The role of mindfulness meditation in supporting people with dementia to live well.

By Guy Robertson

Mindfulness Meditation
There are a number of forms of meditation, though they share many common features. This article focuses on the most common meditation practice which is usually referred to as ‘mindfulness’.

Mindfulness is increasingly being recognised as a powerful capability for improving health and general wellbeing in later life. It is essentially about noticing what is occurring in the present moment experience, with an attitude of openness and non-judgmental acceptance.

“Mindfulness is paying attention in a particular way, on purpose, in the present moment, and non-judgmentally.” (Kabat-Zinn 1990)

Mindfulness meditation is an integrative mind-body based approach that helps people change the way they think and feel about their experiences, especially stressful experiences. It involves paying attention to thoughts and feelings so that people become more aware of them, less enmeshed in them, and better able to manage them(Halliwell 2010). Mindfulness meditation is predominantly taught and delivered through eight week Mindfulness Based Stress Reduction (MBSR) courses. A more cognitive variant has been developed, Mindfulness Based Cognitive Therapy (MBCT), which integrates some of the core philosophy and approaches of cognitive behavioural therapy (CBT).

General health benefits
Mindfulness meditation has become an increasingly widespread practice and has been applied across a range of health conditions(Schneider R 2005). Mindfulness courses not only help people deal with illness, they are by nature a health promotion and illness prevention tool(Halliwell 2010). As Grossman and colleagues put it in their 2004 review of mindfulness based approaches “A single, relatively brief and cost effective programme that can potentially be applied to a wide range of chronic illnesses and is able to effect a positive shift in fundamental perspectives toward health and disease should be of great interest.”(Grossman, Nieman et al. 2004). It has been found to be effective in reducing pain and the emotional reaction to it(Kabat-Zinn 1986), and has been found to improve mood and quality of life in chronic pain conditions such as fibromyalgia(Grossman 2007) and lower back pain(Morone N E 2008b). There is also significant evidence about its benefits in addressing depression, to such an extent that the National Institute for Health and Clinical Excellence (NICE) has now recommended Mindfulness Based Cognitive
Therapy for those with a history of three or more episodes of depression in their Guidelines for the Management of Depression (NICE 2009)

**Dementia, cognitive decline and attention**
Dementia is an age related condition which involves a deterioration in cognition, including attention. Although the hallmark of dementia is recent memory deficit, attentional problems are being increasingly recognised as integral to the condition. A few studies have examined vigilance in relation to dementia (see Perry and Hodges (Perry and Hodges 1999) for a review). Invariably all studies showed an impaired ability to sustain attention in people with dementia. Other studies (Belleville and al 2008) have shown task switching abnormalities as well as attention control are diminished in people with dementia. The fact that meditation (MBSR) has been demonstrated to enhance many forms of cognition that are known to decline with age, such as working memory, many forms of attention, and fluid intelligence, must therefore be of interest. Some academics (Hu X 2011) propose that, given meditation’s ability to strengthen various aspects of attention, there is therefore a justification for research to explore whether meditation could halt the deterioration from mild cognitive impairment to dementia.

**Mindfulness and attention**
At the heart of mindfulness meditation is the practice of initiating and sustaining a focus on a mental or sensory activity, with deliberate effort. To sustain the focus the meditator has to continuously (moment by moment) monitor their attention. As the attention wanders away from the chosen object or sensation the typical instruction is to recognise the wander and then restore attention on the chosen object. Hu et al (Hu X 2011) propose that long term meditation should result in improvement in three aspects of attention:-
- Sustained attention
- Distraction inhibition
- Task switching

Valentine and Sweet (Valenine and Sweet 1999) studied the effects of short and long term concentrative style meditation on attention span of meditators and found that both short and long term meditators performed better than non-meditating controls on tests of sustained attention. Others (Prakash and al 2010) have found that long term concentrative meditation practitioners performed better on paper-pencil tests of attention that covered tasks of sustained attention, visual scanning, task-switching, response inhibition and information processing.

