Mindfulness and Emotion Processing

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Mindfulness and Emotional Response

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Abstract

Background: Mindfulness is considered a transdiagnostic process of change (Baer, 2007) which aids emotion regulation (Chambers, Gullone, & Allen, 2009). Clinically, mindfulness-based interventions can reduce depressive relapse (Kuyken et al., 2008) and increase wellbeing (Schroevers & Brandsma, 2010). However, it is not yet clear how mindfulness alters emotion processing (Davidson, 2010). This thesis examines the impact of both a brief lab-based mindfulness training, and longer term practice, on emotional response and related memory recall.

Methods: We examined the impact of mindfulness on emotional response in both long-term meditators and matched controls. Participants underwent a brief training in adopting either experiential (state mindfulness) or evaluative self-focus whilst viewing a series of personality traits on a screen (Farb et al 2007). Images from the International Affective Picture System (Lang et al 1999) were then shown to investigate differences in emotional response. Self-reported arousal and valence ratings were collected, and skin conductance response (SCR) measured. We also investigated the impact of mindfulness on memory recall by administering a surprise recognition test.

Results: People with more than 500 hours of meditation experience rated normatively negative stimuli as less unpleasant, and negative and positive stimuli as less arousing than controls. They also showed reduced SCR to positive stimuli. In addition, meditators scored higher on self-report measures tapping 'non-reactivity', 'non-judging' and 'non-attachment'. No between condition differences in emotion processing were observed nor group differences on a memory task.

Conclusion: Meditators showed measurable differences in emotional processing, both in subjective reports of their emotional experience and on a more implicit measure of physiological response. These data, while observational, are consistent with a state of calm equanimity in those with experience of meditation (Desbordes et al., 2014). The effects observed have clinical relevance, and may aid the understanding of the processes of change in mindfulness-based interventions.

Aims and Objectives

Mindfulness-based interventions are clinically effective in reducing depressive relapse (Kuyken et al., 2008) and increasing wellbeing (Schroevers & Brandsma, 2010). However, it is not yet clear exactly how mindfulness impacts on emotion processing (Davidson, 2010). This study will examine the impact of a brief lab-based mindfulness training, and longer term mindfulness practice, on emotional response and related memory processes. These data will add to our understanding of the processes of change that occur during mindfulness interventions.

Introduction

Mindfulness meditation practices encourage a non-judgmental, non-evaluative, present moment awareness of one's experience (see Coffey, Hartman, & Fredrickson, 2010 for a discussion). The roots of mindfulness lie in Buddhist meditation, however, secular adaptations have been gaining popularity in health settings since the development of Mindfulness-based Stress Reduction (MBSR) program for chronic pain (Kabat-Zinn, 1982). A recent systematic review of randomised control trials (RCTs) of MBSR found it to lead to improvements in mental health (Fjorback, Arendt et al. 2011). Mindfulness-based cognitive therapy (MBCT) is an 8 week program which merges MBSR with developments in clinical psychology, and RCTs have shown it can prevent relapse in depression (Fjorback, Arendt, Ornbol, Fink, & Walach, 2011; Kuyken et al., 2008) and improve affect in people with mild to moderate psychological problems (Schroevers & Brandsma, 2010). In addition, a recent systematic review and meta-analysis of structured meditation programs including non-secular approaches also observed moderate evidence of meditation-related improvements in anxiety, depression and pain (Goyal et al., 2014).

Enough data has now been gathered from studies of mindfulness-based interventions (MBIs) to conduct meta-analyses to examine clinical efficacy and effectiveness. One comprehensive meta-analysis had a broad inclusion criteria including uncontrolled pre- and post studies, and studies of both clinical and non-clinical samples. Two hundred and nine studies were included and moderate effect sizes observed for pre- and post and wait-list control comparisons. Small to moderate effects were also observed for comparisons with active controls which included psychoeducation, supportive therapies and relaxation, but MBIs did not differ from CBT (Khoury, Lecomte et al, 2013).

Another meta-analysis examined the impact of MBIs on anxiety and depression symptoms (Hofmann, Swayer et al, 2010). Thirty-nine studies met the inclusion criteria and 16 of these included a control or comparison group; 8 wait-list, 3 treatment as usual (TAU), and 5 active controls. MBIs were found to be moderately effective at improving mood and anxiety symptoms with larger effect sizes observed for interventions with those with a clinical diagnosis of anxiety or depression (Hofmann, Swayer et al, 2010).

A further study focussed more specifically on MBCT for psychiatric conditions, the majority of which were RCTs including participants with a diagnosis of major depression (Chiesa & Serret, 2011). The main finding of this study was that the 4 studies examining MBCT as an adjunct to usual care, in contrast to TAU alone, suggested significantly reduced depressive relapse in those who have been depressed 3 or more times before (Chiesa & Serret, 2011).

More recently, a meta-analysis was conducted to examine MBIs for people who met criteria for depression or anxiety i.e. not in remission as is the case with many trials (Strauss, Cavanagh et al, 2014). Twelve RCTs were identified, and significant effects were observed for depression but not anxiety symptom severity when contrasting with inactive control groups (7 studies; 5 TAU, 1 wait-list and 1 exercise). Interestingly, effects were specific to MBCT not MBSR, and did not hold for studies using active controls (5 studies; 4 group CBT, 1 group psycho-education). These findings are also consistent with a recent large scale RCT of MBCT for those remitted from depression that observed no advantage for MBCT vs. an active control in preventing depressive relapse in the group as a whole. However, this study did find that a subgroup of participants who have a history of childhood trauma gained additional protection from depressive relapse from MBCT (Williams, Crane et al, 2013).

Overall these data suggest that MBI's may be effective in treating symptoms of anxiety and depression, and in preventing depressive relapse, especially as an adjunct to TAU. However, the data so far suggest that MBIs may not be more effective than active controls, especially CBT, unless perhaps there is a history of childhood trauma. It is likely that our understanding of these clinical outcome data will be further enhanced by studies focussing on the processes of change that occur in MBIs.

Buddhist Background to Mindfulness

The Buddha Shakaymuni was an historical person born in approximately 563-566 BC. He identified a framework called the Four Noble Truths which provide a basis for understanding the nature, origins and transformation of suffering which includes the practice of mindfulness (Teasdale & Chaskalson, 2011). The First Noble truth is that there is 'dukkha' or suffering which loosely translates as a broad sense of discontent or unsatisfactoriness (Ekman, Davidson, Ricard, & Wallace, 2005; Teasdale & Chaskalson,

2011). The Buddha is said to have described this as 'It is as if a man were pierced by an arrow, and following that piercing, he is hit by a second arrow' (Teasdale & Chaskalson, 2011). A modern psychological translation using depression as an example, is that the 'first arrow of a simple feeling of sadness is transformed into a more intense persistent state of depression when we add the second arrow of ruminative thinking' (Teasdale & Chaskalson, 2011). The Second Noble Truth is that the cause of this discontent is craving, a state that disrupts the balance of the mind (Ekman et al., 2005), and includes an attachment to that which is perceived as pleasant and an aversion towards that perceived as unpleasant. The Third Noble truth states that the end of suffering is possible, and the Fourth Noble proposes a method which includes mindfulness (Teasdale & Chaskalson, 2011). The initial challenge of Buddhist meditation has been described as learning how to 'identify how [mental states] arise, how they are experienced and how they influence oneself and others over the long run' (Ekman et al., 2005).

Operationalising Mindfulness Meditation

Mindfulness has been defined and operationalised in a variety of different ways (Davidson, 2010). It is a state that can fluctuate over time and vary in different individuals. In addition, it is skill that can be trained and honed either through Buddhist practices, secular mindfulness approaches or possibly brief laboratory-based mindfulness interventions. However, distinctions have been drawn between mindfulness as a state i.e. after brief training, and mindfulness achieved through longer periods of training, which are likely to be qualitatively different (Williams, 2010). The distinction between state and trait may also be difficult to delineate with practitioners developing qualities that will eventually 'evolve into lasting traits' (Lutz, Dunne, & Davidson, 2007). This also has implications for baseline conditions that are used in experimental tasks, as 'rest' may differ in experienced practitioners in contrast to controls. Variations in dispositional mindfulness are also of relevance (Davidson, 2010), and so time spent training is unlikely to be linearly related to quality of practice. However, in terms of clinical benefit, as with other therapeutic approaches, the hope is that those that have participated in mindfulness-based interventions will continue to practice the skills that they have learnt. This means that understanding the impact of longer term practice will help elucidate processes of change.

Two main forms of mindfulness meditation are reported in the scientific literature and included in most secular mindfulness approaches; 'focussed attention' and 'open monitoring' (Lutz, Slagter, Dunne, & Davidson, 2008). These practices are also found in different Buddhist traditions such as Zen, Tibetan and Vipassana (Lutz, Slagter, et al., 2008). However, the onus on these different approaches may vary by tradition, by stage of practice, and/or practitioner preferences and needs.

Focussed attention practices encourage the practitioner to repeatedly return the attention to a chosen object (Lutz, Slagter, et al., 2008). The breath is often used as an object and over time the practitioner learns to sustain attention on the breath for increasing periods of time. The task is simply to learn to notice when the mind has wandered, as it invariably will, and when it does return the attention to the object i.e. the breath. Sustaining attention on the breath is reported to become less effortful with practice (Lutz, Slagter, et al., 2008).

Open monitoring, sometimes referred to as 'open presence', or 'choiceless awareness', involves the 'non-reactive monitoring of the content of experience from moment to moment' (Lutz, Slagter, et al., 2008). As the ability to sustain and focus attention becomes more honed, this skill can then be used to transition into 'open monitoring' practice, by gradually reducing the focus of attention on a specific object (Lutz, Slagter, et al., 2008). For instance, many practices begin with more concentrated focus on an object such as the breath but then open out to include the contents of experience (Farb, Anderson, & Segal, 2012). This transition has been described as moving from an 'effortful' focus of attention on the object, to an 'effortless sustaining of awareness' (Lutz, Slagter, et al., 2008). For a more detailed discussion of the different types of practices and terminology see Lutz et al (2007).

Measuring Mindfulness

It is important to bear in mind that objective measures of mindfulness have not yet been developed (Baer, 2011). The main method of assessing mindfulness is via self-report. For studies of long-term meditation practitioners, this will include descriptions of their practice experience over time, including knowledge of the traditions or approaches that they have trained in, and for this it is important to ensure clarity in terminology (Lutz et al., 2007).

A major limitation of studies of long-term meditation practitioners vs. controls is non-random allocation to groups, as is the case with many clinical studies. In addition these studies are also often cross-sectional which means it is not possible to ascertain causality. Longitudinal designs, such as pre- and post mindfulness interventions or meditation retreats, overcome this limitation to some degree but are still prone to other experimental artefacts such as demand characteristics.

Many standardised self-report measures have been developed to attempt to capture mindfulness and related concepts. These have been designed to measure state mindfulness, dispositional mindfulness and more enduring mindfulness and related qualities that are thought to develop over time with practice. These measures have been validated on novices, experienced practitioners and different clinical groups. For

instance, the Frieburg mindfulness questionnaire (Walach, Buchheld, Buttenmuller, LKleinknecht, & Schmidt, 2006) was originally validated on experienced meditation practitioners (Baer, 2011). This may pose difficulties when assessing mindfulness in mixed samples of experienced and novice practitioners as it may impact on the validity of the constructs being measured i.e. items may tap different constructs in different populations. On the other hand the Toronto Mindfulness questionnaire was explicitly developed to tap state mindfulness occurring immediately after mindfulness practice (Baer, 2011).

The Five Facet Mindfulness Questionnaire (FFMQ) is a composite of 5 existing self-report measures (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). These measures were given to a large sample of undergraduates (n = 613), the majority of whom had no experience of meditation. Self-report questionnaires measuring related constructs were also administered as a further test of validity. Initial factor analyses revealed 5 clear factors accounting for 33% of the variance and 64 of the 112 items that loaded onto these factors were retained. These factors were 1) Non-reactivity, 2) Observing/noticing thoughts, feelings and sensations, 3) Acting with awareness, 4) Describing or labelling experience and 5) Non-judging of experience. These items were combined into a new measure with a 5 point Likert scale and administered to a new sample of 268 undergraduates. Confirmatory factor analyses revealed that the 'Observe' factor may only be valid and meaningful to participants with experience of meditation. A later study further examined the construct validity of the FFMQ with meditating and non-meditating participants. Scores on all the factors, except 'Acting with awareness' were positively correlated with meditation experience. Further interesting relationships emerged between the 'Observing' factor and well-being, with a positive association seen in meditators but not controls. This may reflect the fact that the association between observing one's internal experience and well-being is likely to be mediated by further practice-related qualities such as equanimity or decentring (see below), skills which may not be developed in non-meditators. A short form of the FFMQ has since been developed and validated (Bohlmeijer, Klooster, Fledderus, Veehof, & Baer, 2011) – see Methods section.

A further self-report measure has been developed to tap a wider Buddhist construct referred to as non-attachment (Sahdra, Shaver, & Brown, 2010). This is defined as a 'subjective quality of not being stuck or fixated on ideas, images, or sensory objects and not feeling an internal pressure to acquire, hold, avoid, or change' (Sahdra et al., 2010). This is a 30 item measure that purports to measure one factor and positively correlates with scores on the non-reactivity subscale of the FFMQ, mindful awareness, self-compassion and measures of wellbeing. Differences on this measure are observed between meditators and controls. This quality is also closely aligned to the Buddhist

concept of equanimity, which is defined as ‘an even minded mental state or dispositional tendency towards all experience’ and encompasses qualities such as non-reactivity, non-judgment and acceptance (Desbordes et al, 2014).

Neural Correlates of Mindfulness

Many studies have attempted to measure the neural correlates of mindfulness. In terms of structural neuronal correlates, a recent meta-analysis and review of 21 neuroimaging studies examined the association between meditation and brain morphology (Fox et al., 2014). This included 17 studies of long term meditation practitioners with over 1000 hours practice, and 4 pre- and post- intervention wait-list control studies, with meditation experience ranging from 4-60 hours. Compared with controls, meditators display neuroanatomical differences with anatomical peaks in the left and right anterior/mid cingulate cortex and right orbitofrontal cortex, more posterior areas such as the anterior precuneus and left fusiform gyrus, the left anterior insula and somatamotor cortices. The authors suggest that differences in the rostral prefrontal cortex are likely due to increases in metacognitive awareness, and differences in the orbitofrontal cortex and anterior cingulate cortex may relate to emotion regulation functions (Fox et al., 2014). Differences in the insular cortex were reported in 5 studies and are amongst the most robust finding. This is not surprising given the anterior insula has been associated with interoceptive awareness to include breathing focus tasks and emotional processing (Craig, 2009; Lawrence et al., 2014). However, when considering this evidence it is also worth bearing in mind that structure-function relationships in the brain are not well understood (Fox et al., 2014).

In terms of functional neuronal correlates, the data are largely consistent with the structural differences observed. However, a variety of experimental tasks has been used for fMRI studies and so in turn impact on the findings. For instance, distinct neural correlates were observed in participants who attended an 8 week MBSR course when trained to adopt experiential (state mindfulness) vs. evaluative self-focus in response to trait adjectives (Farb et al., 2007). This study found reductions in medial prefrontal cortex activation in those who had undertaken mindfulness training in contrast to controls during the ‘state mindfulness’ task. A similar effect was confirmed in a recent meta-analyses of functional neuroimaging studies, in which reductions in superior medial gyrus activation were observed in long-term, defined as > 5000 hours, vs. short-term practitioners, (Tomasino, Fregona, Skarap, & Fabbro, 2013).

MBSR trained participants have also been tested using a sadness invocation task and increased insula activation was observed in the MBSR group in contrast with controls (Farb et al., 2010). In another study increased right anterior and middle insula activation was observed during mindfulness of breathing i.e. focussed attention, alongside

reductions in dorsomedial prefrontal (DMPFC) activations (Farb, Segal, & Anderson, 2013). These authors suggest that one function of mindfulness training is to alter the negative or self-critical appraisals associated with cortical midline activation. They point out that instead the attention is positively directed towards present moment focus which is non-conceptual and non-threatening and does not rely on the cortical midline systems (Farb, Anderson, et al., 2012). Consistent with this, participants with social anxiety who had completed MBSR training showed reduced DMPFC activation post-intervention (Goldin, Ramel, & Gross, 2009).

Emotion Regulation and Mindfulness

Despite the fact that mindfulness-based approaches have been researched for several decades, studies investigating the impact of mindfulness on emotional processes are relatively recent (Davidson, 2010). In terms of psychological theories of emotion regulation, five areas have been identified in which we may try and intervene and manipulate our emotional experience; situation selection, situation modification, attentional deployment, cognitive change and response modulation (Gross & Thompson, 2007). Initially mindfulness is likely to impact via attentional deployment via the turning of attention towards thoughts, feelings and sensations with an attitude of curiosity and acceptance. Such non-judgmental awareness is likely to facilitate exposure to emotional states and decrease both avoidance and/or over engagement via rumination or worry, which in turn is likely to aid emotional processing (Chambers et al., 2009). This is in contrast to a more narrative self-focus which may lead to a loss of cognitive access to inner experiences such as body sensations (Koole & Rothermund, 2011).

Similarly, Teasdale (1999) posited 3 modes of processing emotional material; i) mindless/emoting, ii) conceptualising/doing and iii) mindful experiencing/being. He hypothesised that mindless/emoting may prevent effective emotional processing by perpetuating a ruminative mode of processing, whilst mindful experiencing may instead facilitate emotional processing. For example, how a person responds to depressed thinking activated by negative mood is important in preventing relapse (Fresco, Segal, & Kennedy, 2007; Kuyken et al., 2010). The ability to decentre i.e. take a present-focussed, non-judgmental stance towards their experience, coupled with low cognitive reactivity i.e. mindless/emoting, provides protection from relapse at 18 months (Fresco et al., 2007). These processes are fostered by MBCT interventions for preventing depressive relapse, and in other 3rd wave approaches that include mindfulness, which move away from directly challenging the content of thoughts (Longmore & Worrell, 2007).

Self-compassion has also been found to be a key ingredient in mindfulness based approaches (Feldman & Kuyken, 2011; Kuyken et al., 2010). For instance, sustaining attention on the present-moment is not always easy and perceived failure can readily

activate self-critical appraisals regarding lack of success (Feldman & Kuyken, 2011; Kuyken et al., 2010). Self-compassion is integral to regarding one's experience from a non-judgmental stance and the intention is that this is at the very least implicit in secular mindfulness training approaches, for instance, by being embodied by the teacher (Feldman & Kuyken, 2011). Buddhist traditions include practices that involve purposively generating compassion towards the self and others via imagery techniques, and there is now a move to include similar practices i.e. loving-kindness, in secular mindfulness programs (Boellinghaus, Jones, & Hutton, 2013, 2014).

Similarly, a further aspect of emotion regulation that is receiving increasing attention and is central to secular and traditional forms of mindfulness is positive affect more generally, for instance, joy. The generation of positive affect can aid the regulation of negative emotions (Fredrickson, 1998), and increases in positive affect as measured by the Positive and Negative Affect Schedule (PANAS), have been observed after mindfulness interventions (Schroevers & Brandsma, 2010).

Measuring Emotion

There is no agreed definition of emotion and the debate surrounding this is outside the scope of this thesis (Feldman Barret, Mesquita, Ochsner, & Gross, 2007; Nielson & Kaszniak, 2007). However, most agree that emotions include bodily changes and central and autonomic nervous systems, facial, bodily and vocal expressions, cognitive changes including content and process, behavioural consequences and changes in subjective experience (Nielson & Kaszniak, 2007).

