The influence of mindfulness in attention based tasks.

A thesis presented in partial fulfilment of the

requirements for the degree of

Master of Arts

in

Psychology

at Massey University, (Albany),

New Zealand.

Alana Brandy Marshall

2008

Abstract

Mindfulness, defined as the self-regulation of attention so that it is maintained on immediate experience, has demonstrated clinical efficacy for the treatment of a diverse range of mental and physical health concerns. This study sought firstly, to determine whether the mindfulness attention awareness scale (MAAS) developed by Brown and Ryan (2003) in America would be applicable for use with an adult sample in New Zealand. Secondly, this study investigated whether mindfulness, as measured by the MAAS, could be linked to enhanced attentional processing using attentional paradigms from cognitive psychology, including inattentional blindness (IB) and change blindness (CB) tasks. The results support the use of the MAAS with adults in New Zealand. The results also show that participants in the high mindfulness group detected the unexpected event in the IB task and reported changes in the CB task significantly more often than participants in the low mindfulness group. This finding provides support for the prediction that mindfulness and the MAAS would be associated with improvements in sustained attention and switching, in addition to facilitating the identification of objects in unexpected contexts. The results suggest the use and development of mindfulness as a tool to enhance attentional processing for a variety of psychotherapy, occupational, and sporting processes. The discussion considers these issues along with some reservations regarding the use of the MAAS, limitations of the study, and suggestions for future research.

Acknowledgements

I wish to acknowledge the fantastic support and guidance from my supervisors Dr. Heather Buttle* and Dr. Ian Evans*.

I wish to thank the following – my personal mentor Dr. Alan Winton* for his valued wisdom and support, and the psychology department administration and support staff*.

And last, but not least, my family and friends for their unwavering support and confidence throughout this journey.

This research was conducted in accordance with Massey University's human ethics guidelines.

* School of Psychology, Massey University, Albany and Palmerston North.

Contents

The influence of mindfulness in attention based tasks

This study investigated the association between mindfulness and enhanced attentional processing. Traditional and empirical mindfulness definitions, the clinical efficacy of the mindfulness based stress reduction programme, and related interventions will be outlined. In addition proposed explanatory mechanisms of how mindfulness works will be described. Researchers have predicted that mindfulness would facilitate the identification of objects in unexpected contexts and would be linked to improvements in sustained attention and switching. Theoretical models of attention will be detailed to provide conceptual links to the inattentional blindness (IB) and change blindness (CB) paradigms utilised in this study. This paper explores whether the mindfulness attention awareness scale (MAAS) developed by Brown and Ryan (2003) in America can be extended for use with New Zealand adults. In addition this study describes visual attention tasks utilising IB and CB paradigms in an attempt to discover if individuals with higher levels of mindfulness, as determined by the MAAS, detect unexpected stimuli and changes to visual scenes more often than individuals with lower levels of mindfulness. This study should then provide evidence as to the usefulness of mindfulness as a tool for improved attentional processing in applied settings.

Mindfulness definitions

The value and benefits of mindfulness have been recognised in many Eastern countries for the past 2500 years (Kabat-Zinn, 1990). The systematic cultivation of mindfulness is most frequently aligned with Buddhist meditative practices, where it is known as the heart of Buddhist meditation and is comprehensively detailed in the traditional Buddhist literature and psychological texts (Thera, 1962). Within such meditative practices, conscious or heightened attention and awareness are actively fostered (Brown & Ryan, 2003). Although linked to Eastern philosophies one of the major strengths of mindfulness is that it is not dependent on any belief system or ideology, so that its benefits are accessible for anyone to test for themselves (Kabat-Zinn, 1990).

Mindfulness has been traditionally defined as "keeping one's consciousness alive to the present reality" (Hanh, 1976, p.11). Thera (1972), a modern Buddhist monk described the essence of mindfulness as "the clear and single-minded awareness of what actually happens to us and in us at the successive moments of perception" (p. 5). Kabat-Zinn (1994) advocated that mindfulness is "paying attention in a particular way: on purpose, in the present moment, and non-judgementally" (p. 4). Grossman, Niemann,

Schmidt, and Walach (2004) characterised mindfulness as "dispassionate, non-evaluative and sustained moment-to-moment awareness of perceptible mental states and processes. This includes continuous, immediate awareness of physical sensations, perceptions, affective states, thoughts, and imagery" (p. 36).