The practice of mindfulness meditation involves training processes of attention to enable consciousness to enter a state of mindful awareness (Teasdale and Barnard 1993). Jha, Krompinger and Baime (Jha, Krompinger et al. 2007) conducted functional magnetic resonance imaging (FMRI) on a sample of meditation practitioners following a month long mindfulness retreat. Three distinct sub-sections of attention were identified, each having an independent function and neuro-anatomy. ‘Alerting’ involves achieving and maintaining a state of preparedness. ‘Orienting’ directs and limits stimulus input and ‘conflict monitoring’ prioritises among competing tasks.
Retreatants fmri’s were compared to completers of an 8-week MBSR program and a control with no meditation experience. At pre-test assessment the retreatants displayed enhanced conflict monitoring. At post-test the MBSR group had significantly improved in ability to orient attention and the retreatants had heightened ‘alerting’ in comparison to controls. Findings suggested mindfulness practice improve attentional processing.

Expert mindfulness practitioners have, in other research, displayed enhanced attentional processing in comparison to age and gender matched controls (Van Den Hurk, Giommi et al. 2010). Meditators showed heightened orienting and executive attention reflected by reaction time and accuracy. For responses with the same reaction time, extensive mindfulness meditation was related to a reduction in errors (Van Den Hurk, Giommi et al. 2010). Both these studies investigated advanced mindfulness practitioners, which prevented randomisation procedures. However, meaningful controls were employed and the outcomes therefore illustrated the benefit of sampling participants with long-term experience to inform on possible effects of the practice.

Neuro-psychological research uncovered functional differences in the brains of long-term meditators. Lazar et al (Lazar 2005) found increased cortical thickness, which correlated with amount of meditation experience, in participants who meditated for 40 minutes per day compared to controls. Implicated brain regions involved areas of the pre-frontal cortex that are associated with attention and sensory processing. Thinning of grey matter in these areas typically occurs with age, but was observed to occur at a much slower rate in long-term meditators suggesting the practice might offer protection from age-related neural loss. Self-reported mindfulness and meditative experience have both been related to fmri patterns of attentional functions and cognitive flexibility (Moore and Malinowski 2009). Mindfulness meditation practitioners have displayed significantly better performance on Stroop interference tasks (which assess reaction times) and the concentration and endurance test in comparison to a meditation naive control. Meditation practitioners were also seen to report the highest levels of mindfulness (Moore and Malinowski 2009).

Meditators have been found to exceed non-meditators on measures of selective attention, concentration and perspective shifting with high face validity showing that meditation was associated with a more accurate, efficient and flexible visual attention processing system (Hodgins and Adair 2010). Information processing involves the ability to attend, perceive, label and assign meaning based on memory. A study (Slagter and al. 2007) examined practitioners following a 3-month mindfulness retreat, and compared them to a control condition of naive meditators who were trained in meditation 20 minutes per day for 1 week prior to testing. The Attentional Blink Task, which involves distribution of attentional resources, was used to assess participant ability to detect a second stimulus in close proximity to presentation of an earlier one. Retreatants were quicker than controls at detecting the second stimulus, showing lower attentional blink. Overall, meditation
practitioners showed improved information processing capacity (Slagter and al. 2007).

**Emotional regulation and intelligence**
Goldin and Gross (Goldin and Gross 2010) examined brain–behaviour indices of emotional reactivity and regulation of negative self-beliefs in patients with Social Anxiety Disorder. Patients underwent FMRI while reacting to negative self-belief in either breath focused or distraction focused conditions. Compared with baseline assessment, those who had completed a course in MBSR showed improvement in anxiety, depression and self-esteem following the breath focused task. In addition neuro-imaging showed decreased negative emotional experience and reductions in amygdala activity. The changes documented indicated that exposure to negative experience had lead to decreased negative affect and were, therefore, consistent with the assumption that MBSR enhances emotion regulation.