One approach to classifying emotional states is along two independent dimensions of arousal and valence (Lang, 1995). Valence ranges from pleasant/attractive to unpleasant/aversive responses (Lang, 1995). Arousal on the other hand refers to the degree to which a stimuli is activating (Posner, Russell, Gerber, & Gorman, 2009) and ranges from calm to aroused. It may also signify personal significance or relevance (Nielson & Kaszniak, 2007). These two dimensions of emotion have been shown to have distinct neural correlates (Lewis, Critchley, Rotshtein, & Dolan, 2007; Posner et al., 2009). They have also been used in standardised rating scales to measure people's response to images from the International Affective Picture system (IAPS: Lang, Bradley, & Cuthbert, 2005) and to emotional words (Lewis et al., 2007).

However, active reporting of emotional experience is likely to impact on the very experience being reported (Kassam & Mendes, 2013; Nielson & Kaszniak, 2007). Nielson et al (2007) point out that self-reports of emotion are a result of reflective cognition 'brought to bear' on raw feelings, and so constitute an 'interaction of raw feeling and cognition'. Nevertheless, this interaction needs to be balanced with the fact that self-

reports are likely to be more valid if relating to currently experienced emotions (Mauss & Robinson, 2009).

Further measures of emotion that do not involve self-report include those relating to autonomic nervous system responses. Electrodermal or sweat gland activity is a measure of sympathetic nervous system activation which is best viewed as an index of arousal (Mauss & Robinson, 2009). For instance, increased skin conductance responses are observed when viewing pleasant and unpleasant pictures compared to neutral images (Bradley & Lang, 2007). However, it is important to note that there is a not a one to one correspondence between 'felt activation' and physiological activity (Feldman Barret et al., 2007).

Emotion Processing and Mindfulness

Experimental Design

As discussed above emotional experience can also be measured using a variety of techniques ranging from self-report to more implicit psychophysiological measures. Measuring the association between mindfulness and emotion-processing also raises further research questions and design issues focussed on how best to operationalise mindful emotion processing.

Many experimental studies of emotion regulation give participants explicit instructions to attempt a particular emotion regulation strategy whilst viewing emotional stimuli i.e. distance or reappraise (Ochsner et al., 2004). Following on from this some studies have provided brief mindfulness training and then instructed participants to attempt to remain in a mindful state when viewing emotion-related material (Arch & Craske, 2006; Erisman & Roemer, 2010; Taylor et al., 2011). For instance, one study compared beginners with long term meditators (> 1000 hours practice) and asked them to view pictures in a mindful state vs. a control condition defined as 'without attempting to modulate attention' (Taylor et al., 2011). Critiques of this approach may be that it does not control for demand characteristics i.e. participants ascertaining the hypotheses of the researcher and responding accordingly. It is also difficult to choose and operationalise an appropriate control task (Lutz et al., 2007).

Other studies have instead used an emotional provocation task such as films or images without instructions to respond in particular way in an attempt to capture spontaneous responses to affect-laden stimuli in those who have undertaken mindfulness training (Desbordes et al., 2012; Farb et al., 2010) including long-term meditators (Nielson & Kaszniak, 2006; Ortner, Kilner, & zelazo, 2007). Whilst this approach may be less prone to demand characteristics, there is no control for fluctuations in state mindfulness in the

laboratory. A potential issue when attempting to induce state mindfulness is ensuring equivalence between participants. The ability to rest in a mindful state at any given time will not only vary by individual and the stability of their training but also by events that are current for the individual at that time. For instance, if one person has just experienced a stressful event, the pull to replay that event may be stronger than the intention to remain in momentary awareness.

Building on the work of Farb et al (2007), who was in turn drawing on earlier studies manipulating different types of self-processing (Watkins & Teasdale, 2001), we will use a paradigm that trains participants to adopt an experiential self-focus whilst viewing mildly emotional trait words, in contrast to a control condition whereby participants actively evaluate the personal relevance of the trait words shown. We then present participants with emotional images and measure SCR, arousal and valence ratings. This approach is an attempt to standardise the baseline state in which participants then view an affective probe, and previous data suggests distinct neural correlates for these conditions, with experiential self-focus consistent with mindful emotion processing (Farb et al., 2007). However, whether such lab-based procedures should be labelled a state of mindfulness is debatable (Williams, 2010). For ease of reference, we label these conditions 'Sensing' and 'Judging' (please see Methods).

Emotional Valence

In terms of existing studies on mindfulness and self-reported emotional valence, the data so far are inconsistent. In terms of participants without prior meditation experience, one study found that those who undertook a 10 minute training in mindfulness to include experiential exercises reported more positive affect after watching an 8 minute positively valenced film and reduced negative affect after watching an 'affectively mixed' valenced film (Erisman & Roemer, 2010). Another study found 15 minutes of breathing focus in novices to be associated with more positive affect after viewing 5 neutral IAPS, compared to participants who either worried or were instructed to let their minds wander (Arch & Craske, 2006). However, no differences were observed for the negative slides. The focussed breathing group also showed less negative affect as measured by the PANAS completed after viewing a set of negative slides, than the group who were instructed to worry.

Another study asked a large internet based sample (n = 247) to view IAPS images online and found no differences found on ratings of aversive and neutral pictures on the basis of a median split scores on the Frieburg Mindfulness Scale (Sauer, Walach, Schmidt, & Hinterberger, 2011). Eighty-three participants reported a 'regular form of meditative training', although it is not clear whether this was further verified or how regular meditation training was operationalised.

In terms of participants with meditation experience, 11 meditators with 10 years plus experience vs. 17 controls were asked to rate IAPS images in both a conscious and masked condition (Nielson & Kaszniak, 2006). No difference in valence ratings was observed. However, a positivity effect was observed in meditators, characterised by 'more positive facial affect, a failure to rate ambiguous stimuli as negative, and a higher number of positive false alarms in the masked condition' (Nielson & Kaszniak, 2006).

In a longitudinal study, 14 participants with a diagnosis of social anxiety disorder who completed 8 weeks of MBSR training, underwent fMRI scanning pre- and post-intervention. Whilst in the scanner they rated a series of trait words with reference to the self. Significantly decreased endorsement of negative trait words was observed post-intervention (Goldin et al., 2009). In another study of a similar design, participants viewed a series of negative self-beliefs followed by either a mindfulness condition consisting of breath focussed attention, or a distraction condition consisting of counting. Self-report ratings of how negative they felt reduced for the mindful breathing condition, post-intervention, suggesting an effect of mindfulness training (Goldin & Gross, 2010). These data suggest reduced reactivity to negative stimuli to be associated with mindfulness training.

Similarly, another study found evidence of reduced emotional reactivity to a stressor in 26 partially remitted depressed participants who had undergone 8 weeks of MBCT in contrast to 19 wait list controls. Participants delivered a speech in front of a one way mirror and were told there were judges behind the mirror evaluating their performance. They self-reported their anxiety levels at baseline during the speech, immediately after and 40 mins and 90 mins after the speech. Significant reductions in anxiety were observed post-intervention for the timepoints after the speech suggesting less prolonged emotional reactivity to the stressor (Britton, Shahar, & Szepsenwol, 2012).

Studies examining responses to experimentally induced pain are also of relevance here. Long-term meditators show reduced unpleasantness ratings but not intensity when receiving electric shocks (Gard et al 2010). In another similar study, long-term meditators also showed reduced ratings of thermal pain unpleasantness but not intensity during 'open monitoring' as opposed to 'focused attention' (Perlman et al, 2010). Again, these data are consistent with an account that emphasises reduced reactivity to negative stimuli as a result of mindfulness training.

Overall, the data regarding emotional valence and mindfulness training are mixed, but there is some suggestion that people with mindfulness experience may report less negative affect/more positive affect in contrast to control participants. Based on these

data, we predict that participants with meditation experience will show reduced unpleasantness/increased pleasantness ratings to normatively negative stimuli.

Emotional Arousal

Turning to self-reported arousal, reduced arousal ratings have been observed for normatively positive and negative images, in participants who completed a 7 week mindfulness intervention (Ortner et al., 2007). Participants were simply asked to view the images and rated them without any special instructions to regulate their emotional response. However, a control group who underwent a 'relaxation and body awareness' intervention also showed differences on arousal ratings for normatively positive stimuli.

Another study which attempted to measure emotion processing in participants who had undertaken 8 weeks of mindfulness training asked participants to remain in an 'ordinary, meditative state' observed neural correlates consistent with reduced arousal i.e. reduced amygdala response in contrast to a control group, but did not gather behavioural data (Desbordes et al., 2012). These data suggest that participants with mindfulness experience are likely to report reduced arousal to normatively positive and negative images, across conditions.

As described above, Taylor et al (2011) also measured arousal ratings to normatively positive and negative images that participants had viewed whilst being asked to remain in a mindful state. This study tested 12 experienced meditators and 10 beginner meditators, who had 7 days of 20 minute per day training, and found positive and negative images were rated as less intense across groups in a 'mindfulness condition'. Increased down-regulation of amygdala was observed in controls only during the mindfulness condition. Based on these data, we would predict participants with minimal experience of mindfulness beyond a brief lab-based training, may show reduced arousal ratings to emotional pictures during the 'Sensing' condition.

Skin Conductance Response (SCR)

Regarding electrodermal activity, skin conductance level (SCL) has been found to be reduced after MBSR training for fibromyalgia (Lush et al., 2009) and after 5 days integrative body mind training which included mindfulness elements vs. simple relaxation (Tang et al., 2009). In terms of participants with no meditation experience, no SCL differences were observed as a result of a brief-lab based training (Erisman & Roemer, 2010).

Turning to consider specific skin conductance responses, one study observed no group differences on SCR in experienced meditators (Nielson & Kaszniak, 2006). However, reduced SCR for negative and pleasant images was observed amongst meditators who

have high clarity scores, defined as the 'the ability to identify, distinguish, and describe specific emotions' (Nielson & Kaszniak, 2006). They also found a stronger quadratic effect for controls i.e. more marked differences between conditions. Similarly, reduced SCR to unpleasant pictures was observed post-intervention in a group who had relaxation, and group that had mindfulness training (Ortner et al., 2007). Reductions in SCR to pleasant pictures were observed for the mindfulness group alone. Based on these data, we expect that meditators will show reduced SCR to normatively positive and negative images in contrast to controls.

Aside from subjective ratings of arousal and valence, and the amplitude of physiological responses, another route through which mindful experiencing may facilitate emotional processing is through the affective timecourse (Davidson, 2010). Behavioural patterns indicating a short affective timecourse have been observed in people who meditate (Ortner et al., 2007). Another study found quicker affective recovery from a laboratory-based stressor in participants who had undertaken an 8 week MBCT course (Britton et al., 2012). In addition, participants with a diagnosis of depersonalisation show longer SCR latencies (Sierra et al., 2002), as do those high on neuroticism, two constructs likely negatively associated with mindfulness (Michal et al., 2007; Sahdra et al., 2010). Based on these data, we also predict reduced latency of SCR onset in meditators in contrast to controls.

Mindfulness and Memory Processes

Finally a further process upon which mindfulness may impact is memory encoding and retrieval. Mindfulness interventions are associated with increased specificity of autobiographical memory retrieval (Williams, Teasdale, Segal, & Soulsby, 2000) possibly mediated by reductions in rumination and increased efficiency of executive function processes (Sumner, 2012). In addition, a brief mindfulness intervention has been shown to reduce the number of negative words recalled in lab-based paradigm (Alberts & Thewissen, 2011). The authors suggest that the non-judging aspect of mindfulness may serve to neutralise negative valence of the stimuli. However, superior recall of positively valenced words in contrast to controls was observed in participants who completed 12 weeks of meditation classes (Roberts-Wolfe, Sacchet, Hastings, Roth, & Britton, 2012). These authors attribute these effects to 'increased efficiency in positive information processing' (Roberts-Wolfe et al., 2012).

However, there is also a well-established literature that demonstrates that memory recall is prone to a self-reference effects (Rogers, Kuiper, & Kirker, 1977). Enhanced memory recall has been observed for material that is processed with reference to the self in contrast to another person and it has been suggested that is likely due to increased elaboration and organisation of the material to be remembered (Klein, 2012; Symons &

Johnson, 1997). For instance, studies that use a 'close other' as a control condition i.e. mother, show less of an effect than studies using an 'familiar other' i.e. a famous person, a key difference being the likely elaboration and organisation of the material (Klein, 2012).

The current paradigm provides an opportunity to examine these effects by further fractionating self-processing. We will measure memory for traits presented in a self-focus mode which encourages elaboration of the trait words presented (Judging) vs. a self-focus mode that involves directing attention towards self processes without encouraging elaboration on the mental contents (Sensing). To further investigate this effect we will add a further condition to our study requiring participants to process trait words with regard to a person who is familiar but not known to them ('Other' condition). If the self-reference effect is a result of increased elaboration of the material to be remembered as suggested then we would predict increased recall of traits shown in the evaluative self-processing condition (Judging) in contrast to traits processed in the 'Sensing' or 'Other' condition.

Summary and Hypotheses

Self-reported Valence:

- Meditators will rate normatively negative images as significantly less unpleasant than controls.

Self-reported Arousal:

- Meditators will rate normatively positive and negative images as less arousing than controls.
- Controls will rate normatively positive and negative images shown after the Sensing condition as less arousing than those shown after the Judging and Other conditions.

Skin Conductance Response:

- Meditators will show reduced SCR to normatively positive and negative images in contrast to controls.
- Meditators will show reduced SCR latency of onset to normatively positive and negative images in contrast to control participants.

Memory Recall:

- Significantly more traits will be recalled from the Judging condition in contrast to the Sensing and Other conditions.

Methods

Design

Participants were trained to adopt different types of self-focus (judging/evaluative vs. sensing/experiential) whilst being shown a series of personality traits as detailed in Farb et al (2007). This paradigm has previously been extended to include affective probes consisting of normatively positive, neutral and negative images from the International Affective Series (IAPS: see Figure 1) for a functional magnetic resonance imaging (fMRI) study (Lawrence et al, in preparation). In the current study we also added an additional control condition for a memory recall task, consisting of judgments about a familiar other i.e. Prince Charles.

The Independent Variables are:

1) Self-focus condition with 3 levels: i) Sensing, ii) Judging and iii) Control
2) IAPS normative valence with 3 levels: i) Positive, ii) Negative and iii) Neutral
3) Group based on meditation experience with 2 levels: i) Meditator ii) Control

The Dependent Variables are:

1) Skin conductance response amplitude/latency
2) IAPS valence/arousal ratings
3) Number of trait words correctly identified during a recognition test

The self-focus condition and affective probe valence are within-participants resulting in a 2 (meditators vs. controls) x 3 (sensing, judging, control) x 3 (negative, positive, neutral) mixed design. The trait adjectives, IAPS and self-focus conditions were counterbalanced for presentation (see below).

Participants

Inclusion criteria for the meditation group were (i) an ongoing practice, (ii) a minimum of 500 hours practice accrued in meditation which fosters present moment awareness such as focussed attention and/or open presence meditation.

We chose this type of meditation as both are included in secular interventions such as MBCT and MBSR but also in Buddhist traditions such as Vipassana/Insight meditation, Tibetan (Shine, Calm Abiding, Mahumudra etc) and Zen (Lutz, Slagter, et al., 2008).

We were interested in impact of longer term meditation practice as secular interventions encourage the continued long-term practice of the skills taught in the 8 week courses. In

terms of operationalising long term practice, 500 hours was chosen as this is likely to capture those who have been meditating regularly i.e. 30 mins per day for 3-4 years, those who have been meditating for a longer period of time, but allowing for peaks and troughs in daily/weekly practice, and those who have also developed their practice by sitting silent retreats.

Exclusion criteria were: poor understanding of written and verbal English; currently receiving treatment for psychiatric illness; having a diagnosis or neurological disease or learning disability.

Participants were recruited via circular emails to local Buddhist centres i.e. Tibetan Buddhist centres (Samye Dzong), sitting groups (Goenka vipassana) and the South London and Maudsley Mindfulness Special Interest Group. In addition, potential participants who were not able to take part in our previous study due to scanning contra-indications, and those who have taken part in other local studies conducted by different researchers, were contacted via email.

Control participants were recruited from staff and students at King's College London, and the local area. Participants in the control group had no or minimal experience of mindfulness i.e. less than 2 sessions, and no or minimal experience of related practices such as yoga, tai chi etc. i.e. fewer than six total sessions attended.

The groups were matched for gender (Lang, Greenwald, Bradley, & Hamm, 1993) and age. Our upper age limit was 65 years due to the differences in emotional processing observed in older adults (Neiss, Leighland, Carlson, & Janowsky, 2009) i.e. adults aged between 65-85 on average show increased valence and arousal ratings for emotional pictures. In addition, this study showed that older adults were less likely to show measurable skin conductance responses. The authors speculated that this may be due to age-related changes in skin or hypothyroidism.

We also administered the Hospital Depression and Anxiety Inventory (Zigmond & Snaith, 1983) which measures current symptoms of depression and anxiety (see below for further information on psychometric properties). One participant scored in the moderate range and was reminded that support was available through their GP.

One participant was excluded due to fatigue i.e. drifting into sleep during the paradigm. In addition, 2 datasets were excluded due to movement artefacts resulting from speaking several times during the paradigm and excessive coughing.

Power Analysis

For between-group differences in valence ratings to normatively negative stimuli, our previous data suggests that 12 participants are needed in each group to detect a difference with 90% power (d_z = 1.25, one-tailed). Based on this calculation and allowing for counterbalancing constraints we will recruit 18 control participants and 18 meditators. This will also allow us to detect between-group differences in arousal and SCR (d_z = 1, one-tailed) and within-group differences in arousal with 90% power (d_z = .6, one-tailed).

Ethical Approval

Ethical approval was granted by the Psychiatry, Nursing & Midwifery Research Ethics Sub-Committee (Reference Number: PNM12/13-142).

Stimuli

Pilot work

The initial version of the paradigm was piloted on 14 participants (Karontis, 2010). The selection criteria did not require participants to have any prior experience of mindfulness or meditation training. This pilot study enabled us to thoroughly test the paradigm including IAP stimuli choice (Lang et al., 2005), trait words (as in Farb et al, 2007 with additional trait words selected from Anderson et al, 1968), timings for stimuli presentation (11/14 control participants indicated 4 seconds is long enough to display the trait words), and the experimental manipulation (100% of participants indicated that they understood the task instructions regarding the different types of self-focus).

Trait Words

Three trait lists were created consisting of 9 sublists of 4 traits, 2 mildly positive and 2 mildly negative. Following on from Farb et al (2007) we used personality trait adjectives taken from Anderson (1968). In this study, 100 college students rated 55 personality-trait words on likeability, the words were then listed in terms of likeability (Anderson, 1968). We selected mildly negative traits ranked between 90-220 and mildly positive between 400 – 500 (see Appendix 1 for traits used). Fifty participants in the original study also rated the words for meaningfulness ranging from 0- 4 with 4 being highest. All the words used in the current study were 3 or above for meaningfulness. Traits were not controlled for word length but the counterbalancing strategy means each list is seen in each condition an equal amount of times. Bearing in mind the number of traits needed, it was not possible to select neutral traits, as these were more limited, and in addition these tend to have lower ratings for meaningfulness.

