*, 11, 671-684.
- Gyatso, Janet. (1992). *In the mirror of memory: Reflections on mindfulness and remembrance in Indian and Tibetan Buddhism*. Albany, NY: State University of New York Press.
- Heeren, A., Van Broeck, N., & Philippot, P. (2009). The effects of mindfulness on executive processes and autobiographical memory specificity. *Behaviour Research and Therapy*, 47, 403-409. doi: 10.1016/j.brat.2009.01.017
- Langer, E. J. (Ed.). (1992). Matters of Mind: Mindfulness/mindlessness in perspective. *Consciousness and Cognition*, 1, 289-305.

- Lau, M. A., Bishop, S. R., Segal, Z. V., Buis, T., Anderson, N. D., Carlson, L., Shapiro, S., Carmody, J., Abbey, S., & Devins, G. (2006). The Toronto Mindfulness Scale: Development and Validation. *Journal of Clinical Psychology, 62*(12), 1445-1467. doi: 10.1002/jclp.20326
- Moore, A., & Malinowski, P. (2009). Meditation, mindfulness, and cognitive flexibility. *Consciousness and Cognition, 18*, 176-186. doi: 10.1016/j.concog.2008.12.008
- Nielsen, L., & Kaszniak, A. (2006). Awareness of subtle emotional feelings: A comparison of long-term meditators and nonmeditators. *Emotion, 6*(3), 392-405. doi: 10.1037/1528-3542.6.3.392
- Nurius, P. (1993). Human memory: A basis for better understanding the elusive self-concept. *Social Service Review, 67*(2), 261-278.
- Pecher, D., Boot, I., & Van Dantzig, S. (2011). Abstract concepts: Sensory-motor grounding, metaphors, and beyond. In Brian H. Ross (Eds.), *Psychology of Learning and Motivation*, (217-248).
- Ráhula, W. (1974). *What the Buddha Taught*. New York, NY: Grove Press.
- Salomon, G., & Globerson, T. (1987). Skill may not be enough: The role of mindfulness in learning and transfer. *International Journal of Educational Research, 11*(6), 623-637. doi: 10.1016/0833-0355(87)90006-1
- Shiffrin, R. M., & Atkinson, R. C. (1969). Storage and retrieval processes in long-term memory. *Psychological Review, 76*(2), 179-193. doi: 10.1037/h0027277
- Wagstaff, G., Brunas-Wagstaff, J., Cole, J., & Wheatcroft, J. (2004). New directions in forensic hypnosis: Facilitating memory with a focused meditation technique. *Contemporary Hypnosis, 21*, 14-28.

Williams, J. M. G., Teasdale, J. D., Segal, Z. V., & Soulsby, J. (2000). Mindfulness-based cognitive therapy reduces overgeneral autobiographical memory in formerly depressed patients. *Journal of Abnormal Psychology, 109*(1), 150-155. doi: 10.1037/0021-843X.109.1.150

Zeidan, F., Johnson, S., Diamond, B., David, Z., & Goolkasian, P. (2010). Mindfulness meditation improves cognition: Evidence of brief mental training. *Consciousness and Cognition, 19*, 597-605. doi: 10.1016/j.concog.2010.03.014

Table 1

*Means (and standard deviations) for scores on the mindfulness manipulation and memory article questionnaire.*

Condition	Manipulation Check	Memory Article Questionnaire
Control	5.12 (0.77)	24.56 (5.70)
Distraction Task	4.94 (0.75)	24.78 (5.23)
Guided Attention	4.94 (0.83)	24.70 (4.62)

Table 2

*Factor loadings between factor scores and manipulation check items (see Appendix B for details) for all participants.*

Item	Factor		
	1	2	3
1	0.16	0.11	0.42
2	-0.07	0.74	0.29
3	0.36	0.63	0.22
4	-0.08	0.01	-0.89
5	0.16	0.79	-0.23
6	-0.82	0.02	-0.08
7	-0.89	-0.09	-0.04
8	0.91	0.08	0.24
9	0.76	0.16	0.28
10	0.79	0.30	0.02



Table 3

*Correlations (and significance levels) between scores for Factor 1 (focus/awareness) and mean scores for recall, recognition, and all memory questions overall.*

Condition	Memory Performance Variable		
	Recall	Recognition	All
Control	0.48 ( $p = .01$ )	.35 ( $p = .08$ )	0.51 ( $p = .007$ )
Distraction Task	0.30 ( $p = .14$ )	0.30 ( $p = .14$ )	0.34 ( $p = .09$ )
Guided Attention	0.63 ( $p = .001$ )	-0.021 ( $p = .93$ )	0.39 ( $p = .07$ )

## Appendix A

*Please answer the questions below by writing in the correct answer in the space provided.*

1. What is the main character's name?
2. What are "viticulture" and "oenology"?
3. Who is Jabulani Ntshangase?
4. What was the first type of wine the main character had?
5. What was her reaction to it?
6. What title did the main character win in 2009?
7. What about wine caused the main character to fall in love with it?
8. What are the "two-worlds" that the main character straddles? What are the differences between these two worlds?
9. What has Human Rights Watch criticized?
10. What is the beverage of choice for most South Africans?
11. To what university was the main character's scholarship?
12. What language was spoken at this university?
13. What led to the main character's "oenological conversion"?

14. What did the main character say she smelled in the wine when others said they smelled cassis and truffles?

*Please identify whether the sentences below are original sentences from the article or whether they are new and different sentences that were not in the article by either writing “Original” or “New” in the space provided.*

1. “She had never been outside the eastern province of KwaZulu Natal, but she boarded a bus and traveled across South Africa to the wine country of the Western Cape.”
2. “He opened a superb red, raised the moist cork to his nose and talked rapturously about the wine’s fruitiness and color and fragrance.”
3. “Ms. Biyela has been an important figure in South Africa’s transformation, as she is not someone who has been born into success, but rather is a someone who has risen to success through hard work.”
4. “At her part-time job at Delheim, in-between talking with visitors she spent time tasting the wines she served.”
5. “She hopes more of her black compatriots will warm up to wine and says, “It won’t happen until people think of it as part of their food and not something that needs to be smelled and talked about.””



## Appendix C

## Experimenter script for guided attention exercise

Before first minute: “For this part of the study we’re going to have three minutes to do a guided attention exercise. We’ll want to know your impression of it at the end of the study. Don’t feel the need to respond during the exercise. For the first minute you’ll close your eyes and imagine the physical environment you’re in. For the second minute, you’ll keep your eyes closed and focus on your thoughts. For the third minute, you’ll keep your eyes closed and focus on your emotions.

“Throughout this exercise, please try and maintain focus and dismiss any irrelevant or distracting thoughts. Any questions?”

“Okay, close your eyes and imagine the environment you are in. Picture the physical space, the way the room is arranged, the table, the chairs. Become aware of the temperature of the room and the feeling of sitting. Remember to maintain focus and dismiss any irrelevant or distracting thoughts. You can begin now.”

Start time for first minute. At the end of the first minute, say:

“Now, keeping your eyes closed, shift your attention to your thoughts. Become aware of what they are centered on. Notice what pace they are moving from one topic to the next. Notice what you are thinking about. Again, try your best to maintain focus and not get distracted.”

Start time for second minute. At the end of the second minute, say:

“Lastly, focus on your emotions. Notice how you are feeling right now. Become aware of what your mood is like. Again, remember to maintain focus and dismiss any irrelevant or distracting thoughts.”

Start time for third minute. At the end of the third minute, say:

“Now, open your eyes and reorient yourself. That’s the end of this part, and you’ll answer questions about it later on.”