Recently, Bishop et al. (2004) proposed an operational definition of mindfulness. Bishop et al. (2004) described a two-component model of mindfulness. The first component encompassed the self-regulation of attention so that it is maintained on immediate experience, which in turn should allow for increased recognition of mental events in the present moment. The second component involved adopting an orientation towards present moment experiences characterised by curiosity, openness, and acceptance (Bishop et al., 2004). Both traditional and empirical definitions of mindfulness involve the self-regulation of attention on immediate experience and a non-judgemental and accepting attitude towards one's experiences.

Clinical interventions

In 1979 Kabat-Zinn and colleagues developed a clinical intervention programme based upon the principles of mindfulness (Kabat-Zinn, 1990). The outpatient programme, called mindfulness-based stress reduction (MBSR) serves patients with diverse mental and physical health concerns (Miller, Fletcher, & Kabat-Zinn, 1995). The original aim of the intervention was to facilitate adjustment to medical illness and provided systematic training in mindfulness meditation as a self-regulatory technique to emotion management and stress reduction (Bishop, 2002). The structured programme is carried out over eight to ten weeks with single weekly sessions of 2.5 hours and an additional all day session per course (Grossman et al., 2004). Each session covers particular exercises and topics that are examined within the context of mindfulness including: sitting meditation, body scan, and hatha yoga (Shapiro, Schwartz, & Bonner, 1998). These exercises cultivate the ability to bring attention back to the present moment, by using the breath as an anchor whenever attention has been diverted to streams of thoughts, worries, or a general lack of awareness (Williams, Teasdale, Segal, & Soulsby, 2000). Regular practice is cultivated with 45-minute homework exercises involving meditation, yoga, and applying mindfulness to situations in everyday life (Grossman et al., 2004).

Clinical studies based on the MBSR intervention have revealed improvements in a variety of scales assessing physical, and/or psychological symptoms, and/or overall functional quality of life estimates for patient groups with diverse problems including;

chronic pain (Kabat-Zinn, 1982; Kabat-Zinn, Lipworth, & Burney, 1985; Kabat-Zinn, Lipworth, Burney, & Sellers, 1987; Randolph, Caldera, Tacone, & Greak, 1999), panic disorder and generalised anxiety disorder (Kabat-Zinn et al., 1992; Miller et al., 1995) obsessive compulsive disorder (Singh, Wahler, Winton, & Adkins, 2004), binge eating disorder (Kristeller & Hallett, 1999), anxiety and obsessive neuroses, and narcissistic and borderline personality disorders (Kutz et al., 1985), multiple sclerosis (Mills & Allen, 2000), psoriasis (Kabat-Zinn et al., 1998), fibromyalgia (Kaplan, Goldenberg, & Galvin, 1993), and cancer (Massion, Teas, Hebert, Wertheimer, & Kabat-Zinn, 1995; Speca, Carlson, Goodey, & Angen, 2000; Carlson, Ursuliak, Goodey, Angen, & Speca, 2001; Carlson, Speca, Patel, & Goodey, 2004).

Further improvements associated with MBSR interventions were found for patients with; heterogeneous medical and psychiatric diagnoses (Reibel, Greeson, Brainard, & Rosenzweig, 2001), community volunteers with high stress levels (Williams, Kolar, Reger, & Pearson, 2001), low income Latino outpatients with diverse medical and/or psychological disorders (Roth & Creaser, 1997), and German patients with chronic physical, psychologic, or psychosomatic illnesses (Majumdar, Grossman, Dietz-Waschkowski, Kersig, & Walach, 2002). Clinical research also showed that training in MBSR resulted in demonstrable effects on brain and immune function in healthy employees (Davidson et al., 2003), and increased empathy ratings and spiritual experiences in student samples (Astin, 1997; Shapiro et al., 1998). Meta-analyses conducted by Baer (2003) and Grossman et al. (2004) provided additional support for the efficacy of MBSR programmes.

Other treatment interventions which incorporate mindfulness components as part of the overall intervention include; mindfulness-based cognitive therapy (MBCT), dialectical behaviour therapy (DBT), acceptance and commitment therapy (ACT), and relapse prevention (RP).

Segal, Williams, and Teasdale (2002) formulated MBCT, an eight-week group intervention based on the MBSR programme. MBCT combines training in mindfulness with techniques drawn from cognitive therapy in a comprehensive treatment package specifically tailored to train patients in skills relevant to the prevention of depressive relapse (Teasdale, Segal, & Williams, 1995). MBCT teaches formerly depressed individuals to observe their thoughts and feelings in a non-judgemental way, and to regard them simply as mental events that come and go, rather than aspects of themselves, or as necessarily accurate reflections of reality (Teasdale et al., 2000).