Emotional intelligence is defined as ‘the ability to perceive accurately, appraise and express emotion; the ability to understand emotion and emotional knowledge; the ability to regulate emotions to promote emotional and intellectual growth’ (Mayer and Salovey 1997). Baer, et al (Baer and al 2006) found dispositional mindfulness to be related to many indicators of emotional intelligence. Creswell, et al (Creswell and al 2007) found that individuals higher in dispositional mindfulness (MAAS) displayed less reactivity to emotionally threatening stimulus (lower amygdala activation on FMRI). In addition participants displayed stronger pre-frontal cortical activation, which is associated with improved executive functioning. Regulation of emotional reaction was positively associated with mindfulness score.

Both cross-sectional and experimental research has been conducted on meditation and emotional intelligence (Chu 2010). In cross-sectional research full time working adults with differing amounts of meditation experience were assessed. Experience of meditation correlated with higher levels of emotional intelligence (Emotional Intelligence Scale), less perceived stress (Perceived Stress Scale) and low negative mental health (General Health Questionnaire). In an experimental study participants completed 8 weeks of 20-minute sessions of meditation training per day. No pre-test differences were seen between control and meditation groups. At post-test those practicing meditation displayed higher emotional intelligence in addition to less perceived stress and reduced negative mental health, including lower social dysfunction as measured by self-report scales (above).

An enhanced ability to discriminate between emotions in other people may result from advanced meditation practice (Neilsen L 2006). Long-term meditators were compared with non-meditators on measures of self-reported valence (the intrinsic attractiveness or aversiveness of an event, object, or situation) and arousal in response to masked and non-masked emotional pictures (using the International Affective Picture System) (Bradley and Lang 1999). Although no differences were found on physiological measures, long-term meditators reported greater emotional clarity and improved valence discrimination. Nielson and Kaszniak (Neilsen L 2006) suggested these processes operated as mechanisms behind beneficial change based
on the Somatic Marker Hypothesis (Bechara and Damasion 2005) which states that emotions affect the decision making process by signaling the quality of possible future outcomes.

Specific aspects of ‘mindfulness’ have, therefore, been found to be associated with distinct patterns of both positive and negative affect. Awareness in daily activity, observing and attending, disengaging from unpleasant experience and accepting without judgment are significantly related to changes in affect (Schroevers and Brandsma 2010). Chambers, Gullone and Allen (Chambers, Gullone et al. 2009) recommend that mindfulness could be better understood as a cognitive re-appraisal at ‘process’ instead of ‘content’ level. By this, authors refer to changes in how a person relates to appraisal of emotion as opposed to changing the emotion itself. Overall, it appears cognitive and affective mechanisms interact in mediation of the emotional health and well-being outcomes of mindfulness meditation.

Mindfulness and Cognitive Decline

Pagnoni and Bakic (Pagnoni G 2007) have found evidence that regular practice of meditation may have neuroprotective effects and reduce the cognitive decline associated with normal ageing. They used Voxel-based morphometry (a neuroimaging analysis technique) or MRI anatomical brain images and a computerized sustained attention task with 13 regular meditators and 13 matched controls. While control subjects displayed the expected negative correlation of both gray matter volume and attentional performance with age, meditators did not show a significant correlation of either measure with age. The effect of meditation on gray matter volume was found most prominent in the putamen, a structure strongly implicated in attentional processing. Similarly, a study by Lazar (Lazar 2011) has shown that meditation increases gray matter in specific regions of the brain and may slow the deterioration of the brain as a part of the natural aging process. The experiment included 20 individuals with intensive Buddhist "insight meditation" training and 15 who did not meditate. The brain scan revealed that those who meditated had an increased thickness of gray matter in parts of the brain that are responsible for attention and processing sensory input. The results showed that the change in brain thickness depended upon the amount of time spent in meditation. The structural changes were found in areas of the brain that are important for sensory, cognitive and emotional processing. The researchers also found that regular meditation practice may slow age-related thinning of the frontal cortex. Most of the regions identified in this study were found in the right hemisphere and the right hemisphere is essential for sustaining attention, which is a central practice of mindfulness meditation. A recent review (Xiong G 2009), compiled evidence of the various ways in which meditation could have neuroprotective effects on brain ageing, including elevating levels of Brain Derived Neurotrophic factor, strengthening of neuronal circuits, lower age related decline in aging brains etc. On the basis of this evidence, Hu et al (Hu X 2011) conclude that, in view of the strong theoretical basis of the effects of concentrative meditation on attention, combined with evidence that meditation has been effective in improving attention in ageing
individuals, it seems that concentrative meditation could be a potential candidate as an adjustment therapy for attentional rehabilitation in people with dementia.