Number of traits and presentation time: Four traits, 2 mildly positive and 2 negative were presented to cue participants towards self-reference. The traits were presented for 5 seconds each with a 2 second gap, totalling 28s seconds per trial. This differed from the

fMRI study, which showed 6 traits for 4s each with a 2s gap, totalling 36s per trial. This was to allow for a 3rd control condition to be added for the memory recall task, without leading to excessive participant fatigue, and/or too high a memory load for the recall task (Gutchess, Kensinger, Yoon, & Schacter, 2007). In addition, 8\16 participants in the fMRI study requested that the traits be displayed for longer – 3 of these were meditators and 5 controls. This means that across conditions participants were shown 108 traits which is consistent with other memory recall studies (Serbun, Shih, & Gutchess, 2011).

Valence order of traits presented: Due to the low probability of an SCR (.41 across all stimuli and .55 across negative stimuli) in the fMRI study (Lawrence, In preparation) which may be due to the slow recovery time of the SCR, and contamination by the previous condition, in the current study we decided to show positive traits which are generally less arousing last i.e. neg, pos, neg, pos. This will mean effects are constant across conditions.

Affective Probes

For the initial version of the paradigm, two lists of stimuli from the International Affective Picture System were created, each with 9 stimuli, 3 of each valence. This means each condition included 9 affective probes. These were matched on normative valence, arousal ratings, and content i.e. 2 x mutilation scenes, 2 x toilet scenes etc. Negative images were chosen for being highly arousing and normatively unpleasant. Item by item comparison for the matched stimuli revealed significant differences on arousal ratings between 2 stimuli i.e. fireworks were rated as more relaxing than the skydive image ($t_{(13)} = 3.395$, $p = 0.005$ – mean difference 1.8 in contrast to 1.4 in normative samples). On the basis of these data, the fireworks were replaced by an image more comparable in terms of normative arousal ratings (IAP no: 5629 hiker – mean arousal: 6.55 SD 2.1; IAPS no; 5621 skydive – mean arousal 6.99 SD: 1.95), and also more similar in content i.e. active rather than passive. This amended stimuli list was used in a subsequent functional magnetic resonance imaging study (Lawrence et al., In preparation).

Current study: The IAPS lists used in Lawrence et al (In preparation) were used and a 3rd list was constructed to allow for the additional 'other judgement' condition. Again, we attempted to match the list in terms of normative valence and arousal ratings and also the content of the images (see Appendix 2 for details of the IAPS used).

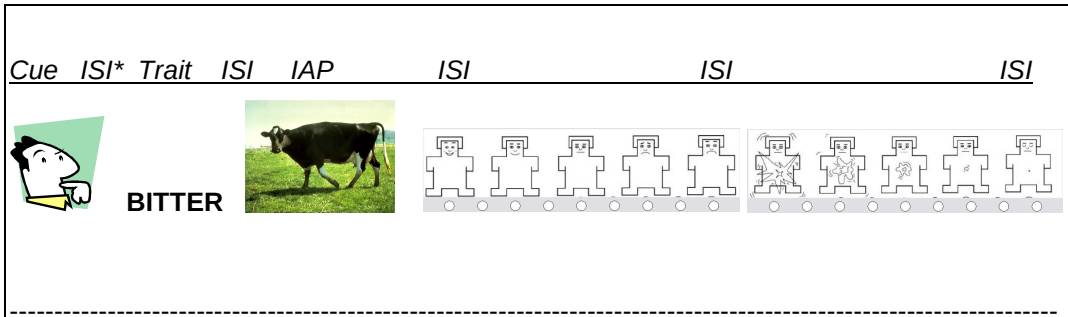
The IAPS were presented for 6s as opposed to 8s required in the fMRI study due to the temporal characteristics for the haemodynamic response. Six seconds was deemed sufficient for the SCR data (Norris, Larsen, & Cacioppo, 2007)

Following each self-focus condition a negative, positive or neutral valence IAP was presented followed by a computerised Self-Assessment Mannequin for valence (Pleasant/unpleasant) and arousal ratings (calm/aroused) on a 9 point scale (SAM: Bradley and Lang 1994 – see Figure 1). Ratings were via a left/right keypad with initial cursor position randomly determined.

Paradigm Timings

For paradigm timings for each condition shown please see Figure 1. Each trial lasted 61s and each condition was shown 3 times in each run. This means that each run lasted 549s i.e. 9 mins 9s. Each run was followed by a short break. There were 3 runs in total. The whole paradigm lasted 27mins 27s excluding baseline periods at the start of each run.

Figure 1: Paradigm Timings For Each Condition



A short ISI between the trait word and IAP (3s in total) was chosen to fit with the paradigm constraints. In the current paradigm 55s has elapsed since previous IAP i.e. in essence a long ISI but only 3s since previous trait word. This means it is possible that participants would not have fully recovered from the trait shown 3s before which may reduce the SCR amplitude (Recio, Schacht, & Sommer, 2009). However, a long ISI would minimise the desired impact of Sensing or Judging state on affective response so in order to minimise this potential carry-over effect, the paradigm was altered so that the least arousing trait word in a sublist was displayed last.

Counterbalancing

Condition Presentation: Carry-over effects between conditions are unlikely due to the ISI including a 10s icon and 11s of SAM ratings. However, to control for possible fatigue and motivation effects, 3 different condition orders were created, ensuring that over the 3 runs

each participant viewed each condition first once, and that no condition was presented more than twice in succession. In addition, across these 3 different condition presentation orders, each condition followed each of the other conditions a similar number of times (11, 12 or 13/72). The 3 different condition orders were also viewed an equal number of times by each group and gender.

Trait Lists: Nine playlists were created which allowed each of the 3 trait lists to precede each of the 3 IAPS lists once in each of the 3 condition presentation orders detailed above. The presentation of the traits in each list was held constant.

IAPS List: Each run consisted of 3 presentations of each condition, varied according to the different condition order presentations detailed above. For each condition, one negative, positive and neutral IAP was presented in each run. To control for potential fatigue effects, this was systematically varied by condition, so that neutral, negative and positive images were displayed once as the 1st image, once as the 2nd image and once as the 3rd image for specific conditions across the 3 runs for individual participants. Collapsing across conditions, images of the same valence were not presented more than twice consecutively. In addition, to prevent habituation, normatively unpleasant images were presented so that each run consisted of just one toilet scene, one mutilation and one attack image.

Memory paradigm

A control condition was included for the memory task. Participants were shown trait words and asked to think about whether the trait word shown describes a famous person. We chose Prince Charles as he was deemed to be either positive or neutral and familiar to most. A 'familiar other' rather than 'close other' was chosen in order to maximise the expected self-reference effect (SRE) (Klein, 2012). For instance, Serbun et al (2011) found enhanced SRE for self- and close other for general and specific details of a visual object. This study used 36 items in each condition, and compared self, mother and Bill Clinton and both self and mother showed advantage compared to Bill Clinton (Serbun et al., 2011)

The instructions for this condition were matched as closely as possible to the Judging/evaluative instructions. This included the removal of the autobiographical component of the previous self-focus induction training protocol (see Appendix 7: Farb et al., 2007; Lawrence et al, In preparation).

Immediately after the paradigm finished, participants were administered the National Adult Reading Test (Nelson, 1982) which served as a distractor task. Participants were then presented with a recognition test with an equal number of foils. Foils were selected

from traits ranked between 90-220 and mildly positive between 400 – 500 (Anderson, 1968).

The memory paradigm was piloted on 2 participants who recalled 6 and 10 traits respectively when asked to freely recall. When presented with a recognition test with an equal number of foils pilot participants recalled 46 and 47 traits correctly from 108 presented i.e. around 42%. These were spread amongst conditions with some evidence of a primacy and recency effect but this did not account for all the data. Based on these pilot data the decision was made to use a recognition procedure instead of free recall. The trait word lists were slightly amended as a result of piloting feedback.

SCR Data Acquisition

Participants were tested between 1 and 6pm to control for diurnal variation skin conductance level (Hot, Naveteur, Leconte, & Sequeira, 1999). The skin conductance data were acquired using a PsychLab SC4 module (Contrast Precision Instruments) to measure skin conductance response (SCR) using the exosomatic constant voltage method (0.5V).

Participants were asked to wash their hands with tap water but no soap (Boucsein et al., 2012) before the electrodes were attached to the volar surfaces of the distal phalanges of the 1st and 2nd digits of the non-dominant hand (Boucsein et al., 2012; Dawson, Schell, & Filion, 2007). The electrodes were 8mm in diameter and made from silver/silver chloride, and skin surface area was standardised using double sided sticky SC collars. Consistent with guidelines, standard SC electrolyte gel was used and the electrodes were attached using standard medical tape (Dawson et al., 2007).

After the electrodes were attached, participants were asked to keep their hand upright on their lap as still as they could for the duration of the task. The participants then adjusted their posture and the researcher explained the procedure for the baseline period. When the participant was comfortable and ready the program was started. There was a baseline period of 2 minutes before the first run where participants were asked to sit quietly and then asked to simulate blowing up a balloon. Then participants sat quietly for a further 1 minute before the task started. In between the runs there was a period of a few minutes when participants were able to adjust their posture if necessary. The electrodes were removed after the third run.

Self-Report Measures

The Hospital Anxiety and Depression scale (HADS): A 14 item scale with 7 items relating to anxiety and 7 to depression. Each item has a possible score of 0-3 with a total score of 21. Clinical cut-offs have been established with 8-10 being borderline, 11-14 moderate and 15-21 indicating severe symptoms for both anxiety and depression. A review study of 71 papers found the HADS to have good internal consistency, and 'good' to 'very good' concurrent validity when compared with scores on other standardised self-report anxiety and depression scales, for instance, the Beck Depression Inventory and the Spielberger's State-Trait Anxiety Inventory (Bjelland, Dahl, Haug, & Neckelmann, 2002).

Five Facet Mindfulness Questionnaire – Short Form (FFMQ-SF): The FFMQ was developed by pooling data from five separate mindfulness measures (Baer et al., 2006). Factor analyses confirmed a five-factor structure: 1) Non-reactivity, 2) Observing/noticing thoughts, feelings and sensations, 3) Acting with awareness, 4) Describing or labelling experience and 5) Non-judging of experience (Baer et al., 2006). Internal consistency was found to be 'adequate' to 'good' for all 5 facets. Convergent validity was found in relation to constructs such as openness to experience, self-compassion and emotional intelligence. Discriminant validity was confirmed by negative correlations with constructs such as alexithymia, dissociation, thought suppression and absent-mindedness. A further study replicated this 5 factor structure in a sample of meditators (Baer et al, 2008). This study also observed 'adequate' to 'good' internal consistency across factors for 4 samples (meditators, demographically matched controls, non-matched controls and students) with the exception of non-reactivity in the non-meditating sample (Baer et al, 2008). However, as previously mentioned the association between items on the Observing facet and wellbeing may differ between controls and meditators (see Introduction).

A confirmatory factor analysis confirmed the validity of the five-factor structure observed in the original measure, in a shortened 24-item version (Bohlmeijer et al., 2011). Internal consistency was again 'acceptable' to 'good' i.e. .75, for non-reactivity and above .8 for all the other factors, which the authors note is slightly higher for observing and non-reacting than in the earlier studies of the longer version (Bohlmeijer et al., 2011). The inter-correlations between the subscales, and correlations with other constructs was almost identical to the long version of the measure (Bohlmeijer et al., 2011).

Trait Non-Attachment Scale (NAS): The NAS was designed to measure the Buddhist concept of non-attachment in healthy adult populations. Non-attachment is defined as a 'relative absence of fixation on ideas, images, or sensory objects, as well as an absence of internal pressure to get, hold, avoid, or change circumstances or experiences. The non-attached state of mind is equanimous, flexible, and receptive. This is in contrast to a

grasping, anxious, needy, or rigid state of mind' (Sahdra et al., 2010). This state is cultivated in Buddhist meditation.

An initial 135 items purporting to describe non-attachment were generated, with equal numbers of positive and negative worded items. In order to assess face validity, these items were sent to a number of Buddhist scholars and teachers across a range of Buddhist traditions. Responses were received from 9 experts, 5 of which were clinicians. This process reduced the pool of items to 72 which received consistently high ratings across experts. These items were then administered to 331 students who rated them on a scale of 1-6 ranging from 'strongly agree' to 'strongly disagree'. An exploratory factor analysis of these data then reduced the pool to 30 items. Factor analyses confirmed a single factor to account for 35.24% of the variance.

Participants with meditation experience scored more highly than demographically matched controls supporting the scales construct validity. Convergent validity was assessed against self-report data tapping constructs such as mindfulness, acceptance, non-reactivity, self-compassion, non-contingent happiness, and a negative association with materialism. Discriminant validity was measured using scales tapping constructs such as avoidant attachment, depersonalisation, absorption, amnesia, and alexithymia. High test-retest reliability was also observed. Internal consistency was high across samples (undergraduates n = 352, American adults in a online survey n = 511).

Procedure

Individuals who responded to our recruitment material were sent an Information Sheet (Appendix 3) detailing the study, which included the contact details of the researcher. At first communication we explained what participation involved, and answered any questions arising from the Information Sheet, as well as ensuring participants met the selection criteria. This also involved administering a brief questionnaire about Meditation Experience for the meditation group (see Appendix 4). We emphasised that participants were not obligated to participate following this initial contact, and that they may withdraw at any time up until data had been collection without giving a reason. If participants were willing, we then scheduled an appointment.

Informed consent was obtained and the FFMQ-SF (Appendix 5: Baer et al., 2006), NAS (Appendix 6: Sahdra et al, 2010), and the HADS were administered. Participants were trained in adopting experiential/sensing vs. evaluative/judging self-focus in a procedure adapted from Farb et al, (2007) and Lawrence et al (in prep) – see Appendix 7. Once participants had read the instructions they were asked to describe both Sensing and Judging in their own words and describe a recent example of these approaches related to an experience. An example of an experience used to describe the Sensing and Judging distinction by one participant included being tired and focussing on why this was vs. how

it felt in terms of physical sensations. Participants also were encouraged to ask questions to clarify their understanding. This training took on average 10 minutes. Participants then completed a brief practice run on the paradigm. Once the participant was happy with the task the skin conductance electrodes were attached and the main paradigm was administered.

When participants finished the paradigm, the NART was administered, followed by a surprise trait Recognition test. This was then followed by a Debriefing Questionnaire (see Appendix 8). Participants were then given the opportunity to ask questions about the study and were also given £10 to compensate for their time and out of pocket expenses.

Data Coding and Analysis

Data were anonymised, coded and entered into IBM SPSS IBM v. 20.

In terms of behavioural ratings, where the data met parametric assumptions, the general linear model was used to examine hypotheses i.e. a 3 x 3 x 2 mixed analysis of variance (anova), with paired t tests used to examine simple effects. Otherwise, alternative non-parametric tests were used.

The SCR time series were smoothed using a single pass of a three-point equally weighted moving average filter. SCR amplitude was defined as the highest phasic increase in conductance initiated 1 - 5 sec after stimulus onset and exceeding 0.01 μS (Dawson et al., 2007). The probability of a response, regardless of amplitude, was also calculated i.e. number of responses above 0.01 over total number of presentations. Non-parametric statistics are used where sample sizes were small and/or skewed due to missing data, with exact two-tailed significance reported.

Results

Sample Characteristics

There were an equal number of men (n=9) and women (n=9) in each group and no group difference in age in years (t = -.62, df 34, p = .54 – see Table 1).

In terms of current mental health, the groups did not differ on anxiety (t = 1.49, df 34, p = .15) or depression scores (t = .32, df 34, p = .75) as measured by the Hospital Anxiety and Depression Scale (see Methods) which measures symptomatology over the past week - see Table 1) All but one participant scored in the normal to mild range on anxiety. One control participant scored in the moderate range.

Table 1

Mean and Standard Deviation Age and Scores on Self-Report Measures

	Controls		**Meditators**		**P value**
	Mean	**SD**	**Mean**	**SD**	
Age in years	37.9	7.2	39.6	9.2	p = .54
Verbal IQ	117.6	4.9	119.6	4.5	p = .2
HADS: Anxiety	4	3.8	2.5	1.9	p = .15
HADS: Depression	1.4	1.7	1.2	1.4	p = .75
NAS:Non-Attach	4.3	.68	4.9	.56	p = .005
FFMQ:Non-React	3.2	.77	3.9	.57	p = .003
FFMQ: Observe	3.9	.87	3.9	.58	p = .99
FFMQ: Aware	3.7	.56	3.7	.43	p = .74
FFMQ: Describe	3.9	.62	4	.63	p = .67
FFMQ: Non- Judge	3.3	.71	4.2	.49	p < .001

M = Mean, SD = Standard Deviation; Verbal IQ was measured using the NART; HADS refers to the Hospital Anxiety and Depression Scale; NAS refers to the Non-attachment Scale – see below; FFMQ refers to the Five Facet Mindfulness Questionnaire: Short Form, and the 5 subscales – see below.

Education status was measured in four categories being secondary, further, degree and postgraduate level. The groups did not significantly differ in terms of education status (χ^2 = 3.85, df 3, p = .28). In addition, the groups did not differ in terms of Verbal IQ predicted from the National Adult Reading Test (Nelson, 1982; t = -.13, df 34, p = .2; – see Table 1).

Standardised Self-Report Measures

Five-Facet Mindfulness Questionnaire – Short-Form (FFMQ-SF)

Two participants in the meditation group omitted to complete the last page of the FFMQ-SF and so had 6 missing items. Factor means for these participants were calculated on completed values.

Independent t-tests were used to compare meditators and control participants on the 5 different factors of the FFMQ-SF. Statistically significant differences were observed on the 'non-reactivity' (t = -3.19, df 34, p = .003) and 'non-judging' subscales (t = -4.16 df 34, p < .001) with meditators scoring higher than controls. There were no statistically significant differences on the 'observing' (t = .02, df 34, p = .99), 'acting with awareness' (t = -.33, df 34, p = .74) or 'describing' subscales (t = -.42, df 34, p = .67; – see Table 1)

Non-Attachment Scale (NAS)

Total mean score on the NAS was calculated as data suggests this measure is best accounted for by a single factor model labelled 'non-attachment'. Three participants had one missing item on the NAS and so the total mean score was calculated on completed values i.e. 29 items rather than 30.

An independent t-test was used to compare meditators and control participants and a statistically significant difference was observed (t = -.3.01, df 34, p = .005) with meditators scoring higher than controls on 'non-attachment' – see Table 1).

Meditation Experience of Meditators

Data for number of years of regular and consistent meditation practice was available for 17 meditators as one participant instead reported years since she started meditation i.e.18 although described her practice during this time as inconsistent. The median years of regular and consistent meditation practice was 7 years (IQR: 10.5). The median estimated total hours spent in meditation was 1500 (IQR: 1304). The median hours estimated spent in meditation per week over the last 6 months was 4.5 hours (IQR: 4.8). Sixteen participants indicated that they had attended a silent retreat for longer than one day. Ten participants indicated that they had a formal meditation teacher.

Task Performance

As expected, debriefing data revealed a statistically significant group difference in participant self-reports as to their ability to remain in 'sensing' mode when requested during the task. Ten control participants reported that they were able to do this 'some of the time' with the remainder endorsing 'most of the time'. However, 15 participants in the meditator group endorsed 'most of the time', 2 'some of the time' and one 'not all the time' (χ^2 = 8.46, df 2, p = .015).

No such differences were observed in participant self-reports as to their ability to remain in 'judging' mode when requested during the task (χ^2 = 1.33, df 2, p = .51). The majority of participants reported that they were able to do this 'most of the time' (n = 14 controls and n=16 meditators). No other group differences were observed in responses endorsed on the debriefing questionnaire.