Research on MBCT has demonstrated a significantly reduced risk of relapse for patients with three or more previous episodes of depression (Teasdale et al, 2000), as well as reductions in over-general autobiographical memories postulated to be characteristic of depressed individuals (Williams et al., 2000; Kuyken & Brewin, 1995).

DBT is a multifaceted approach to the treatment of borderline personality disorder, and teaches mindfulness skills within the context of synthesising acceptance and change (Linehan, 1993a; 1993b). DBT offers numerous mindfulness exercises from which clients may choose. Some examples include; observing the breath, the encouragement of mindful awareness during everyday activities, and exercises whereby individuals imagine that the mind is the sky, and that thoughts, feelings, and sensations are clouds that they watch passing by (Linehan, 1993a; 1993b). The efficacy of DBT has been shown by several studies (i.e., Koons et al., 2001; Linehan, Armstrong, Suarez, Allmon, & Heard, 1991; Linehan, Heard, & Armstrong, 1993; Linehan, Tutek, Heard, & Armstrong, 1994).

ACT, developed by Hayes, Strosahl, and Wilson (1999) utilises several strategies, which are consistent with mindfulness approaches. For instance, clients are taught to abandon attempts to control thoughts and feelings, and instead are instructed to observe them non-judgementally and accept them as they are, while changing their behaviours in positive ways to improve their lives (Hayes, 1994). Research has supported the efficacy of ACT (i.e., Strosahl, Hayes, Bergan, & Romano, 1998; Zettle & Raines, 1989).

RP is a cognitive-behavioural treatment package, which aims to forestall relapses in individuals treated for substance abuse (Marlatt & Gordon, 1985). Mindfulness skills are taught as techniques for coping with urges to engage in substance use, and include; observing the urges as they appear, accepting them non-judgementally, and coping with them in adaptive ways (Marlatt, 1994). Empirical studies have provided support for the efficacy of RP (i.e., Curry, Marlatt, Gordon, & Baer, 1988; Ito, Donovan, & Hall, 1988).

Although DBT, ACT, and RP include components of mindfulness, the relative contribution of mindfulness training to these treatment effects has not been investigated (Baer, 2003). Many interventions are adapting mindfulness techniques, and appear to be benefiting clients with diverse mental and physical health concerns.

Explanatory mechanisms

Several researchers have proposed explanatory mechanisms of how mindfulness skills lead to symptom reduction and behaviour change. Mindfulness training is thought to provide a powerful cognitive-behavioural coping tool (Kabat-Zinn et al., 1992). It has been posited by current theory that it is the cognitive-emotional appraisal of situations that determines the stress subsequently experienced (Beck, 1976; Lazarus & Folkman, 1984). Mindfulness practice may lead to changes in thought patterns, or in attitudes about one's thoughts (Baer, 2003). For instance, mindfulness invites participants to discover alternative paradigms, and new interpretations of stress, such as viewing stress as a challenge instead of a threat (Shapiro et al, 1998). In addition, cognitive change appears to result from viewing one's thoughts as temporary phenomena without inherent worth or meaning (Baer, 2003).

Note that there may appear to be many similarities between cognitive behavioural therapy (CBT) and mindfulness, but there are also core structural and theoretical differences. In contrast to CBT, mindfulness does not place any emphasis on differentiating and changing thoughts judged to be irrational or distorted (Baer, 2003). The emphasis in mindfulness is to simply observe thoughts, note their impermanence, and refrain from evaluating them (Baer, 2003). While CBT teaches coping skills to be utilised during stressful moments, mindfulness is seen as a "way of being" to be practiced in all moments (Kabat-Zinn et al., 1992). In CBT clear goals are usually implemented such as changing behaviour or thinking patterns (Baer, 2003). However, mindfulness is practiced with a seemingly paradoxical attitude of non-striving, with no specific goals being adopted (Baer, 2003).

A further proposed mechanism of how mindfulness achieves its effects is in relation to exposure. Sustained, non-judgemental observation of bodily phenomenon, cognitions, emotions, or urges, without avoidance or escape, may lead to the ability to experience such phenomenon without excessive emotional reactivity (Kabat-Zinn et al, 1992; Kabat-Zinn, 1990). Kabat-Zinn (1990) highlighted that several studies involving patients suffering from acute pain have demonstrated that *tuning in* to sensations is a more effective approach to reduce the level of pain experienced when the pain is intense and prolonged than is distraction.