**Grey matter changes**

MRI studies provide an interesting insight into morphological changes of the brain resulting from meditation. Most frequently reported are structural alterations in anterior cingulate cortex, superior and inferior frontal cortex, and prefrontal cortex. These regions are involved in attention, perceiving internal experience, sensory processing, and executive functions. Some studies report increased volume of hippocampi, which are important for memory. For an overview of MRI studies on meditation and their findings, see Marciniak et al (Marciniak R 2014). Similar regions of activation are reported from functional imaging studies. SPECT performed during meditation showed increased regional cerebral blood flow in the prefrontal cortex, superior frontal, and cingulate cortex, and the right temporal lobe (Wang and al 2011). As Lazar et al (Lazar 2005) have shown, meditation can have a compensatory effect on the decrease of cortical thickness related to aging. The increased cortical thickness found in meditators can be explained by several mechanisms: neuronal arborization, multiplication of glial cells, or formation of vessels (Lazar 2005). This also implies that meditation could potentially lead to neuroregeneration.

Some of the changes in the structure of the brain that meditation appears to produce may also be relevant to people with dementia. In one study (Newberg A B 2010) Newberg et al determined if subjects with memory loss problems demonstrated changes in memory and cerebral blood flow (CBF) after a simple 8-week meditation program. The meditation program resulted in significant increases (p< 0.05) in baseline CBF ratios in the prefrontal, superior frontal, and superior parietal cortices. Scores on neuropsychological tests of verbal fluency, and logical memory showed improvements after training. This preliminary study evaluated whether an 8-week meditation program resulted in improvements in neuropsychological function and differences in CBF in subjects with memory loss. The findings were encouraging, though there are a number of limitations that need to be addressed in future studies with more participants and more detailed analyses. Another study (Moss AS 2012) found that an 8-week, 12 minute a day meditation program in patients with memory loss was associated with positive changes in mood, anxiety, and other neuropsychologic parameters, and these changes correlated with changes in cerebral blood flow. A larger-scale study is needed to confirm these findings and better elucidate mechanisms of change. Another study (Holzel, Carmody et al. 2010) found changes in brain gray matter concentration attributable to participation in an MBSR program. Analyses confirmed increases in gray matter concentration within the left hippocampus. Whole brain analyses identified increases in the posterior cingulate cortex, the temporo-parietal junction, and the cerebellum in the MBSR group compared with the controls. The results suggest that participation in MBSR is associated with changes in gray matter concentration in brain regions involved in learning and memory processes, emotion regulation, self-referential processing, and perspective taking. A review (Marciniak R 2014) of the research evidence concluded that meditation can be a potentially
suitable non-pharmalogical intervention aimed at prevention of cognitive decline in older people (although there are some limitations to these conclusions).