Behavioural Data Analysis

Where the data met parametric assumptions, the general linear model was used, with simeple t tests to examine predictions. Deviations from normality were transformed where possible. Otherwise, if deviations from normality were marked, and/or if there was heterogeneity of variance, alternative non-parametric tests were used. Two-tailed p values are given and family-wise error rate was controlled using the False Discovery rate (Benjamin & Hochberg, 1995). Where assumptions for sphericity were not met, corrected Greenhouse-Geisser values are reported.

Unless stated, raw rather than transformed values are reported and used for visual presentation of the data. Partial eta squared is reported for effect sizes i.e. .05 small effect size, .1 medium, .2 represents large effect size.

Four participants (one male and one female in each group) had 2 instances of missing data and 2 instances of duplicate data in run 3 due to an error in the playlist. These cells were replaced with means for that run in the case of duplicate data and means from equivalent Condition x Valence cells in run 1 and run 2 for missing data.

Valence Ratings

We hypothesised that meditators would rate normatively negative images as less unpleasant than control participants. To test this hypothesis, a 3 x 3 x 2 (condition x stimuli valence x group) mixed ANOVA was conducted for subjective valence ratings.

Table 2

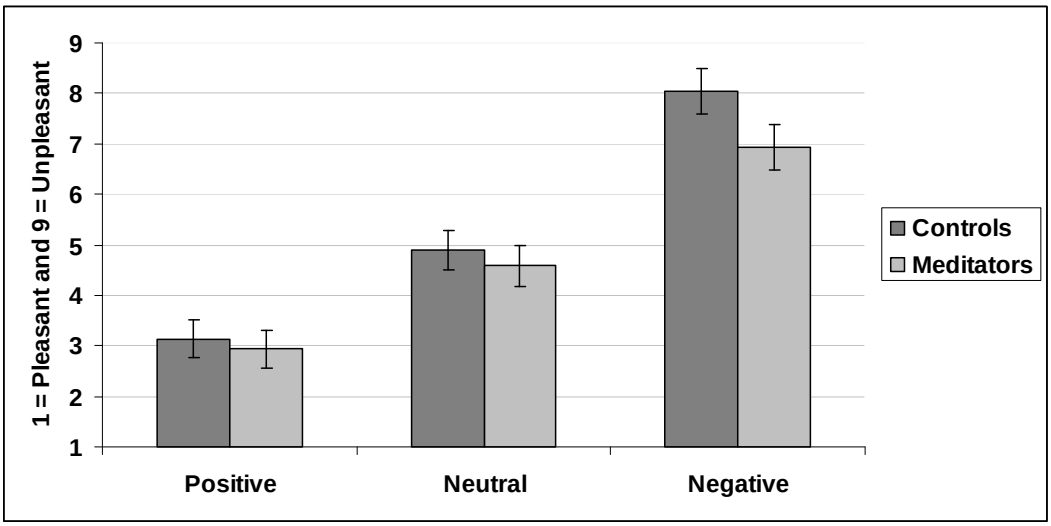
Mean and Standard Deviation Valence Ratings by Normative Valence Category

	Controls		Meditators		
Valence	**M**	**SD**	**M**	**SD**	**P value**
Positive	3.14	.8	2.9	.73	p = .43
Neutral	4.9	.66	4.6	.95	p = .39
Negative	8	.62	6.9	1.2	p = .003
Total	5.36	.53	4.82	.8	p = .002

Note; M = Mean; SD = Standard Deviation; FWE corrected p values reported for simple effects; Valence refers to normative valence of stimuli

A main effect was observed for Group ($F_{(1,34)}$ = 10.86, p = .002, η^2_p= .24 i.e. large effect size) and as predicted there was a Group x Valence interaction ($F_{(2,68)}$ = 11.02, p = .001, η^2_p= .25) with meditators rating normatively valenced negative stimuli as less unpleasant than controls (t = -3.73, df 34, p = .003: see Table 2 and Figure 2).

Figure 2: Mean and 95% Confidence Intervals for Valence Ratings by Normative Valence Category



A main effect was also observed for normative stimuli valence in the expected direction ($F_{(2,68)}$ = 303.2, p < .001, η^2_p= .9).

In addition, there was a main effect for Condition ($F_{(2,68)}$ = 3.6, p = .033, η^2_p= .09) and a significant interaction between Condition x Valence ($F_{(4, 136)}$ = 4.5, p = .007, η^2_p= .1 No Condition x Group interaction was observed ($F_{(2,68)}$ = 1.3, p = .28, η^2_p= .04). Nor was there an interaction was observed for Condition x Valence x Group ($F_{(4, 136)}$ = 1.43 p = .23, η^2_p= .04).

Valence ratings – Main findings:

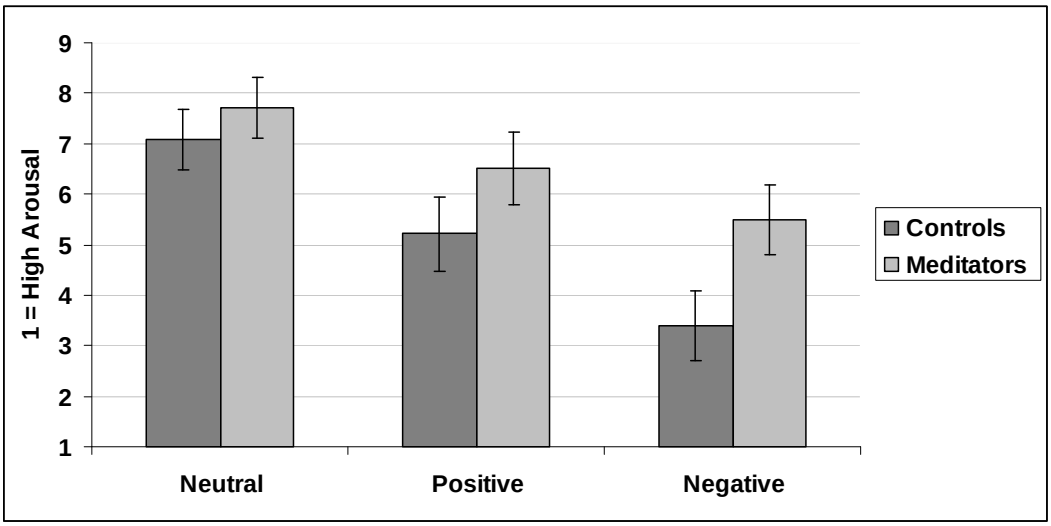
- Consistent with predictions, participants in the meditator group rated normatively negative images as less unpleasant than control participants.

Arousal Ratings

We hypothesised that meditators would rate normatively positive and negative images as less arousing than control participants. To test this hypothesis a 3 x 3 x 2 (condition x stimuli valence x group) mixed ANOVA was conducted for subjective arousal ratings.

A main effect was also observed for Group ($F_{(1,34)}$ = 11.5, p = .002, η^2_p= .25 representing a large effect) with meditators rating stimuli as significantly less arousing than controls. This was in part driven by a Group x Valence interaction ($F_{(1,34)}$ = 5.12, p = .008, η^2_p= .13 i.e. representing a medium sized effect) with meditators rating both normatively valenced positive (t = - 2.54, df 34, p = .0024) and negative stimuli (t = -4.3, df 34, p = .003) as less arousing than controls, consistent with predictions (see Figure 3; and Table 3)

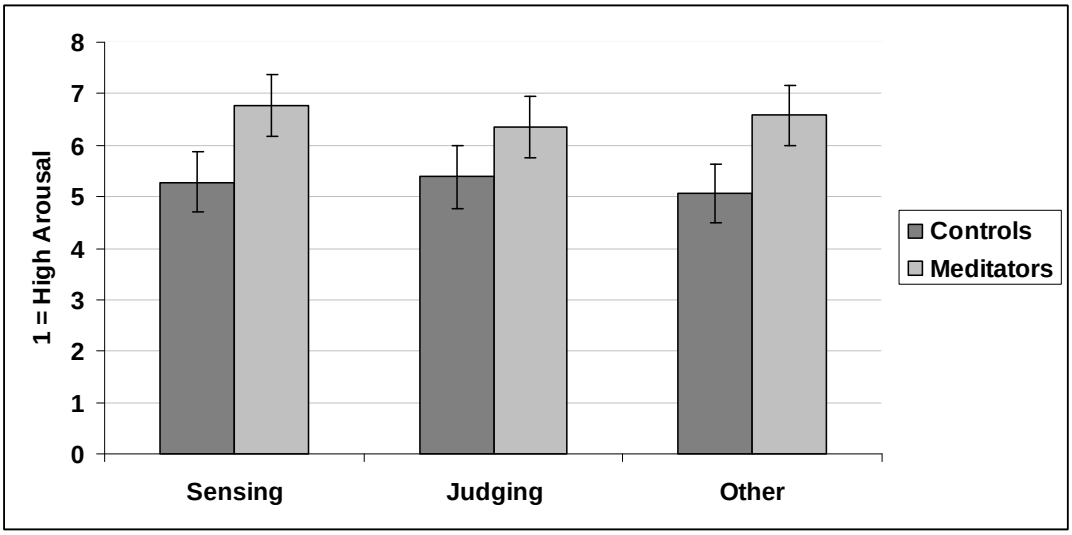
Figure 3: Mean and 95% Confidence Intervals for Arousal Ratings by Normative Valence Category



We also predicted that controls would rate normatively positive and negative images shown after the Sensing condition as less arousing in contrast to those shown after the Judging and Other conditions. A Condition x Group interaction was also observed ($F_{(2,68)}$

= 4.02, p = .022, η^2_p= .1 medium effect size – see Figure 4 and Table 3). However, for control participants, no statistically significant differences were observed for arousal rating for images shown after Sensing and Judging conditions (t = .74, df 17, p = .47) nor Sensing and Other conditions (t = .74, df 17, p = .16 – see Figure 4).

Figure 4: Mean and 95% Confidence Intervals Arousal Ratings by Condition



A main effect was also observed for normative stimuli valence ($F_{(2,68)}$ = 85.29, p < .001, η^2_p= .7, representing a large effect) in the expected direction. No main effect was observed for Condition ($F_{(2,68)}$ = 2.04, p = .14, η^2_p= .06). No interaction was observed for Condition x Valence ($F_{(4, 136)}$ = 1.3 p = .274, η^2_p= .04). No Condition x Valence x Group interaction was observed ($F_{(4, 136)}$ = 1.5 p = .2, η^2_p= .04). The same pattern of findings was observed when covarying for HADS anxiety score.

Table 3

Mean and Standard Deviation Arousal Ratings by Normative Valence Category

	Controls		Meditators		
Valence	**M**	**SD**	**M**	**SD**	**P value**
Neutral	7.1	1.3	7.7	1.2	p = .46
Positive	5.2	1.7	6.5	1.3	p = .024
Negative	3.4	1.2	5.5	1.6	p = .003
Condition					
Sensing	5.3	1.2	6.8	1.2	p = .003
Judging	5.4	1.3	6.3	1.2	p = .028
Other	5.1	1.1	6.6	1.3	p = .003
Total	5.2	1.2	6.6	1.2	p = .002

Note; M = Mean; SD = Standard Deviation; 1= High arousal, 9 = Low arousal. FWE corrected p values reported for simple effects; Valence refers to normative valence of stimuli.

Arousal ratings – Main findings:

- As predicted, meditators rated normatively negative and positive images as less arousing than control participants.
- Contrary to predictions, controls did not rate normatively negative and positive images shown after the Sensing condition as less arousing than those shown after the Other or Judging conditions.

Associations with Ratings

Exploratory correlations were conducted for the whole sample to examine the association between rating variables and scores on self-report measures tapping 'non-attachment', 'non-reactivity' and 'non-judgment' that significantly differed between groups. Unadjusted, two-tailed p values and are reported. Pearsons correlations are reported for arousal ratings and Spearmans rho for valence ratings.

Arousal ratings for normatively negative stimuli were significantly associated with non-attachment (r = .53, p = 0.001), non-reactivity (r = .43, p = 0.012), and non-judgment (r = .52, p = 0.001). Arousal ratings for normatively positive stimuli were significantly

associated with non-attachment (r = .59, p = 0.001), non-reactivity (r = .4, p = 0.016), and non-judgment(r = .34, p = 0.04).

Valence ratings for normatively negative stimuli were significantly associated with non-attachment (r = -.46, p = 0.005), non-reactivity (r = -.4, p = 0.017), and non-judgment (r = -.4, p = 0.015).

Skin Conductance Response

Amplitude was defined as the highest phasic increase in conductance initiated 1 - 5 s after stimulus onset and exceeding 0.01 μS. Mean SCR amplitude was calculated as the mean value for trials where a measurable response occurred. Mean SCR magnitude data was calculated as the mean value including non-responses, which were coded as zero (Dawson, Schell and Filion et al. 2007). SCR amplitude/magnitude data were converted to standard z scores to minimise artefacts due to likely individual differences in SCR (Bouscein et al 2012) which may be obscuring any group differences. The latency of onset of the first event-related SCR to occur in the 1-5s window was also recorded, unless this was a relatively small response preceding a larger phasic increase, in which case the latency of the highest phasic increase was recorded.

Due to the number of non-responses inherent in SCR data, and in accordance with our hypotheses, the analyses were performed collapsing across condition. All participants showed measurable skin conductance responses (SCR) to the stimuli. However, 4 participants (1 meditator, 3 controls) did not show enough measurable responses to enable the calculation of means for each valence category, with one control participant showing only one event-related SCR. These 4 participants were not included in the amplitude and latency analysis due to empty cells. The probability of a response regardless of amplitude (number of responses above 0.01/total number of presentations) was calculated. The mean probability of a response was .6 ± .25 and this did not differ between groups (t = - .5, df = 34, p = .6 – see Table 4).

SCR Amplitude

We hypothesised that meditators would show reduced SCR to normatively positive and negative images in contrast to control participants. A 2 x 3 Group x Valence mixed ANOVA for SCR amplitude standardised scores was conducted to test this hypothesis.

A main effect was observed for valence ($F_{(2,60)}$ = 7.5, p < .001, η^2_p= .2; see Table 4). As expected, statistically significant differences were observed between positive and neutral stimuli (t = 2.9, df = 31, p = 0.05), and negative and neutral stimuli (t = 3.6, df = 31, p = 0.01).

Table 4

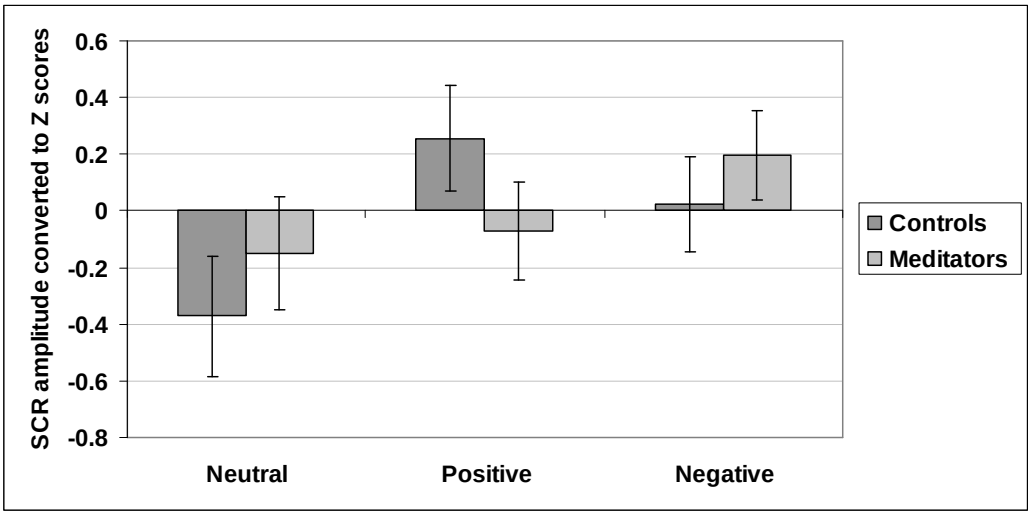
Mean and Standard Deviation Response Probability and Raw SCR Amplitude (μS) and *Latency in seconds*

	Controls		**Meditators**		**Total**	
SCR	**M**	**SD**	**M**	**SD**	**M**	**SD**
R Prob	5.8	.27	.63	.22	.6	.25
Amplitude						
Neutral	.2	.2	.22	.18	.21	.18
Positive	.46	.41	.31	.28	.38	.35
Negative	.42	.43	.38	.32	.4	.37
Latency						
Neutral	2.05	.61	1.7	.39	1.87	.53
Positive	2	.4	2	.39	1.98	.39
Negative	1.8	.33	1.8	.38	1.8	.35

Note; Note; M = Mean; SD = Standard Deviation; SCR refers to skin conductance response; R Prob = Response Probability.

No main effect was observed for Group ($F_{(1,30)}$ = .72, p = .4, η^2_p= .02). However, a Group x Valence interaction was observed ($F_{(1,31)}$ = 3.97, p = .024 η^2_p= .12). Consistent with predictions, this interaction was mainly driven by group differences on normatively positive stimuli (t = 2.6 df 30, p = 0.042; see Figure 5 and Table 4).

Figure 5: Mean Z scores and 95% Confidence Intervals for SCR by Normative Valence



Due to known differences in SCR due to anxiety, the analyses were also conducted with HADS anxiety score entered as a co-variate and the same pattern of findings was observed.

SCR Magnitude

Non-parametric Mann-Whitney tests revealed no significant between-group differences in mean SCR magnitude i.e. including non-responses as 0's, for normatively negative (U = 130, p = .3) or positive stimuli (U = 117, p = .95) or collapsed across groups (X^2 = .52, p = .15).

SCR Latency

We hypothesised that meditators would show reduced SCR latency of onset to normatively positive and negative images in contrast to control participants. A 2 x 3 (Group x Condition) mixed ANOVA for SCR latency was conducted. No main effect was observed for Group ($F_{(1,29)}$ = .1, p = .32, η^2_p= .03), nor for Valence ($F_{(2,58)}$ = .1.3, p = .27,) η^2_p= .04, nor a Group x Valence interaction ($F_{(2,58)}$ = 2.3, p = .12, η^2_p= .07 – see Table 4).

Skin Conductance Response – Main findings:

- Consistent with predictions, meditators showed reduced SCR amplitude to positive stimuli in contrast to controls.
- No group differences in SCR amplitude were observed for normatively negative stimuli.
- No group differences were observed for latency of SCR response.

Trait Recognition

There was one case of missing data due to an error in task administration. A primacy effect was observed suggesting significantly more traits were recalled from the first run in contrast to the last run (t = - 2.4, df 34, p = 0.022), and this was also the case when computing proportion of traits recalled overall (t = - 2.23, df 34, p = 0.032).

There were no group differences in terms of the proportion of traits overall recalled in the first run (t = - 1.6, df 33, p = 0.11) or last run (t = .48, df 33, p = 0.63). Neither was there a group difference in the number of false positives recalled (t = - .08, df 33, p = 0.94 – see Table 5).