The improved self-observation resulting from mindfulness training has been postulated to promote a variety of coping techniques (Baer, 2003). Increased awareness of pain sensations and stress responses as they occur, may assist individuals to activate a

range of coping responses (Kabat-Zinn, 1982). For instance, mindfulness training may promote recognition of early signs of potential depressive relapse (Teasdale et al., 1995), satiety cues and desires to binge in patients with binge eating disorder (Kristeller & Hallett, 1999), as well as early detection of additive urges (Marlatt, 1994) at a time when the utilisation of previously learned skills would be most likely to be effective in preventing the problem (Teasdale et al., 1995).

Mindfulness training has also been posited as a method for teaching acceptance (Baer, 2003). Kabat-Zinn (1990) described acceptance as one of several foundations of mindfulness practice, and includes the acceptance of bodily sensations, feelings, thoughts, and urges without trying to escape, avoid, or change them. For instance, accepting that panic attacks may occasionally occur, and that they are time limited and not dangerous, may reduce maladaptive behaviours such as avoidance of activities or drug and alcohol abuse (Baer, 2003). Hayes (1994) defined acceptance as "experiencing events fully and without defence, as they are" (p.30). Hayes (1994) also suggested that empirically oriented clinicians may have overemphasised the importance of changing all unpleasant symptoms, without recognising the value of acceptance.

Hayes and Feldman (2004) postulated that mindfulness assists with emotion regulation. Mindfulness cultivates the development of a distanced or 'decentered' relationship with one's internal and external experiences, which in turn decreases emotional reactivity, and assists with a return to baseline after reactivity. These benefits are considered conceptual opposites of the problems of avoidance and over-engagement with emotions (Hayes & Feldman, 2004).

It has been well documented that various meditation strategies lead to the induction of relaxation (Benson, 1975; Orme-Johnson, 1984). However, mindfulness training does not aim to induce relaxation but rather teaches non-judgemental observation of each thought, feeling, and sensation that arises in the stream of consciousness (Baer, 2003). Mindfulness is seen as a form of mental training to decrease cognitive vulnerability to reactive modes of mind that might otherwise amplify stress and emotional distress, or that may otherwise perpetuate psychopathology (Bishop et al., 2004).

Another hypothesised pathway is derived from Schwartz's systems model of self-regulation (Schwartz, 1984). Self-regulation is the process by which a system maintains both stability of functioning and adaptability to new circumstances (Shapiro & Schwartz, 2000). Schwartz (1984) proposed that self-regulation is achieved through continual feedback loops that connect all subsystems to the larger whole. Disregulation

and ensuing disease stem from disconnection of feedback loops as a result of not attending to critical messages within the system. Once disregulation arises, attention is needed to re-establish connectedness, which in turn enhances health. A potential hypothesis is that mindfulness assists in increasing the amount of attention and connection in the human system, leading to increased psychophysiological regulation, balance, and health (Shapiro & Schwartz, 2000). This attentional component of mindfulness is the focus of this study.

Attention

Awareness and attention are the primary features of consciousness (Brown & Ryan, 2004). Awareness has been described as the background "radar" of consciousness, constantly scanning both the inner and outer environment (Brown & Ryan, 2003). Attention has been referred to as the ability to select part of the incoming stimulation requiring more comprehensive information processing (Moray, 1969). Selection of a particular object, a train of thought, or a location in space at which something important might be happening is the essence of attention (Rees, Frackowiak, & Firth, 1997).

An important distinction in the attention literature is made between focused, divided, and sustained attention (Levitin, 2002). Research on focused attention demonstrates how effectively individuals can select certain inputs rather than others, and allows researchers to investigate the nature of the selection process and the fate of unattended stimuli (Levitin, 2002). Divided attention is the extent to which individuals can split attention between two complex tasks, such as following two conversations simultaneously (Craik, Govoni, Naveh-Benjamin, & Anderson, 1996). Divided attention studies provide insights into processing limitations and attentional mechanisms and their capacity (Levitin, 2002). Sustained attention refers to the ability to maintain a state of vigilance over prolonged periods of time (Posner & Rothbart, 1992).

Several theories emerged out of the initial research on focused attention. Broadbent (1958) developed an early selection model of attention. In this model, all incoming sensory information is initially retained in a short-term store and then subsequently forwarded to a selective filter. This filter allows only one message through to the part of the system that has a limited capacity. Preconscious processing cannot occur (unattended information cannot guide later behaviour) as unattended signals if left in sensory memory will rapidly decay and they never receive the additional processing needed for longer-term retention (Broadbent, 1958).