Prevention
There is some evidence that meditation might serve as a potential tool for the prevention of Alzheimer’s disease (Horrigan 2007). It has been evidenced that meditation can influence risk factors of Alzheimer’s disease such as hypertension (Anderson 2008) and high levels of cholesterol (Walton and al 2004). Besides, the impact of meditation on the cerebral blood flow (Newberg and al 2001) could play a role in Alzheimer’s disease as well (Roher and al 2012). Others (Xiong G 2009) have developed the claim that meditation may have the possibility of preserving cognition and preventing dementia. While the mechanisms remain investigational, studies show that meditation may affect multiple pathways that could play a role in brain aging and mental fitness. For example, meditation may reduce stress-induced cortisol secretion and this could have neuroprotective effects potentially via elevating levels of brain derived neurotrophic factor (BDNF). Meditation may also potentially have beneficial effects on lipid profiles and lower oxidative stress, both of which could in turn reduce the risk for cerebrovascular disease and age-related neurodegeneration. Further, meditation may potentially strengthen neuronal circuits and enhance cognitive reserve capacity. There is also evidence (Wilson R S 2002) to suggest that frequent participation in cognitively stimulating activities is associated with reduced risk of Alzheimer’s Disease.

The figure below from Marciniak et al (Marciniak R 2014) shows proposed ways how meditation impacts cognitive functions. The effect of meditation on cognition is both direct and indirect (I–V): meditation positively influences hypercholesterolemia and hypertension which represent risk factors for Alzheimer’s disease (I). Further it increases cerebral blood flow (II) and has a protective effect on the cortical thickness (III). Meditation further reduces stress (IV), anxiety, and depression (V). All these mechanisms lead to better cognitive functions.

![Diagram showing the effects of meditation on cognitive functions.](Source: (Marciniak R 2014))
There have also been some claims that mindfulness meditation may help slow down the progression of Alzheimer’s Disease. As people age there is a high correlation between perceived stress and Alzheimer’s disease; it is therefore possible that stress reduction, delivered through meditation, might improve cognitive reserve. Researchers (Erwin Wells R 2013) found that MBSR may reduce hippocampal atrophy and improve functional connectivity in the same areas of the brain most affected by Alzheimer’s disease. Another study (Xiong G 2009) found that meditation may reduce stress induced cortisol secretion and that this could have neuroprotective effects potentially via elevating levels of brain derived neurotrophic factor (BDNF). Meditation could also potentially have beneficial effects on lipid profiles and lower oxidative stress, both of which could in turn reduce the risk of cerebrovascular disease and age related neurodegeneration.

**Mindfulness and Dementia**

There has been very little application of mindfulness meditation to people with dementia. One academic review (Lindberg D A 2005) concluded by supporting the hypothesis that meditation could be taught to older people, even those with dementia. One application of MBSR with people with dementia was undertaken by McBee (McBee 2003) in a nursing home environment. She shortened the MBSR protocol to be suitable for dementia residents. Nursing home staff reported improved mood and functioning of those involved (McBee 2004). A study by Newberg et al (Newberg A B 2010) (which included a small number of people with dementia) examined the effect of an 8-week meditation program using a simple method of Kirtan Kirya. The control group was listening to music instead of performing meditation. Fifteen seniors with age-related cognitive impairment (n = 7), mild cognitive impairment (n = 5), and Alzheimer’s disease (n = 3) were included in the study. Cerebral blood flow and performance in cognitive tests were examined. The effect of the 8-week long meditation program showed a significant increase in cerebral perfusion in prefrontal, parietal, and auditory cortex. The results of neuropsychological tests showed an improvement in verbal fluency and logical memory in the meditating group. Most of the participants also expressed a significant subjective improvement in cognitive functions.