Table 5

Mean and Standard Deviation Number of Traits Recalled

Traits	**Controls**		**Meditators**		
Recalled	**M**	**SD**	**M**	**SD**	**P value**
Total	50.1	19.4	52.6	19.8	p = .8
Run 1	17.4	7.4	19.2	6.5	p =.11
Run 3	16.1	6.6	16.3	7.5	p = .63
FP	8.6	5.8	8.7	6.1	p = .94
Condition					
Sensing	15.9	6.8	14.7	8	p = .62
Judging	19.1	7.7	20.8	7	p = .48
Other	15.9	7.3	17.2	6.4	p = .6

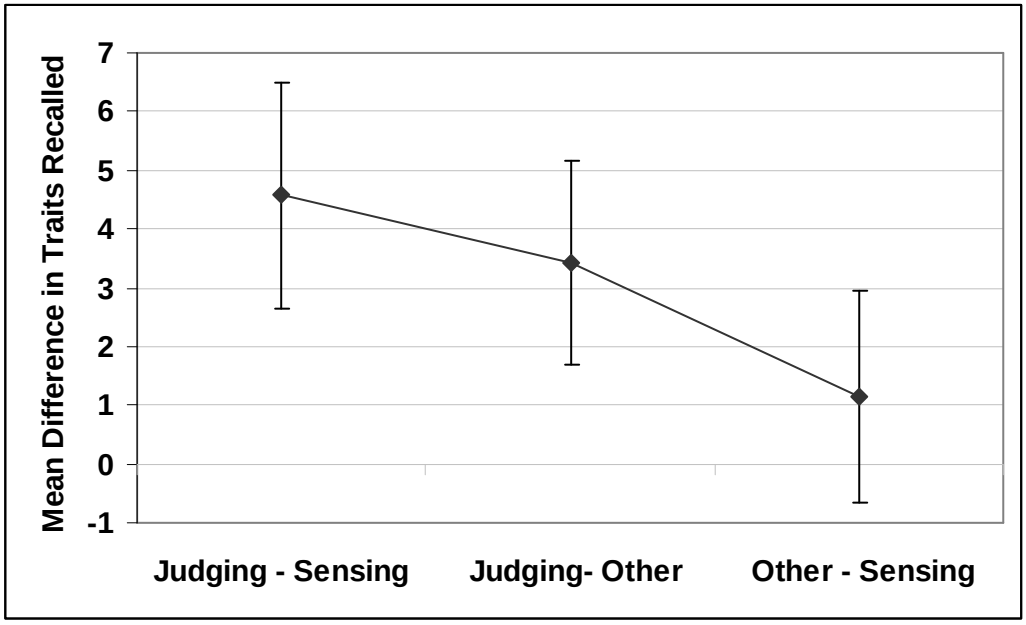
Note; M = Mean; SD = Standard Deviation; FP refers to False Positives

We hypothesised increased recall of traits shown in Judging > Sensing and Other condition. To test this hypothesis, a 3 x 2 x 2 (condition x stimuli valence x group) mixed ANOVA was conducted for number of traits recalled. No main effect was observed for trait valence ($F_{(1,33)}$ = 1.04, p = .35, η^2_p= .031) nor Condition x Valence ($F_{(2,66)}$ = .84 p = .35, η^2_p= .03), nor Valence x Group ($F_{(1,33)}$ = .01 p = .99, η^2_p= .00). No main effect was observed for Group ($F_{(1,33)}$ = .09, p = .77, η^2_p= .003) nor Group x Condition ($F_{(2,66)}$ = 1.6 , p = .21, η^2_p= .05).

However, as predicted, a main effect was observed for Condition ($F_{(2,66)}$ = 14.23 p = < 0.001, η^2_p= .3 i.e. representing a large effect size). Participants recalled more trait words

shown in the Judging condition than they did in the Sensing condition (t = -4.83, df 34, p = 0.003) or the Other condition (t = 4.02, df 34, p = 0.003) – see Figure 6.

Figure 6: Mean Difference Between Conditions in Traits Recalled and 95% Confidence Interval for Mean Difference



Trait Recall – Main findings:

- As predicted, significantly more traits were recalled from the Judging condition in contrast to the two other conditions.
- No group differences were observed in trait recall.
- No valence differences were observed in trait recall

Discussion

Summary of Main Findings

Consistent with our hypotheses, the main findings of this thesis are that meditators rate normatively negative images as significantly less unpleasant, and positive and negative images as less arousing than controls. However, contrary to our predictions, control participants did not show between-condition differences in arousal ratings. In terms of SCR, we observed reduced SCR to positive images in meditators in contrast to controls, however, this effect was not observed for negative images. In terms of memory recall, and consistent with our predictions, significantly more traits were recalled from the Judging condition in contrast to the Sensing and Other conditions. Lastly, meditators scored significantly higher on the Non-attachment scale (Sahdra et al., 2010), and the 'non-reactivity' and 'non-judging' subscales of the FFMQ but not on FFMQ subscales measuring 'observing', 'acting with awareness' and describing' (Baer et al., 2006). Overall, these data demonstrate that experienced meditators show measurable changes in emotional responding.

Self-reported Valence

As predicted, meditators rated negative images as significantly less unpleasant than controls. This is consistent with previous studies that have observed reduced reactivity to negative stimuli (Goldin & Gross, 2010) and to a stressor after 8 weeks mindfulness training (Britton et al., 2012), and reduced unpleasantness ratings to painful stimuli in experienced meditators (Gard et al., 2012; Perlman, Salomans, Davidson, & Lutz, 2010).

These data are also consistent with accounts of processes of change in depression following MBCT which emphasise a key role of a person's response to negative thoughts that occur after a sad mood induction (Kuyken et al., 2010). MBCT participants show evidence of non-reactivity to such thoughts, in contrast to those receiving anti-depressant medication, and this is mediated by self-compassion (Kuyken et al., 2008). Similarly, in the current dataset, participants with meditation experience showed evidence of less reactivity to normatively negative stimuli, by rating them as less unpleasant in contrast to controls.

These data are also in line with the self-report questionnaire data collected which showed statistically significant differences between meditators and controls on the 'non-reactivity' and 'non-judging' subscales of the FFMQ, replicating findings from previous studies (Baer et al., 2006; Bohlmeijer et al., 2011). Both these subscales also tap a common component of acceptance towards one's experience and have been equated with the

Buddhist understanding of the mental state of equanimity 'towards all experience or objects, regardless of their affective valence, pleasant, unpleasant or neutral' (Desbordes et al., 2014). To find that experienced meditators rate normatively negative stimuli as less unpleasant than controls is consistent with this mental state (Desbordes et al., 2014).

Self-reported Arousal

As hypothesised, meditators rated normatively positive and negative images as less arousing than controls. This is consistent with previous data in participants who underwent 7 weeks of mindfulness training (Ortner et al., 2007), and with studies that suggest post-training reductions in amygdala activation (Desbordes et al., 2012). To find that meditators subjectively self-report reduced arousal levels (Nielson & Kaszniak, 2007) i.e. when reflecting upon their current state of activation (Nielson & Kaszniak, 2007), is again consistent with a non-judging, non-reactive stance towards one's experience. Equanimity has been further described as a ' state of being calm, stable, and composed' (Desbordes et al., 2014) and these data suggest a state of relative calm in the face of normatively arousing stimuli.

In terms of the literature on emotion regulation strategies, reduced self-reported arousal can also be achieved via instructions to distance oneself from or reappraise emotional stimuli (Ochsner & Gross, 2008). This is in contrast to the increased arousal and associated neural correlates that are observed in anxious participants (Etkin & Wager, 2007). However, reduced arousal ratings are also a feature of emotional numbing or blunting as observed in participants with a diagnosis of depersonalisation (Sierra et al., 2002) and depression (Moratti, Rubio, Campo, Keil, & Oritz, 2008), and associated with distress. This then raises the question of the validity of an account that predicts reduced arousal to be associated with wellbeing.

However, in terms of emotional numbing or detachment, a key difference is the overall profile of emotional responding. For instance, people diagnosed with depersonalisation show reduced arousal ratings to normatively negative but not positive stimuli (Sierra et al., 2002) and show similar valence ratings to participants with a diagnosed anxiety disorder. This is in contrast to data from the current study which showed reduced unpleasantness ratings to negative stimuli and reduced arousal ratings to both positive and negative stimuli, in contrast to controls. In addition, depersonalisation has been shown to negatively correlate with mindfulness (Michal et al., 2007), and may to some extent be alleviated by mindfulness interventions (Michal et al., 2013).

It is also important to note that our control participants did not significantly differ from mediators in terms of current anxiety levels. That said, one participant in the control group scored in the moderate range for anxiety, as measured by the HADS, but the pattern of findings held with HADS score entered as a covariate.

Moving to within-group differences, contrary to predictions, we did not observe reduced arousal ratings in controls in response to positive and negative images shown after the Sensing condition in contrast to the Judging and Other conditions. This is contrary to previous findings that suggest reduced arousal ratings in controls as well as meditators (Taylor et al., 2011). However, there were important paradigm differences which may account for these findings i.e. in Taylor et al. participants had mindfulness training for 20 minutes per day for a week and in the task were asked to a be in a mindful state whilst viewing the images.

It is also of relevance that there was a significant difference in participants self-reports as to their success in the 'Sensing' condition, with controls more likely to report that they were only able to remain in a state of 'Sensing' when cued 'some of the time' as compared to 'most of the time' which was more regularly endorsed in meditators. This may mean that our experimental manipulation was not powerful enough to induce a state similar to mindfulness in control participants. However, it is also of note that this condition did not impact on picture ratings for meditators significantly more than the 'Other' condition. This may be due to baseline levels of mindfulness awareness in meditators (Lutz et al., 2007) obscuring between-condition differences i.e. it is likely that in trained meditators, what was once an explicit emotion regulation skill might become implicit due to repetition (Gyurak, Gross, & Etkin, 2011). Alternatively, there may be a lack of the expected carry-over effect from this experimental manipulation. In addition, it is also of interest that anecdotally meditators tend to report finding the 'Judging' condition more effortful, as it is contrary to their training, whereas the converse was true for control participants.

Skin Conductance Response

We predicted that meditators would show reduced SCR to normatively positive and negative images in contrast to controls, in line with the predictions and findings for self-reported arousal. However, we observed meditators to show reduced SCR to normatively positive images only. No between-group differences were observed for negative stimuli and the probability of an SCR response was comparable between groups.

Previous data on SCR in meditators is limited and mixed, with a suggestion that effects are only observed for negative stimuli in meditators with over 10 years experience who are high on clarity (Nielson & Kaszniak, 2006). This may explain why we did not find a difference in normatively negative stimuli in the current study. In addition, meditation experts show greater right anterior insula activation during negative but not positive emotional sounds (Lutz, Brefczynski-Lewis, Hjohnstone, & Davidson, 2008), and this brain region covaries with increased SCR (Critchley, Elliot, Mathias, & Dolan, 2000).

Previous studies have found increased down-regulation of the amygdala in novice meditators during emotion provocation paradigms (Desbordes et al., 2012; Taylor et al., 2011), and so one possibility is that a similar effect is diluting the current data, influencing the lack of group differences observed for negative stimuli. However, SCR to positive and negative stimuli did not significantly differ in controls, as is often the case (Bradley, Codispoti, Cuthbert, & Lang, 2001), and down-regulation of the amygdala in novice meditators has been previously observed with both negative and positive stimuli (Taylor et al., 2011), although arguably one might expect this effect to be less pronounced with positively valenced, non-threatening images.

Turning to the literature on SCR and emotional response, a motivational account has been proposed that views stimuli as either appetitive/pleasant or defensive/unpleasant with increased SCR observed for arousing stimuli in both categories (Bradley et al., 2001). Appetitive/pleasant stimuli are also often rewarding, and there is some evidence to suggest that high self-reported trait mindfulness predicts less responsiveness to rewarding feedback as measured via electroencephalography (EEG) (Teper & Inzlicht, 2013). This was in turn related to mindful acceptance scores but not present moment awareness (Teper & Inzlicht, 2013), and was specific to rewarding stimuli and not observed for aversive feedback (Teper & Inzlicht, 2013). These data are consistent with our own findings which may suggest less responsiveness to potentially rewarding pleasant/appetitive stimuli in meditators.

To observe less physiological arousal response in the face of potentially rewarding stimuli is again consistent with an account that emphasises increased equanimity (Desbordes et al., 2014). It is also of relevance that most Buddhist traditions emphasise self- and other related compassion which are posited to be related to a third affect regulation system focussed on contentment, in contrast to threat-based and drive-based systems (Gilbert, 2009). This system is described as one of ‘positive calm’ as opposed to a ‘drive system’ which is more activating and a source of anticipation and pleasure (Gilbert, 2009).

These data are consistent with reduced arousal ratings observed for positive stimuli in meditators. However, reduced self-reported arousal to negative stimuli was also reported but this effect was not observed for SCR. Attenuated SCR and arousal ratings to negative stimuli have been observed in depersonalisation disorder where it is conceptualised as a distressing, prefrontal inhibition of limbic system responses which manifests as clinical emotional numbing (Sierra et al., 2002). However, a correspondence between arousal and SCR is not always observed and may depend on factors such as personality differences (Norris et al., 2007). In the current dataset, the implication is that the observed group differences in self-reported arousal for negative

stimuli may be mediated by differences in the appraisal or perception of physiological arousal (Nielson & Kaszniak, 2007) as opposed to actual bodily change. This is consistent with an account that emphasises a change in the relationship with thoughts, feelings and sensations, or decentring, as opposed to a change in actual physiological arousal for aversive stimuli.

We also predicted reduced SCR latency of onset to normatively positive and negative images but did not observe this effect. Previous data suggest quicker recovery from IAPS in meditators as evidenced by reduced emotional interference (Ortner et al., 2007). However, we did not see a quicker SCR onset in meditators as predicted. This suggests that mindfulness training as operationalised in this thesis does not result in reduced latency to negative and positive images.

Self-report data

Group differences were observed on the Non-attachment scale (Sahdra et al., 2010) which purports to measure the Buddhist concept of non-attachment (see Introduction) as a state encompassing psychological flexibility, lack of fixation, and non-reactivity or evenmindedness (Sahdra et al., 2010). This concept is closely related to equanimity (Desbordes et al., 2014) and positively correlates with the FFMQ non-reactivity subscale (Sahdra et al., 2010). It is important to note that the concept of non-attachment very much differs from apathy or detachment and negative associations are observed with constructs such as depersonalisation, dissociation and avoidant attachment (Sahdra et al., 2010). To find group differences on this measure provides further support for our interpretation of self-reported arousal and valence data as being associated to increased equanimity in meditators. In addition, across groups, scores on this scale positively correlated with negative valence and positive and negative arousal ratings, providing further evidence for the role of equanimity in interpreting the current dataset.

As mentioned above, we also observed statistically significant differences between meditators and controls on the ‘non-reactivity’ and ‘non-judging’ subscales of the FFMQ, replicating findings from previous studies (Baer et al., 2008). Again, across groups, scores on these scales were positively associated with negative valence and positive and negative arousal ratings.

No differences were found for the ‘acting with awareness’ or ‘describing’ subscales of the FFMQ which is contrary to previous findings (Baer et al., 2008). However, it is of note that although these 2 subscales have been found to differ significantly in 2 large samples of meditators and controls, the magnitude of these differences was smaller than for the ‘non-reactivity’ and ‘non-judging’ subscales (Baer et al., 2008).

In addition, we did not observe group differences on the 'observing' subscale of the FFMQ. However, the validity of comparing meditators and controls on this subscale has been questioned (Baer et al., 2008). Similarly, a more recent study found that a 4 factor model that doesn't include 'observing' best describes data from non-meditators whereas a 5 factor model fits data from meditators (Williams, Dalgleish, Anke, & Kuyken, 2014). Items on this subscale tap self-focus i.e. awareness of thoughts, feelings and sensations, however, this is only correlated with well-being in mediators, which may be because they are also trained in the processes of non-judgment and non-reactivity (Baer, 2007; Baer et al., 2008). In the absence of these additional skills, self-focussed attention is likely to be a transdiagnostic process involved in the maintenance of several clinical conditions (Baer, 2007; Ellet & Chadwick, 2007; Hunter, Phillips, Chalder, Sierra, & David, 2003).

Memory Recognition

As predicted, significantly more trait words were recalled from the Judging condition in contrast to the Sensing and Other conditions. These data go some way to confirming our experimental manipulation, by suggesting that participants across groups were behaving differently in each condition as instructed. The lack of group differences here also suggests that control participants did not engage in active elaboration in the 'Sensing' condition. These data are also consistent with the debriefing data in which no differences were observed in participant self-reports as to their ability to remain in 'Judging' mode when requested.

The lack of group effects suggests that training in mindfulness meditation does not confer a benefit in recalling personality trait words. A previous study found that a brief mindfulness intervention reduced the number of negative words recalled in a lab-based paradigm and argued that mindful awareness may have 'neutralised' the negative material to be remembered (Alberts & Thewissen, 2011). In addition, superior recall of positively valenced words in contrast to controls was observed after 12 weeks of mindfulness training (Roberts-Wolfe et al., 2012). We did not observe an interaction between valence and condition or group and valence, suggesting no state or trait mindfulness related effects for negative or positively valenced traits. However, there were differences between the paradigms used and previous studies have failed to find valence effects when using recognition vs. recall tasks, and so it may be that valence effects are only observed when there are few retrieval cues (D'Argembeau, Comblain, & Van der Linden, 2005). Also from a theoretical standpoint, it is not clear why mindfulness should reduce recall of negative traits and increase positive recall in those without a history of depression i.e. where mindfulness might offset memory bias.

In terms of traits recalled, we observed a primacy effect as expected but no recency effect which is likely due to fatigue. In terms of the literature on the self-reference effect in memory, these data are consistent with an account based on elaboration of the

material to be remembered (Klein, 2012). The suggestion is that increased non-judgemental, non-elaborative self-awareness i.e. simply attending to the thoughts, feelings and sensations that arise as a result of reading a trait word, is not sufficient to improve memory recognition. Instead significantly more traits were recalled from the Judging condition, whereby participants were asked to actively elaborate upon the words shown by considering whether the word described them and the reasons why. This was in contrast to the Sensing and Other conditions, and these differences represented a large effect size.

Clinical Implications

In terms of the clinical relevance of these data, a large effect was observed for reduced ratings of unpleasantness for normatively negative stimuli in participants with meditation experience. Perceiving stimuli as unpleasant or aversive is a key process in both anxiety and depression, and if emotional experience is appraised as less aversive then it is less likely to lead to experiential avoidance (Baer, 2007; Chambers et al., 2009), a transdiagnostic process involved in the maintenance of several psychological conditions (Baer, 2007).

A medium sized effect was observed for group differences in arousal and SCR. For positive stimuli, differences were observed in both self-reported arousal and physiological responding, and these data suggest less engagement with potentially rewarding stimuli in those with meditation experience. These data may be of relevance to psychological conditions wherein the reward system is emphasised such as addictions, and it is of note that mindfulness-based interventions have had some success in this area (Zgierska et al., 2009).

For negative stimuli, no differences were observed on a physiological level, but self-reported arousal was reduced in meditators. These data suggest differences at the level of cognitive appraisal and perceived arousal when responding to negative stimuli. Both reduced physiological arousal in the case of positive stimuli, and perceived arousal in the case of negative stimuli are likely to confer advantages in terms of wellbeing, and are consistent with an account that emphasises contentment as a means of affect regulation (Gilbert, 2009).