A study by Innes et al (Innes and al 2012) examined the effect of meditation on stress, quality of sleep, mood, sympathetic activation, and memory functions in adults suffering from cognitive decline. The effect was also studied on their caregivers. Six patients in early stages of Alzheimer’s disease and their caregivers were tested before and after undergoing an 8-week meditation program. The participants showed a significant improvements and the researchers concluded that meditation may offer an acceptable and effective intervention for reducing perceived stress and improving certain domains of sleep, mood, and memory in adults with cognitive impairment and their caregivers.
One of the most extensive studies to date is that carried out by Quintana H et al (Quintana and al 2014) which sought to assess the effects of a mindfulness based program on the clinical course of Alzheimer’s disease. A two year randomized and double blind clinical trial was conducted on 127 probable Alzheimer’s disease patients, according to NINCDS-ADRDA scale. Patients were grouped into three experimental groups (cognitive stimulation, progressive muscular relaxation, and mindfulness) plus a control group. All participants were receiving donepezil. Cognitive skills were assessed with CAMCOG and MMSE, functional area with RDRS-2, and NPI was used for psychopathology screening. Three treatment sessions per week were carried out for two years, and follow up measurements were taken every six months. The results showed that the global cognitive function, functionality and behavioral disorders measurements indicated that patients from the experimental group based on mindfulness were stable during the two years, while patients from the control group, as well as the other experimental groups, showed a mild but significant worsening of their mental capacities. The researchers concluded that the mindfulness based neuropsychological program showed better cognitive and functional stability, as well as significant improvement in the psychopathological condition of mild to moderate Alzheimer’s patients. These results support the idea that a mindfulness based intervention can produce a clinically relevant improvement in the treatment of dementia.

Many of the results outlined above suggest a possible explanation of the impact of meditation on processes in the human brain. Marciniak et al (Marciniak R 2014) proposes that the mechanisms include increased cerebral perfusion in prefrontal, parietal and auditory cortex (Newberg A B 2010), a protective effect on gray matter thickness (Pagnoni G 2007), and enhancing of the function of areas involved in attention (Lazar 2005). In addition, meditation can potentially enhance the power of cognitive circuits and increase cognitive capacity (Xiong G 2009). Moreover, it can improve myelination or restructuralization of white-matter tracts in the involved areas such as anterior corona radiate associated with the anterior cingulate cortex (Tang and al 2010). Another explanation of the neuroprotective effect of meditation can be the decrease in cortisol level (Jacobs and al 2013), caused by stress, which may be related to a higher hippocampal volume in meditators (Luders and al 2013). Epel et al (Epel and al 2009) emphasise the correlation between the maintenance of the length of telomeres and decreased cognitive stress and tension due to meditation (Jacobs and al 2011). Meditation can positively impact dyslipidemia and oxidative stress, which further decreases the risk of vascular diseases of the brain as well as Alzheimer’s disease (Reitz 2013).

The positive potential of meditation, which is suggested from the research reported here, has to considered within the limitation of these studies. Many papers included too few subjects, control groups were missing or the research has been performed by institutions supporting a special type of meditation. In many studies, the effect of meditation on cognition was often measured by many different cognitive tests and the effect on specific cognitive functions has not been proved.
Mindfulness and quality of life for people with dementia

The studies cited above have focused on cognitive improvements; little has been done to assess whether mindfulness meditation can produce quality of life benefits. The current investigators have undertaken one of the few studies to look at this aspect. Litherland et al (Litherland, Leader et al. 2013) found that people in the early stages of dementia were able to learn mindfulness meditation techniques and that they reported quality of life improvements across a wide range of domain including reduction in anxiety, pain control, coping with memory loss, regulation of emotions, improved sense of self, improved awareness and sense of appreciation, improved relationships. There was some feedback however that some of the course was found to be ‘too cognitive’ for some of the people with dementia.

A recent pre-post study(Paller and al 2014) has shed new light on the potential benefits of mindfulness training for people with cognitive decline and their carers. Pre-post analyses revealed several benefits, including increased quality-of-life ratings, fewer depressive symptoms, and better subjective sleep quality. In addition, participants indicated that they were grateful for the opportunity to learn to apply mindfulness skills and that they would recommend the program to others. The study concluded that mindfulness training can be beneficial for patients and their caregivers, it can be delivered at low cost to combined groups, and it is worthy of further investigation.

Summary and Conclusion

Mindfulness meditation appears to have a lot of potential in supporting people to live well with dementia. The evidence is not yet conclusive: many of the trials included in the literature are small scale and there is a need for greater rigour in some others. That having been said there is enough evidence to suggest that this is a potentially fruitful area for further research. The prospect of meditation playing some role in preventing or delaying the onset of dementia is a particularly exciting prospect, but at the same time the research evidence would need to be much more rigorous than at present.

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References