Overall these data fit with transdiagnostic conceptualisations of mental health. Mindfulness-based approaches also emphasise self-regulation, and so self-efficacy, with few reported side effects (Dobkin, Irving, & Amar, 2012). However, a related issue is the usefulness of these approaches for different service users. Mindfulness-based approaches have been shown to reduce mental distress in many different psychological and physical health conditions, which could be viewed as a lack of specificity. It is likely to be of most use in targeting transdiagnostic processes with a theoretical basis such as

overengagement with mental contents through processes such as rumination, and/or experiential avoidance (Baer, 2007). That said, mindfulness practice is not always easy and requires an ongoing commitment which is a further consideration when assessing suitability for mindfulness interventions. This may explain why success in preventing depressive relapse has been observed only in those who have had 3 or more depressive episodes (Teasdale et al., 2000) and why MBSR was developed for use in the context of chronic, enduring and intractable pain (Kabat-Zinn, 1982).

Limitations

The main limitation of this study is the quasi-experimental design with group allocation being based on pre-existing characteristics i.e. meditation experience. Although groups were matched on gender, education status, age, anxiety and depression we cannot be sure that there are not other cohort differences driving the effects observed. Further possible differences between groups which may have impacted on the findings include motivation during task performance and demand characteristics i.e. ascertaining the hypotheses being tested, and further cohort differences such as disposition and/or world view.

In addition, the meditators varied in their experience and the traditions they trained in and so were not homogenous as a group. Most trained in mindfulness within a Buddhist tradition and so may have been exposed to, and/or be committed to a broader Buddhist training than that ordinarily included in secular mindfulness approaches. That said, key process such as mindful awareness, acceptance, decentring, non-judgment and equanimity are likely to be areas of commonality between the different approaches. A further limitation is the difficulty of quantifying meditation experience. We opted for an inclusion criterion based on estimated hours spent in formal meditation but time spent training is only likely to be approximately related to quality of practice, due to factors such as dispositional mindfulness or other related individual differences (Davidson, 2010).

In terms of other methodological issues, no between-condition effects were observed in emotion processing in either group which may suggest that the experimental manipulation was not sufficient to induce an approximation to state mindfulness, and/or did not lead to the intended carry-over effect for emotion processing. Debriefing data suggest that control participants report being able to remain in ‘Sensing’ mode some of the time but it is not known how much this state approximated mindfulness (Williams, 2010). That said, this experimental manipulation was an attempt to ensure as close an equivalence as possible between groups for task instructions and performance. Future studies may consider further experimental manipulations which enable a more thorough fractionation of key processes (Williams, 2010) while taking into account the need not to fatigue participants.

In addition, our sample size gave us power to detect large effect sizes using one tailed tests which may have increased the likelihood of Type 2 errors i.e. the sample size may not have been sufficient to detect differences of a smaller magnitude. Whilst in the present study, there was a need to balance sample size with practical constraints around recruitment to include the difficulty of finding controls participants who were matched in age and other variables, it is recommended that future research be powered to detect smaller effect sizes to reduce the risk of Type 2 error.

A further limitation is the choice of emotional stimuli which is always an attempt to balance ecological validity with experimental control. The IAPS (Lang et al., 2005) have the advantage of being standardised with published normative data, however, they are only likely to induce an emotional response that is an approximation to the real-life, day to day, emotional responding which mindfulness interventions target. In addition, methods of measuring emotional experience in the laboratory are limited. Self-reports are likely to contaminate the actual subjective experience of emotion (Kassam & Mendes, 2013; Nielson & Kaszniak, 2007), and physiological measures do not capture the richness of emotional experience. Individuals may also vary in their ability or willingness to self-report their emotions with accuracy (Mauss & Robinson, 2009; Nielson & Kaszniak, 2007)

Conclusion

Despite these limitations, these data show that participants who have more than 500 hours meditation experience show measurable differences in terms of emotional response, both in subjective reports of their emotional experience and for normatively positive stimuli in a more implicit measure of physiological responding. No differences were observed on a memory task. The main findings suggest meditation-related change at the level of appraisal of emotional experience. Taken as a whole these data are consistent with a state of calm equanimity in those with experience of meditation (Desbordes et al., 2014); that is negative stimuli being rated as less aversive, ratings indicative of increased calmness in the face of normatively arousing stimuli, and less of a physiological response to potentially rewarding stimuli. The effects observed are likely to be of clinical relevance, and speak to the processes of change in mindfulness-based interventions.

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Appendices

Appendix 1: Trait Words

List A	List B	List C
Sublist 1	**Sublist 1**	**Sublist 1**
overcritical	childish	foolish
helpful	conscientious	talented
incompetent	envious	bitter
curious	tolerant	hopeful
Sublist 2	**Sublist 2**	**Sublist 2**
cowardly	bossy	resentful
constructive	courteous	pleasant
listless	angry	suspicious
inventive	creative	active
Sublist 3	**Sublist 3**	**Sublist 3**
shallow	complaining	boastful
alert	admirable	witty
oversensitive	sloppy	moody
self-assured	logical	frank
Sublist 4	**Sublist 4**	**Sublist 4**
tactless	unfair	negligent
delicate	courageous	capable
irritable	cynical	pessimistic
lively	observant	gracious
Sublist 5	**Sublist 5**	**Sublist 5**
gloomy	unreliable	touchy
respectful	perceptive	co-operative
careless	possessive	scheming
generous	poised	amusing
Sublist 6	**Sublist 6**	**Sublist 6**
irresponsible	petty	vain
productive	resourceful	independent
clumsy	lifeless	smug
humble	skilful	optimistic
Sublist 7	**Sublist 7**	**Sublist 7**
aimless	ungrateful	egotistical
diligent	reasonable	clever
insecure	stubborn	irrational
modest	energetic	decisive
Sublist 8	**Sublist 8**	**Sublist 8**
superficial	jealous	helpless
trusting	forgiving	original
sly	fickle	immature
patient	efficient	sociable
Sublist 9	**Sublist 9**	**Sublist 9**
cold	deceptive	hostile

imaginative	ambitious	enthusiastic
nervous	wasteful	reckless
amiable	self-reliant	relaxed

Appendix 2: Images from International Affective Picture System

List A	**No.**	**Type**
Neutral	7009	mug
Neutral	7150	umbrella
Neutral	7100	hydrant
Positive	1710	puppies
Positive	5629	hiker
Positive	5660	mountain
Negative	3060	mutilation
Negative	9320	toilet
Negative	6370	mask

List B	**No.**	**Type**
Neutral	7233	plate
Neutral	7050	hairdryer
Neutral	6150	plug socket
Positive	1463	kittens
Positive	5621	skydive
Positive	5600	mountain
Negative	9405	mutilation
Negative	9300	toilet
Negative	6350	knife

List C	**IAPS**	**Type**
Neutral	7000	rolling pin
Neutral	7034	hammer
Neutral	7025	stool
Positive	1440	seal
Positive	8186	skydive
Positive	5814	tropical
Negative	3170	tumour
Negative	9301	toilet
Negative	6560	gun

Appendix 3: Information Sheet

INFORMATION SHEET FOR PARTICIPANTS

This study has been reviewed by the Psychiatry, Nursing and Midwifery (PNM) Research Ethics Subcommittee (RESC) at King's College London.

RESC Reference Number: PNM12/13-142

YOU WILL BE GIVEN A COPY OF THIS INFORMATION SHEET

An Investigation into How Different Types of Mental Focus Impact on People's Responses.

We would like to invite you to participate in this original research project being conducted by a postgraduate student. You should only participate if you want to; choosing not to take part will not disadvantage you in any way. Before you decide whether you want to take part, it is important for you to understand why the research is being done and what your participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information.

The purpose of this study is to examine the effects of different types of mental focus on people's responses to different stimuli. Increasing our knowledge of these processes will tell us more about psychiatric conditions such as depression in which people focus their awareness in different ways. This in turn may help us devise appropriate treatment strategies based on altering the focus of awareness. This study is being conducted for the Doctorate in Clinical Psychology at King's College London, and builds on a previous study which found important differences in the way people process emotions.

To take part in this study you need to have a good understanding written and verbal English, not currently be receiving treatment for psychiatric illness, nor have a diagnosis or neurological disease or learning disability. You also need to be between 18-65 years of age because some of the mental processes we are interested in may differ in people who are older than 65. If you meet this criteria and decide to take part then we can make an appointment for to come to the Institute of Psychiatry, DeCrespigny Park, Denmark Hill, London, SE5 8AF to take part in the study.

The first step will be to complete some questionnaires. These include items that require you to rate how you feel in particular situations. This would be in response to statements such as 'I feel tense or wound up' or 'I still enjoy the things I used to enjoy' or 'in difficult situations, I can pause without immediately reacting'. This will take about 15 minutes. Following this you will trained to adopt two different types of mental focus, when shown a cue word on a computer screen. One type of mental focus would be to 'sense what is occurring in one's thoughts, feelings and body, without goal or purpose, other than notice how things are from one moment to the next'. The other type of mental focus is to 'judge what is occurring, and try to figure out what the word might mean to you'. You will have plenty of opportunity to ask questions. We will then give you an opportunity to practice the task, and to ask any further questions.

Once you are ready we will show you a series of cues telling you which mental focus to adopt. You will then see some emotional pictures, and you will be asked to rate how emotional you find each of these pictures using a computerised rating scale. We would also like to measure your physiological responses during the study by using small electrodes taped to your fingertip. These electrodes won't hurt you in anyway and simply measure the amount of sweat sitting in the glands of your fingertips at any one time. The pictures we show you may be quite emotional, but if you find any of the images too distressing, just tell the experimenter and we will stop the study. This should take approximately 45 minutes.

After the session you will have the opportunity to discuss your results and any thoughts you had during the session, and will also be debriefed. If you would like to receive a copy of the overall study results, this can be arranged. All the data collected will also be anonymised by being allocated a unique reference number, to maintain your confidentiality. Only the researchers will have access to the name and number list which will be stored separately to the actual data. For the duration of the project, the data will be stored in locked filing cabinets at the Institute of Psychiatry, King's College London, and on the computers that the researcher is using, but no-one else will have access to it. Once the project is complete, the data will be moved to specialised archive facilities at King's College London, where it will be stored for 4 years.

If you have any questions or would like to discuss the study further please contact:

Dr Emma J Lawrence
emma.lawrence@kcl.ac.uk

It is up to you to decide whether or not to take part. If you do decide to take part you will be given this Information Sheet to keep and be asked to sign a Consent Form. If you decide to take part you are still free to withdraw at any time during the data collection session, without giving a reason. A decision to withdraw at any time, or a decision not to take part, will not affect you in any way. This will not effect any previously agreed compensation for your time. You are also free to withdraw your data for up to 28 days from participation, without giving a reason. To do this please contact Dr Emma Lawrence using the details above.

If this study has harmed you in any way you can contact King's College London using the details below for further advice and information:

Professor Paul Chadwick,
Director of Clinical Psychology Training,
Department of Psychology (PO77),
Rm 2.03, Henry Wellcome Building,
Institute of Psychiatry,
King's College London
Email: paul.chadwick@kcl.ac.uk

Appendix 4: Meditation Experience Questionnaire

1) Do you have any experience of meditation or mindfulness?
   [ ] yes
   [ ] no

2) If so, do you have a regular and consistent practice?
   [ ] yes
   [ ] no

3) Approximately, how many years have you maintained a regular practice?

   ……..

4) In the last 6 months, approximately how many hours would you estimate you have formally meditated each week?

   ……..

5) Since you began practising, approximately how many hours would you estimate you have formally meditated in total?

   ……..

6) What type of meditation forms the basis of your main practice?
   ……
   ……
   ……

7) Have you ever attended a silent retreat for longer that one day?
   [ ] yes
   [ ] no

8) If so, please give details of retreats you have attended i.e. tradition, practice.
   ……
   ……
   ……
   ……
   ……

9) Do you try to practice mindfulness in daily life?
   [ ] yes
   [ ] no

10) Do you have a formal meditation teacher?
   [ ] yes
   [ ] no

Appendix 5: Five Facet Mindfulness Questionnaire – Short Form

5 facet questionnaire: short form (ffmq-sf) - Baer et al 2006

Below is a collection of statements about your everyday experience. Using the 1–5 scale below, please indicate, in the box to the right of each statement, how frequently or infrequently you have had each experience in the last month (or other agreed time period). Please answer according to what really reflects your experience rather than what you think your experience should be.

never or very rarely true	***not often true***	***sometimes true sometimes not true***	***often true***	***very often or always true***
1	***2***	***3***	***4***	***5***

1	I'm good at finding the words to describe my feelings	*DS*	
2	I can easily put my beliefs, opinions, and expectations into words	*DS*	
3	I watch my feelings without getting carried away by them	*NR*	
4	I tell myself that I shouldn't be feeling the way I'm feeling	*/NJ*	
5	it's hard for me to find the words to describe what I'm thinking	*/DS*	
6	I pay attention to physical experiences, such as the wind in my hair or sun on my face	*OB*	
7	I make judgments about whether my thoughts are good or bad.	*/NJ*	
8	I find it difficult to stay focused on what's happening in the present moment	*/AA*	
9	when I have distressing thoughts or images, I don't let myself be carried away by them	*NR*	
10	generally, I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing	*OB*	
11	when I feel something in my body, it's hard for me to find the right words to describe it	*/DS*	
12	it seems I am "running on automatic" without much awareness of what I'm doing	*/AA*	

13	when I have distressing thoughts or images, I feel calm soon after	*NR*	
14	I tell myself I shouldn't be thinking the way I'm thinking	*/NJ*	
15	I notice the smells and aromas of things	*OB*	
16	even when I'm feeling terribly upset, I can find a way to put it into words	*DS*	
17	I rush through activities without being really attentive to them	*/AA*	
18	usually when I have distressing thoughts or images I can just notice them without reacting	*NR*	

19	I think some of my emotions are bad or inappropriate and I shouldn't feel them	*/NJ*	
20	I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow	*OB*	
21	when I have distressing thoughts or images, I just notice them and let them go	*NR*	
22	I do jobs or tasks automatically without being aware of what I'm doing	*/AA*	
23	I find myself doing things without paying attention	*/AA*	
24	I disapprove of myself when I have illogical ideas	*/NJ*	

Appendix 6: Nonattachment Questionnaire

Sahdra et al., (2010)

Approach to Life Questionnaire

Instructions: To help us understand your general approach to life and your views about yourself, others, and life in general, tell us the extent to which the following statements reflect your experiences at this point in your life. Select a number from 1 to 6 on the scale provided with each statement to rate the extent to which you agree with it.

Please answer according to what *really reflects* your experience rather than what you think your experience should be.

1	2	3	4	5	6
Disagree Strongly	Disagree Moderately	Disagree Slightly	Agree Slightly	Agree Moderately	Agree Strongly

1. I can accept the flow of events in my life without hanging onto them or pushing them away.
2. I can let go of regrets and feelings of dissatisfaction about the past.
3. I find I can be calm and/or happy even if things are not going my way.
4. I have a hard time appreciating others' successes when they outperform me.
5. I can remain open to what life offers me regardless of whether it seems desirable or undesirable at a particular time.
6. I can enjoy pleasant experiences without needing them to last forever.
7. I view the problems that enter my life as things/issues to work on rather than reasons for becoming disheartened or demoralized.
8. I can enjoy my possessions without being upset when they are damaged or destroyed.
9. The amount of money I have is not important to my sense of who I am.
10. I do not go out of my way to cover up or deny my negative qualities or mistakes.
11. I accept my flaws
12. I can enjoy my family and friends without feeling I need to hang on to them.
13. If things aren't turning out the way I want, I get upset.
14. I can enjoy the pleasures of life without feeling sad or frustrated when they end.
15. I can take joy in others' achievements without feeling envious.
16. I find I can be happy almost regardless of what is going on in my life.
17. Instead of avoiding or denying life's difficulties, I face up to them.

18. I am open to reflecting on my past mistakes and failings.
19. I do not get "hung up" on wanting an "ideal" or "perfect" life.
20. I am comfortable being an ordinary, less than perfect human being.
21. I can remain open to thoughts and feelings that come into my mind, even if they are negative or painful.
22. I can see my own problems and shortcomings without trying to
blame them on someone or something outside myself.
23. When pleasant experiences end, I am fine moving on to what comes next.
24. I am often preoccupied by threats or fears.
25. I am not possessive of the people I love.
26. I do not have to hang on to the people I love at all costs; I can let them go if they wish to go.
27. I do not feel I need to escape or avoid bad experiences in my life.
28. I can admit my shortcomings without shame or embarrassment.
29. I experience and acknowledge grief following significant losses, but do not become overwhelmed, devastated, or incapable of meeting life's other demands.
30. I am not possessive of the things I own.

Appendix 7: Task Instructions

Amended and adapted from Farb et al (2007) and Lawrence et al (In preparation)

Instruction Sheet

Sensing vs. Judging

We are interested in two different ways of experiencing the world. One way is to 'judge what is occurring' and another is to 'sense what is occurring'. Here are some examples:

SENSING: When you approach your experience in a sensing state of mind, you try to notice all parts of your experience - your thoughts, your feelings, and the sensations that arise in your body. You try to include all these aspects of your experience in your awareness but there is no purpose or goal, other than noticing how things are from one moment to the next. Importantly, in sensing you are attempting to notice all the aspects of experience as they occur. It is very likely that you will need to repeatedly bring your awareness back to your actual experience in the present moment as it is very common to get caught up in any one particular thought, feeling or sensation.

JUDGING: When you approach your experience in a judging state of mind, you try to figure out what the experience means for you, what it says about you as a person, and possibly trying to find reasons or explanations for the experience. In the judging state of mind you are concerned with what the experience implies about you, almost as if it were a puzzle you were trying to solve. You try and actively think about the experience, and try to figure out, as much as you can, what this experience means about you as a person.

Here is an example of how these different ways modes might be in response to stubbing your toe:

You **JUDGE** the experience, giving it an immediate label of pain. You may curse yourself for being clumsy and causing yourself pain, look for what you stubbed your toe on, and think about why you stubbed your toe ("Why did you not notice the door etc.). You might think about the **REASONS WHY** you are in pain and what this might mean about you as a person. Finding the reasons behind stubbing your toe and the consequences of the pain you are feeling is the puzzle you are trying to solve.

Alternatively, you **SENSE** the experience, noticing exactly how the feelings from your toe spread through your body from moment to moment. Sensing the quality of the sensation as sharp or dull, or more or less intense. You might notice your heart race or your breathing change, and thoughts and emotions that come to mind. You are simply noticing these aspects of your experience which may change over time. In short, you simply notice the **THOUGHTS, FEELINGS AND SENSATIONS** accompanying the stubbed toe without necessarily trying to find explanations for these experiences.

So to recap, **JUDGING** is asking yourself "why do I feel the way I do and what does this *mean about me*?", whereas **SENSING** is noticing your experience as it occurs and being aware of your sensations, thoughts and feelings as they arise. **JUDGING** seeks to label and discover meanings behind things, while **SENSING** seeks to notice and become aware more than we ordinarily would in a given moment.

At this point, hopefully you will have at least a rough sense of the judging/sensing distinction – before we start the task, you will have an opportunity to discuss these modes of experiencing, and think about examples from your own experience.

Word Task

The main task involves adopting both the **SENSING** and **JUDGING** perspective when cued to do so. A series of words will be displayed on the computer screen one at a time and stay on the screen for about 5 seconds each. Before each list of words appears you will be given a CUE which will tell you whether we want you to approach the words from a **JUDGING** or **SENSING** perspective. We will also ask you to make judgments about another familiar person – Prince Charles.

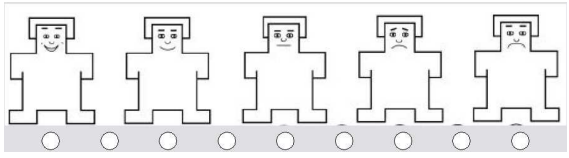
When you see this cue  we would like you to respond to the words that follow by **'SENSING'.** This means that for each word we want you to try to *notice* any changes in your bodily sensations, or thoughts or feelings that the word provokes. Try to focus on how these thoughts, feelings and sensations *come and go over time* rather than getting caught up in any one aspect of your experience.

When you see this cue  we would like you to respond to the words that follow by **'JUDGING'**. This means that for each word we want to you to think about whether this word describes **YOU** as a person. For instance, what does this word mean about you? Try to think about all the possible reasons why this word does or does not describe you.

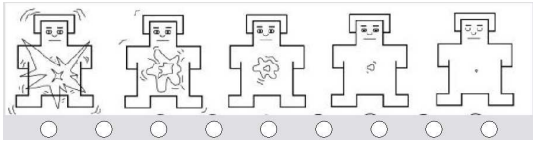
When you see this cue  we would like you to respond to the words that follow by **'JUDGING'** whether the word describes **PRINCE CHARLES**. So for each word we want to you to think about whether this word describes him as a person. For instance, what does this word mean about Prince Charles? Try to think about all the possible reasons why this word does or does not describe Prince Charles.

Pictures

After each set of 4 words you will be shown a picture. Some of these will be quite emotional and/or aversive. After seeing each picture, you will be asked to rate how the picture makes you feel using the left and right arrow key on the keyboard. You will be given 5 seconds to do this. You will see 2 sets of cartoon figures, each arranged as below. These cartoons show two kinds of feelings:

Pleasant vs. Unpleasant 

Please choose the cartoon on the far left if the picture makes you feel very positive, for example, happy, pleased, or hopeful. Choose the far right if the picture makes you feel very negative, for example, unhappy, annoyed, or despairing. If you feel somewhere in between please select the figure in the middle.

Excited vs. Calm 

For the second set of cartoons, please chose the cartoon on the far left if the picture makes you feel very alert, jittery or aroused and the far right if the picture makes you feel very calm, relaxed or dull. For either set of cartoons, if your feeling falls between 2 of the figures, then select the space inbetween.

The cursor will not appear until you have pressed the arrow key and then it will appear in a random position. The program will record the position of the cursor at 5 seconds which will be taken as your response. If you do not manage to respond, please don't worry, and just continue with the task.

Now you will get an opportunity to practice the task. If you are unsure what to do in any of the tasks please ask. You can practice the task as many times as you like, until you are confident with the task, including the sensing/judging distinction.

Appendix 8: Debriefing Questionnaire

Debriefing Questions

1) Were you able to respond to the words shown by 'sensing'?
   [ ] not at all
   [ ] some of the time
   [ ] most of the time

2) Were you able to respond to the words shown by 'judging'?
   [ ] not at all
   [ ] some of the time
   [ ] most of the time

3) Were you able to respond to the words shown by 'judging' in relation to Prince Charles?
   [ ] not at all
   [ ] some of the time
   [ ] most of the time

4) Each trait word was displayed for 5 seconds. Was this long enough to get into each of the different modes?
   [ ] yes
   [ ] no
   If no, for which modes did you need longer……

5) Did you notice any of the following changes over the course of the task?
   [ ] I became better at 'judging' as the task went on
   [ ] I found 'judging' more difficult as the task went on
   [ ] I became better at 'sensing' as the task went on
   [ ] I found 'sensing' more difficult as the task went on

6) Did you find it difficult to change between the different types of self-focus?
   [ ] I did not find this difficult
   [ ] I found this difficult some of the time.
   [ ] I found this difficult most of the time.
   [ ] I was able to do this more easily at the beginning of the task.
   [ ] I was able to do this more easily towards the end of the task.

7) How easy/intuitive did you find the cartoon pictures for rating?
   [ ] easy and intuitive
   [ ] difficult to understand

Service Evaluation Project

Evaluating a CBT Group for Carers of People with Dementia Delivered in Routine Care

Supervised by Dr Sarah Addison

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Abstract

This project is a first step in considering the clinical effectiveness of a CBT group for carers of people with dementia. This group has been delivered routinely for the last 7 years, and we examined pre- and post-intervention scores on standardised outcome measures, alongside responses to a structured evaluation questionnaire. We found a statistically significant reduction in scores on the 28 item General Health Questionnaire (GHQ-28) for all clusters except depression. The proportion of participants who met criteria for 'caseness' on the GHQ-28 also reduced from pre- to post-intervention indicative of clinically significant change. We observed a significant decrease in mean scores on the Clinical Outcomes in Routine Evaluation Outcome Measure (CORE-OM). In terms of carer burden, total scores on the Zarit Burden Interview dropped significantly and more participants were categorised as experiencing 'mild to moderate burden' post-intervention as opposed to 'moderate to severe' and 'severe' pre-intervention. Regarding the evaluation questionnaire, these data suggest that both the format and content of the group were acceptable for participants. In summary, these data suggest that an 8 week CBT group for carers of people with dementia conducted in routine care may lead to clinically significant change. However, future studies with participants randomly allocated to a control group are needed to confirm clinical effectiveness.

Introduction

Caring for a person with physical and/or mental health needs can be stressful, and so people in a caregiver role may have increased mental health needs, and benefit from psychological support. Indeed, psychological interventions have been delivered to people who care for those with a variety of different conditions, such as dementia, cancer and Parkinson's disease (Phillips, Gallagher, Hunt, Der, & Carroll, 2009; Secker & Brown, 2005; Sorensen, Pinquart, Habil, & Duberstein, 2002). Although the type of intervention recommended may be dependent on the diagnosis of the person being cared for (Walsh et al., 2007), some common difficulties emerge. For instance, a large scale study of over 2000 non-routine carers i.e. caring for someone other than their own child, found caregiving strain and burden to be associated with depression and anxiety, and this was further mediated by sleep quality (Phillips et al., 2009).

Interventions for Caregivers: General

It is thought that at least seven million people in the UK provide non-routine care (Phillips et al., 2009) Caregiver burden is multidimensional (Kim, Chang, Rose, & Kim, 2011) and describes the impact of the stress of caregiving and perceived burden including feelings of 'embarrassment, guilt, overload, feelings of entrapment, resentment, isolation, and loss of control' (Phillips et al., 2009). A meta-analysis of interventions for caregivers of older adults, which included pychoeducation, supportive interventions, respite/adult day care, and psychotherapy, found significant reductions in caregiver burden and depression (Sorensen et al., 2002). However, the effects for dementia caregivers were smaller that those for other groups, which may reflect the degree of strain and/or increased complexity in caring for an older adult with dementia. Specifically, CBT has been found to be effective with caregivers, and has been found to be associated with reduced caregiver burden and decreased scores on the GHQ-28 (Secker & Brown, 2005).

Dementia

Dementia is 'a general term for a range of progressive organic brain diseases that are characterised by problems of short-term memory and other cognitive deficits' (Holmes, 2012). A variety of different disease processes and/or clinical presentations characterise dementia including Alzheimer's Disease, Lewy-body dementia, fronto-temporal dementia, Parkinson's disease, HIV-related dementia and vascular dementia (Holmes, 2012). Some types of dementia such as fronto-temporal variants tend to have an average age of onset before 65 years (Snowden, Neary, & Mann, 2002). However, most forms of dementia show increased prevalence in older adults, with age being the main risk factor (Holmes, 2012).

The type of behaviours exhibited by those with a diagnosis of dementia will vary according to individual characteristics, environmental triggers, internal states and the underlying disease process including the disease stage. This means those caring for people with dementia may be attempting to cope with a variety of different symptoms that may also change over time. For instance, people with a diagnosis of Lewy-body dementia are more likely to suffer from hallucinations and delusions, which also occur in people with hearing or visual difficulties, or as a result of a delirium. Apathy, or lack of motivation, on the other hand, is more common in those whose frontal lobe is impacted by dementia. Other difficult behaviours that occur in dementia can include aggression, wandering, incontinence, sleep disruption, nutrition difficulties, depression, agitation and anxiety. Those that care for people with dementia may need psychoeducation as to the nature of dementia, support in managing challenging behaviours, and in developing awareness of the impact that caring has on them as individuals and how to cope with those effects.

Interventions for Caregivers: Dementia

It is well-known that caregiver stress is high amongst those caring for people with a diagnosis of dementia (Donaldson, Tarrier, & Burns, 1998). Evidence suggests that, in the case of dementia, such stress is alleviated by residential placement, which indicates that the day to day demands of caring impact on carer wellbeing (Gaugler, Mittelman, Hepburn, & Newcomer, 2010). It is of note that the gold standard measure of carer burden, the Zarit Burden Interview, was developed for those who care for people with a diagnosis of dementia (Zarit, Reever, & Bach-Peterson, 1980).

Predictors of caregiver burden in carers of those with dementia include disease-related process such as decline as measured by success in activities of daily living (ADLS), followed by social-demographic factors such as older age older and female gender, and caregiving related factors such as number of co-helpers and number of hours spent caring (Kim et al., 2011). The importance of interventions that focus on the functioning of the care recipient in improving caregiver stress, alongside interventions for the caregiver, have also been highlighted (Kim et al., 2011). Similarly, a meta-analysis of non-pharmacological interventions, for both carers and patients with dementia, found that multicomponent support programs can lead to delay in patient institutionalisation (Spijiker et al., 2008).

In terms of caregiver interventions, a single-blind randomised control trial of a 14 session cognitive-behavioural family intervention for caregivers of people of Alzheimer's disease found reductions in carer distress and depression and patient behavioural disturbance at 3 months follow up (Marriott, Donaldson, Tarrier, & Burns, 2000). This intervention focussed on carer education, carer coping skills and stress management drawing on cognitive behavioural therapy (CBT) techniques. Dysfunctional coping strategies have

since been found to be associated anxiety in those caring for people with Alzheimer's disease (Cooper, Katona, Orrell, & Livingston, 2006).

More robust evidence comes from a meta-analysis of 30 studies detailing psychosocial interventions for caregivers of people with dementia which found modest but significant effects for reductions in psychological distress and morbidity in caregivers, and positive change on measures of coping skills and social support (Brodaty, Green, & Koschera, 2003). A larger meta-analysis of 127 intervention studies with dementia caregivers found that CBT improves caregiver burden with a small to moderate effect size and reduces depression with a large effect size (Pinquart & Sorensen, 2006). This is not surprising bearing in mind that CBT was initially developed as an intervention for depression (Beck, 2011). Further support for CBT approaches was established in a review of carer interventions for dementia that included cognitive reframing which demonstrated a beneficial effect on carer depression, anxiety and stress (Vernooij-Dassen, Draskovic, McCleery, & Downs, 2011). In terms of CBT delivery, a systematic review found a positive impact on psychological morbidity for group based of interventions for dementia caregivers (Thompson et al., 2007)

This service evaluation project was undertaken in the Mental Health of Older Adults (MHOA) Lewisham Psychology & Psychotherapy Service in the South London and Maudsley (SLAM) Trust. The National Institute for Health and Care Excellence (NICE) guidelines for carers of people with dementia recommend group interventions, psychoeducation and/or CBT if a carer experiences psychological distress (NICE, 2006). Consistent with these guidelines, the Lewisham Psychology & Psychotherapy service run an 8 week CBT group for carers of people with a diagnosis of dementia. These groups have been run for the past 7 years as part of routine care. In line with Trust policy these interventions have been evaluated using standardised outcome measures. Two outcome measures have been administered both pre- and post intervention. The purpose of this project is to collate, code and analyse these outcome data in order to evaluate the effectiveness of the group as an intervention to reduce carer burden and increase carer wellbeing. These data will aid understanding of the standard of care that is being provided, and may be used to improve care for future cohorts.

More specifically we aim to examine:

1. Statistically significant changes in carer burden and carer wellbeing
2. Clinically significant change in terms of the proportion of individuals above clinical cut-off points.
3. Themes that emerge from the evaluation data that may improve the delivery of future groups.

In line with these aims, we hypothesise:

1. A reduction in total score on the Zarit Burden Interview from pre- to post intervention.
2. A reduction in total score and factor scores on the GHQ-28 from pre- to post intervention..
3. A reduction in total score on the CORE-OM from pre- to post intervention.
4. A reduction in individuals above clinical cut-offs from pre- to post intervention

Methods

Service Context

The MHOA Lewisham Psychology & Psychotherapy Service deliver CBT for carers groups approximately twice per year.

Participants

Data has been gathered from 67 participants attending a CBT for Carers Group in the MHOA Lewisham Psychology & Psychotherapy Service from Dec 2005 to Dec 2012. Thirteen groups have been run to date – although one group had several early dropouts leaving just one participant so the majority of the programme was delivered on a 1:1 basis. All the groups had the same content and structure but this became more standardised over time i.e. by group 13 comprehensive handouts had been prepared to complement the group content. The groups were always conducted by one Clinical Psychologist/Psychotherapist and one other member of staff from the CMHT which may have been another Clinical Psychologist/Psychotherapist or another professional from the CMHT such as an Occupational Therapist or Community Psychiatric Nurse.

Data is available for 55 women and 12 men. Relationship to the person being cared for is known for 50 participants – 17 people were caring for their husband, 3 for their wife, 27 for a parent and the remainder for a neighbour, sister and father-in-law. Although data on the participants age was not routinely collected approximately 30% of this sample were caring for a spouse so likely to be over 65 years of age.

Assessment session

The intention to run a group would be circulated to the CMHT by email and via MDT meetings. Potential referrals would be contacted to undertake a general assessment of their suitability and to explain the nature and aims of the group, and the commitment required. If the participant was deemed suitable and decided they would like to take part, this would be confirmed in writing. At this stage quantitative outcome measures would also be sent.

Quantitative Outcome Measures

The group was evaluated using two standardised measures; one focused on general well-being and another measure more specifically focussed on carer burden.

Carer Burden

The 22 item Zarit Burden Interview measures perceived carer burden (Hebert, Bravo, & Preville, 2000). The original 29-item questionnaire (Zarit et al., 1980) was reduced to 22 items with a five-point scale ranging from 0 (never) to 4 (always) with total score ranging from 0 to 88. The 22 item measure has been shown to have good inter-item reliability and convergent validity (Rankin, Haut, Keefover, & Franzen, 1994). Guidelines for interpreting the scores have been suggested by the authors ranging from 0 – 21 little or no burden, 21 – 40 mild to moderate burden, 41 – 60 moderate to severe burden, 61 – 88 severe burden (Hebert et al., 2000)

Five groups that ran from 2007 to 2009, plus the group with just one participant completing, did not use this measure but instead were administered 2 Likert scale questions focussing on caring difficulties and effectiveness of coping strategies. These were:

1. Overall how difficult are you finding caring for your relative?
2. How effective do you feel your coping strategies are?

Wellbeing: Clinical Outcomes in Routine Evaluation Outcome Measure (CORE-OM)

Groups run after 2010 were evaluated using the trust-wide recommended Clinical Outcomes in Routine Evaluation Outcome Measure (Evans et al., 2000). This is a 34 item questionnaire which assesses a wide range of psychiatric symptoms over the last week. There are 3 main dimensions measuring 1) Subjective wellbeing, (4 items) 2) Problems and symptoms (12 items), and 3) Life functioning (12 items). Six items are also included to provide a screen for psychological Risk i.e. suicidal ideation and harm to self and others. The measure was designed so that the mean of all 34 items can be used as a global index of distress. Mean scores for each symptom cluster can be calculated, allowing for missing data, with a range is 0-4 with higher scores suggesting more severe symptoms and/or distress. The measure has been shown to have good internal and test-retest reliability, good convergent validity with 7 other measures and is sensitive to change (Evans et al., 2000). However, data suggests reduced reliability for the specific factors in adults over 65 years of age (Barkham et al, 2005) and so bearing in mind that a substantial proportion of our sample are likley to fall in this age range, we only report Total Mean scores.

Wellbeing: 28 item General Health Questionnaire (GHQ-28)

Prior to the introduction of the CORE, the groups were evaluated using the GHQ-28 (Goldberg & Hillier, 1979). This was originally a 60 item measure was designed to capture psychiatric symptoms. There are 4 possible responses to each item: 1) 'not at all', 2) 'no more than usual', 3) 'rather more than usual' 4) 'much more than usual' (Jackson, 2007).

A 'scaled' version was created based on principal components analysis of 523 responses given in a primary care setting (Goldberg & Hillier, 1979). The questionnaire was reduced to 28 items with 7 items on loading onto each of four factors; 1) Somatic symptoms, 2) Anxiety and insomnia, 3) Social dysfunction, and 4) severe depression. Different scoring methods have been proposed, although no advantage has been shown for the more complex scoring methods (Goldberg et al., 1997). In this study we used the original GHQ method, which is sometimes referred to as the 'alternative binary method' whereby the 2 least symptomatic answers score 0 and the 2 most symptomatic answers score 1 (Jackson, 2007). A score exceeding 4 is classified as achieving 'psychiatric caseness' (Jackson, 2007). This method has been shown to detect caseness with 88% sensitivity and 84.2% specificity (Goldberg & Hillier, 1979). The GHQ-28 has been shown to be valid in 10 different languages, and not confounded by gender, age or educational status (Goldberg et al., 1997).

Missing Data

Thirteen cases were not included in the analysis due to neither the wellbeing or carer burden data being complete i.e. no pre measures, no post-measures or in 3 cases no outcome measures at all – see Table 1. Reasons for incomplete datasets include dropping out of the programme for personal reasons, a failure to complete and return measures, and in one case a participant declined to complete the post-group outcome measures as she said it made her feel worse to answer the questions. In addition, for 4 cases wellbeing data was available but not carer burden and in 5 cases carer burden was available but no measure of wellbeing was administered (this was the first group delivered in Dec 2005).

Table 1: Participation and Data Collection for Each CBT for Carers Group Delivered

Group ID and Date	Participants	Datasets Analysed	Missing Data
Group 1: 2005	8	5	N = 3 no post measures
Group 2: Summer 2006	4	4*	
Group 3: Oct 2006	6	4	N = 2 no post measures
Group 4: Spring 2007	3	3	-
Group 5: Oct 2007	7	6+	N = 1 declined to complete measure
Group 6: Spring 2008	5	4	N = 1 no post measures
Group 7: Autumn 2008	4	4	
Group 8: Autumn 2009	7	6+	N = 1 no post measures
Group 9: Spring 2010	1	1	-
Group 10: Autumn 2011	5	4*	N = 1 did not complete group
Group 11: Jan 2012	7	4	N = 2 did not complete group N = 1 no post measures
Group 12: Summer 2012	4	3	N = 1 no post measures
Group 13 Winter 2012	6	6	-
Total:	N = 67	N = 54	N = 13

* 2 participants, one in each group, did not complete the Zarit Burden Interview pre- and post-intervention + 2 participants, one in each group, did not complete the coping questions.

Qualitative Outcome Measures

Anonymised evaluation questionnaires were also administered and data was available for 42 participants. The majority (n=34) completed a 14 item questionnaire which probed practical issues alongside questions relating to outcomes. Six questions relating to content were coded: i) number of sessions ii) were expectations met iii) what did the participant learn? iv) what did they like most? v) what did they like least? and vi) would they recommend the group? The remaining questions focussed on how the participant heard about the group, information provided before the group, timing of group, number of participants in the group, length of sessions, small or large group exercises and an open question. These data were coded into recurring themes. 8 participants completed one of two versions of a different questionnaire with slightly amended questions and a Likert

scale for responding. As these datasets were in the minority, data was extracted in accordance with the 6 questions relating to content detailed above.

Procedure

Participants completed the outcome measures before the group started which are sent in an Invitation pack after assessment (pre-intervention) and also during the final session (post-intervention).

The groups consisted of 8 1.5 hour sessions focussed on the following themes:

Week 1: Introductions to each other and to the group – this included general issues relevant to the group such as setting rules and boundaries around confidentiality, considering the course aims, and how these align with their expectations, discussing the effects of caring and beginning to think about issues they would like to cover in week 7 which is left purposely free to allow some flexibility. Participants are also asked to continue reflecting on what they would want on Week 7 as a home task, and to complete the outcome questionnaires if they hadn't already done so.

Week 2: Introduction to the CBT model – participants are socialised to the CBT model by considering the difference between thoughts, feelings and behaviours and how these interrelate. They are encouraged to complete a Hot Cross bun formulation for Home Task

Week 3: Behaviour and activity planning – after reviewing the Home Task, participants are introduced to the idea of Activity Scheduling with the rationale being grounded in the CBT Model. Home tasks include completing an Activity Schedule and mood ratings for the week, and identifying and scheduling in at least one pleasurable activity.

Week 4: Thinking styles – after reviewing Home tasks, participants are reminded of earlier discussion around how thoughts can impact on mood, how to identify negative automatic thoughts and how to complete a Thought record. Further discussion focuses on generating evidence for and against negative automatic thoughts once they have been identified. Participants are asked to complete a thought record as a Home Task.

Week 5: Problem solving – this week focuses on problem-solving techniques and behaviours that are difficult to manage that can be exhibited by people with a diagnosis of dementia. This is accompanied by a handout for future reference.

Week 6: Coping with caring – this week focuses on specific coping techniques such as relaxation, coping statements, sleep hygiene and also recaps techniques covered in

previous sessions such as activity scheduling and identifying negative automatic thoughts.

Week 7: Specific topic(s) that the group wants to address. These vary by group but past examples include The structure of services for people with dementia and psycho-education on dementia types and pathology

Week 8: Looking ahead – this session focuses on summarising the content covered in the previous 7 weeks, completing outcome measures, completing evaluation forms, responding to any final questions and considering future Home Tasks that individuals in the group might find useful.

Data Analysis

Histograms were used to examine the normality of the pre-and post intervention differences and paired t tests were used where there was not a substantial deviation from normality. Where the data were binomial i.e. caseness, McNemar tests were used. Effect sizes are Cohen's d and d .2 = small, .5 = moderate, .8 =large.

Findings

General Wellbeing

Pre- and post measures of general wellbeing were available for 48 participants – the GHQ-28 for 31 participants and the CORE-OM for 17 participants.

GHQ-28: Paired t tests revealed a significant reduction in Total GHQ score post-intervention (t = 3.36, df 30, p = .002).

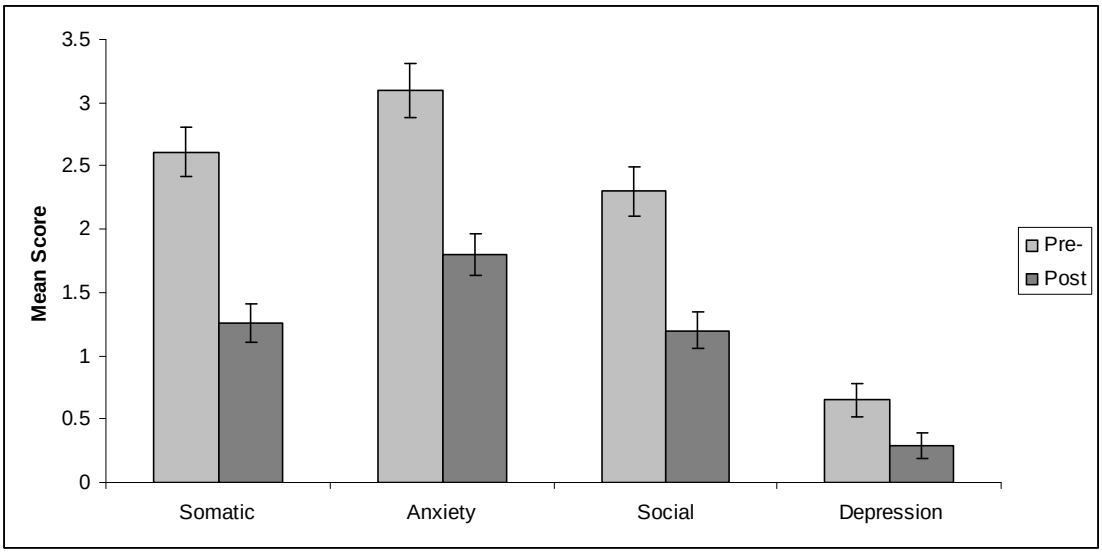
Table 2: Mean and Standard Deviation Scores on the 28 Item General Health Questionnaire

	Pre-intervention	**Post-intervention**	**Effect Size**	**P Value**
Somatic	2.61 ± 2.1	1.26 ± 1.7	.6	p =.002
Anxiety/Insomnia	3.1 ± 2.4	1.8 ± 1.9	.5	p = .008
Social	2.3 ± 2.2	1.2 ± 1.6	.5	p = .008
Depression	.65 ± 1.5	.29 ± 1.1	.2	p = .29
Mean Total Score	8.6 ± 6.7	4.6 ± 4.8	.6	p = .002
Caseness %	65.7%	38.7%	-	p = .035

Regarding symptoms clusters, significant pre- and post-intervention differences emerged in the predicted direction for somatic symptoms (t = 3.3 df 30, p = .002), anxiety/insomnia (t = 2.9, df 30, p = .008), and social dysfunction (t = 2.8, df 30, p = .008), although no

difference was observed on the depression subscale (t = 1.1, df 30, p = .29) – see Table 2 & Figure 1. In addition, significantly less participants met psychiatric caseness criteria post-intervention using the standard cut-off of 4/5 (McNemar p = .035).

Figure 1: Mean Score ± SEM on the 28 Item General Health Questionnaire.



CORE-OM: A mean score was calculated for all completed items, and paired t tests revealed a significant post-intervention reduction (t = 2.4, df 16, p = .027). A mean score for all non-risk items was also calculated, and paired t tests revealed a significant difference in the predicted direction (t = 2.6df 16, p = .02 – see Table 2).

Table 3: Mean and Standard Deviation Scores on the Clinical Outcomes in Routine Evaluation Outcome Measure (CORE-OM)

	Pre-intervention	**Post-intervention**	**Effect Size**	**P Value**
Total Mean Score	1.18 ± .62	1 ± .54	.6	p = .027
Total Mean Score minus Risk items	1.41 ± .71	1.17 ± .6	.63	p = .02

Seven participants met the suggested clinical cut-off for their gender for Total Mean score prior to treatment (38.9%) and 5 after treatment (29.4% McNemar p = .5)

Caregiver Burden

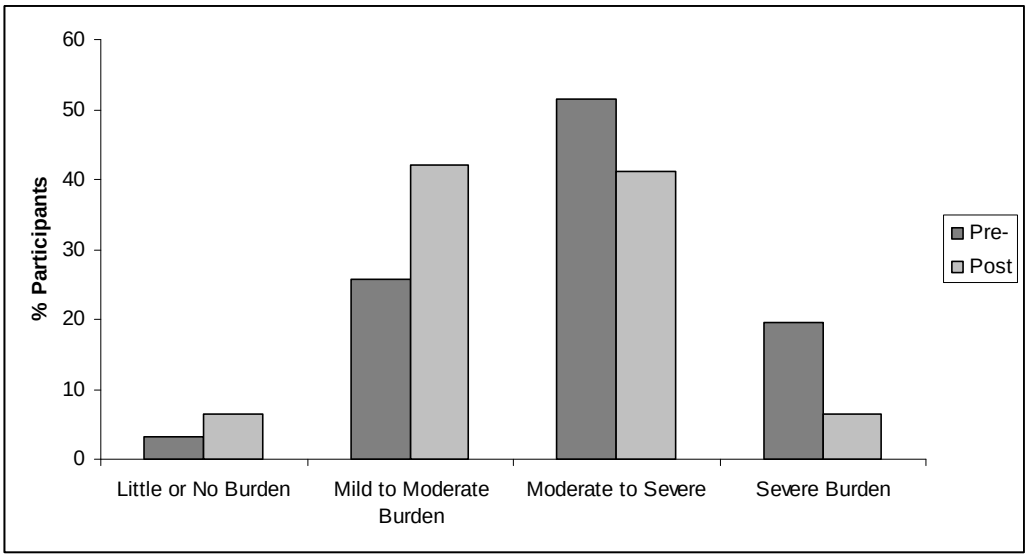
Pre- and post intervention measures of caregiver burden were available for 50 participants – 31 participants were administered the Zarit Burden Interview and 19 instead responded to 2 questions regarding the difficulty of the caring role and strategies for coping, scored on an 8 point scale.

Zarit Burden Interview: Paired t tests revealed a significant reduction in Total Zarit score post-intervention (t = 2.66 df 30, p = .012, ES = .5 - See Table 4; Figure 2. In addition, when the data were collapsed to represent 4 categories of carer burden: 1 = 0– 21 little or no burden, 2 = 21 – 40 mild to moderate burden, 3 = 41 – 60 moderate to severe burden and 4 = 61 – 88 severe burden, paired t tests revealed a significant reduction in category score post-intervention (t = 2.79 df 30, p = .009).

Table 4: Mean and Standard Deviation Total Score on the Zarit Burden Interview with Clinical Categorisation

	Pre-intervention	Post-intervention
Total Score	48.3 ± 15.5	42.5 ± 14.1
Little or No Burden	3.2 %	6.5%
Mild to Moderate Burden	25.8 %	42 %
Moderate to Severe Burden	51.6%	45.2%
Severe Burden	19.4%	6.5%

Figure 2: Percentage of Participants in Each Burden Category Pre- and Post Intervention



Caring Difficulty & Carer Coping: This was measured on an 8 point Likert scale and paired t tests revealed no significant differences between pre- and post intervention (difficult: t = .93 df 18, p = .37; coping t = -.84 df 18, p = .42

Qualitative Evaluation

Forty-two participants completed an anonymous evaluation feedback sheet. The questions were coded according to the type of response given, with common themes collapsed into the following categories:

Was the number of sessions too many/too few/about right? Or 'enough/too much/just right?

23 stated that they thought the number of sessions was 'about right', 14 thought there were 'too few' and 2 stated that there were 'too many'.

Did the group meet your expectations? 37 responded that the intervention met their expectations, 2 said that it was different from what they expected but helpful, 2 said they had no expectations, and one person said that it 'didn't quite meet their expectations but was a good introduction to caring'.

Have you learnt anything that will be helpful to you? When asked if they had 'learnt anything useful', 3 people said they had learnt something useful but did not specify what, 9 specified CBT techniques, 9 specified coping strategies, 6 said both CBT and coping strategies, 2 stated coping strategies and education. Two people said they learnt that they 'are not alone in their thoughts and feelings', 1 person said they learnt humility, and 9 people did not respond to this question

What did you like most about the group? Or 'What were the best parts of the group'? In terms of what participants 'liked most' 34 participants said 'support', 1 person said 'support and education', 1 said they benefitted from being able to express themselves freely, 2 found it useful to identify the link between thoughts and feelings, 1 found it to be 'relaxed', 1 person appreciated the support and handouts, another the support and information, and one person indicated that they liked 'hearing others opinion'.

What did you like least about the group? When asked what they 'liked least' 1 person said 'hearing others sad stories', another the 'lack of males', 2 participants said there were 'too few people', 1 person did not like the fact that 'some people stayed quiet', another said 'lack of direction, poor time management and constant repetition', another said 'occasional silence', another said they liked least the fact that 'some were keen to

discuss caring role rather than CBT and that the aims need to be made clearer', and one person said that it would be 'good to have more information about dementia'.

Overall, 40/42 said they would recommend the group to other carers i.e. 95.2%

Discussion

This service evaluation project considers the effectiveness of a CBT group for carers by examining pre- and post-intervention scores on standardised outcome measures. We found a statistically significant drop in scores on the GHQ-28 for all clusters except depression. In addition, the proportion of participants who met criteria for 'caseness 'showed a statistically significant reduction. We also observed a reduction in mean scores on the CORE-OM. In terms of carer burden, a statistically significant reduction in Total Score was observed along with a statistically significant shift in the category of carer burden with more participants falling into the category of 'mild to moderate burden' as opposed to' moderate to severe' or 'severe burden', post-intervention. In addition, the evaluation data suggest that both the format and content of the group were acceptable for participants.

In terms of pre-intervention scores on the outcome measures administered, it is of note that the majority of participants expressed carer burden at a 'moderate to severe' level. In addition, 65% met caseness criteria on the GHQ, and 38.9% on the CORE-OM. These data are consistent with previous literature indicating that caring for a person with dementia significantly impacts on wellbeing.

More specifically, in terms of the GHQ, which 31 participants completed pre-and post intervention, statistically significant reductions were observed on factors relating to 'somatic symptoms', 'anxiety and insomnia', and social dysfunction, all with moderate effect sizes. In addition, significantly fewer participants met criteria for clinical caseness post-intervention suggesting clinically significant change. However, no statistically significant difference was observed with 'severe depression' for which a smaller effect size was observed. This finding is at odds with previous studies (Pinquart & Sorensen, 2006), however, this is likely to reflect the fact that the pre-intervention score on the 'severe depression' items were much lower than scores on the other factors. This may reflect the fact that this study was service-based and so did not specify inclusion criteria beyond some psychological distress or signs of carer burden. This is in contrast to more robustly controlled trials which often exclude participants that do not meet caseness or diagnostic criteria.

Seventeen participants completed the CORE-OM pre-and post intervention and statistically significant differences were observed on Total Mean score. This measure taps the presence of problems and symptoms, functioning and general subjective wellbeing, so a reduced scores on this measure post-intervention suggests some alleviation of carer burden. In terms of clinical significance on this measure, it is of note that change in the proportion of participants reaching caseness did not reach statistical significance, with only 2 participants moving from clinical to non-clinical range. However, only 38.9% of participants met caseness on the basis of CORE-OM scores pre-intervention although studies have suggested lower cut-offs for older adults which constitute some of the participants in the current sample (Barkham, Culverwell, Spindler, & Twigg, 2005). In addition, the participants in the most case continued to fulfil a caring role which is likely to remain demanding and so aspects of their wellbeing are likely to remain unchanged.

The effect also remained if risk items were removed from the analysis. Examination of the raw data suggests that 4 people endorsed risk items prior to the intervention, and 3 of these continued to endorse risk items, alongside 2 new people. It is likely that this was due to changing circumstances outside of the group. Consistent with these items relating to clinical risk, Trust policy would be to follow this up with the individuals which is routinely done with participants both directly and via the care co-ordinator of the person being cared for.

In terms of carer burden, total score on the Zarit Burden Interview was significantly reduced post-intervention. The effect size was moderate which is line with previous literature (Pinquart & Sorensen, 2006). In addition, there was a significant reduction the categorical score suggesting less participants were categorised as experiencing 'severe' or 'moderate to severe' levels of burden post-intervention. These data suggest that carer burden was somewhat reduced by this intervention. Overall, scores remained quite high on this measure post-intervention, which likely reflects the ongoing impact of caring for a person with dementia. Responses to the two questions regarding carer burden suggest no change, however, this may be due to the data being generated by just 2 items.

Qualitative evaluation data was also gathered from the open-ended questions that participants completed at the end of the course. 88% of the 42 respondents who provided evaluation data, stated that the intervention met their expectations. 55% indicated that the number of sessions i.e. 8 was 'about right' although 33% thought there were too few. In terms of content, participants were asked if they had learnt anything useful, and 21% responded that they found the CBT techniques helpful, 21% coping strategies and 14% found both CBT and coping strategies useful. These data suggest the content of the CBT group is effective. In terms of group vs. individual format, when

participants were asked what they liked most about the intervention, 81% responded that they liked the 'support' provided by the group. This suggests that a group format brings additional benefits for carers of people with a diagnosis of dementia. Overall, these data suggest that both the format and content of the group were acceptable for participants who completed the evaluation questionnaire, which represented 78% of participants for whom we had a pre- and post-intervention measure. It is also of note that the majority of participants completed the group indicating a high rate of adherence and so providing more evidence of acceptability.

Overall, in terms of clinical significance, these data suggest symptom reduction on the GHQ-28 domains, Total Score on the CORE-OM, and overall score on the Zarit Burden Interview scale. We also observed a move from clinical to normative range on GHQ-28 scores for a significant proportion of participants, indicative of clinical change. In addition, the evaluation data confirmed the acceptability of the treatment and adherence rates were high. To summarise, these data suggest that this intervention is likely to be associated with clinically significant change.

Limitations

In terms of limitations, these data were gathered from an opportunity sample rather than participants being randomly allocated to an active or wait-list control group. This limits the generalisability of these data and means that it is not possible to conclude whether the observed changes on outcome measures are due to the specific content of the CBT, non-specific therapeutic factors including the support provided by other participants in the group, or other factors such as the impact of social comparison (Ormel, Koeter, & Brink, 1989). A further uncontrolled factor that could impact on responses are demand characteristics i.e. giving socially desirable responses on outcome measures that are consistent with those hypothesised by the researcher (Ormel et al., 1989), or simply natural change or remission. That said, the evidence base has already been established for the CBT interventions for carers, and the current study instead evaluates the delivery of this intervention in local services.

In terms of content and delivery, this intervention has evolved over time with content being streamlined and outcome measures refined and updated. Although the content has remained the same, some variation may have occurred, which is likely to be reduced in future now the group has been manualised.

Regarding evaluation, outcome measures tended to be scored at session 8 so that they could be fedback to participants. In some instances, the scores for an individual group would be collated and fedback to the team in anonymised form. However, the data was not routinely entered into a database, and instead the raw data, details regarding missing

data, and information about group membership was gathered post-hoc via individual psychologists. Naturally, this led to some unaccounted for missing data and may have led to some error in data collation, coding and analysis bearing in mind that the groups have been run for 7 years. Data was also incomplete for demographic factors such as age.

Implications of the Study

Overall the data suggest that the 8 week CBT for carers of people with dementia group leads to significant reductions in key outcome measures, and is acceptable in terms of the current format and content. No changes to format or content are recommended on the basis of the current data. However, data gathering could be made more robust if the routinely collected outcome data is added to the newly created database at the end of each group. It would also be useful to routinely collect and code the age of participants to enable the validity of outcome measures and coding and analysis methods for different aged cohorts to be considered (Barkham et al., 2005).

Outcome measures could also be anonymised to reduce potential demand characteristics although this would have to be weighed with the benefits of scoring and feeding back individual scores at session 8, which is also likely to reduce missing data. A more robust evaluation of the impact of the content and format of this intervention in routine care could also be conducted by introducing a wait-list control with random allocation to groups. This could be introduced with the 2 groups running per year as is often the case at present. This would allow a more thorough evaluation regarding the active ingredients of this particular intervention. Follow-up data would also give further information as to the effectiveness of the intervention.

Dissemination

This report will be circulated to the psychologists in the MHOA Lewisham Psychology & Psychotherapy service who run these groups routinely. In addition, the author will present these data at one of the quarterly Psychology & Psychotherapy forums, which is attended by all of the Psychologists and Psychotherapists in the CAG. These data can then be used to improve future audits of this intervention and to justify the roll out of this group to the other three MHOA SLaM boroughs.

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