Treisman (1964a) proposed that rather than being completely blocked, the analysis of unattended information is attenuated or reduced. She also suggested that there is a hierarchy of tests, or series of filters that messages pass through. The bottleneck in this model is flexible in terms of whether there is early or late processing, and depends on the amount of resources required for each stage of the analysis or process. (e.g., low attentional demanding stimuli may go on to the semantic stage, whereas more demanding stimuli might get discarded at the physical processing stage) (Treisman, 1964a).

Deutsch and Deutsch (1963) developed a late selection filter model of attention, which was modified by Norman (1968). The combined Deutsch-Norman model reasoned that all stimuli were fully analysed, with the most weighty or relevant stimulus determining the response. In accordance with Broadbent and Treisman, the Deutsch-Norman model assumed the existence of a bottleneck, but located the bottleneck much closer to the response end of the processing system. This model could account for the semantic effects of an unattended message (Styles, 1997) as well as allow for the possibility of preconscious processing (Ellis & Hunt, 1993).

Attentional component

Although clinical interest has been increasingly directed toward the health related outcomes and proposed mechanisms of mindfulness, there are currently no studies that I am aware of which have primarily investigated the attentional component of mindfulness and its relationship to enhanced perceptual processing. However, several researchers have suggested this possibility. Grossman et al. (2004) contended that humans are seen to be largely unaware of their moment-to-moment experience, often operating in a mindless or automatic mode. The persistent, non-evaluative observation of mental content cultivated through mindfulness will gradually give rise to greater veridicality of perceptions (Grossman et al., 2004). Schwartz (1982) mentioned perception when he stated that attention and its regulation lie at the core of perception, appraisal, insight, behaviour change, and coping. Furthermore, Linehan (1993b) highlighted that learning to focus on the present moment cultivates control of attention, a useful skill for people who are often distracted by memories, worries, or negative moods which interfere with their ability to complete important tasks.

Additionally, the first component of the operational definition of mindfulness from Bishop et al. (2004) as mentioned previously encompassed "the self-regulation of attention so that it is maintained on immediate experience, thereby allowing for

increased recognition of mental events in the present moment" (p. 232). This is proposed to lead to a feeling of being very alert to what is occurring in the here and now (Bishop et al., 2004). Bishop et al. (2004) predicted that the development of mindfulness would be related to improvements in sustained attention and switching. These researchers also posited that standard vigilance tests (e.g., Klee & Garfinkel, 1983) and tasks requiring a shift in mind-set (e.g., Rogers & Monsell, 1995) could be utilised to objectively measure this prediction. The change blindness paradigm from cognitive psychology is well suited to test this prediction.

Change blindness

An interesting phenomenon related to focused attention and early and late selection theories, was revealed by investigations into how we integrate visual information across eye fixations to form a stable representation (Simons & Levin, 1997). Despite our impression that we retain the visual details of our surroundings, we are surprisingly unable to detect changes to such details (Simons & Levin, 1998). This failure to see unattended changes has been termed *change blindness* (CB), and occurs both in the laboratory and in real world situations (Simons, Chabris, Schnur, & Levin, 2002). CB requires the absence of focused attention (Rensink, 2000).

In one CB study, observers failed to detect when two men in a photograph exchanged different coloured hats, and only 50% noticed when two people exchanged heads (Grimes, 1996). Surprisingly, participants missed nearly 70% of the changes that occurred during an eye movement (Grimes, 1996). Similarly, CB was induced when changes were made during the interstimulus interval (ISI) between two displays that were each presented for a limited time (e.g., Pashler, 1988; Phillips, 1974; Simons, 1996).

Rensink, O'Regan, and Clark (1997) developed the flicker paradigm, whereby brief blank fields are placed between alternating displays of an original and a modified scene. The disturbances or "transients" generated by the blank field swamp the local motion signals that would normally draw attention to the location of the change (Rensink et al., 1997). The observer must perhaps use a serial search strategy to locate the change (Rensink et al., 1997). Observers found changes very difficult to notice under these flicker conditions, even though the changes occupied large parts of the image, were repeatedly made, and the observers knew they would occur (Rensink et al., 1997). In addition, identification of the change was much faster when a verbal cue was provided,

demonstrating that poor visibility was not the cause of this difficulty (Rensink et al., 1997).

Researchers also discovered that if transients unrelated to the changes (mud splashes) occurred at the same time as the changes, participants ability to detect the changes was greatly reduced, even though the mud splashes did not obscure the changes themselves (O'Regan, Rensink, & Clark, 1999). Similarly, change detection was found to be impaired for changes correlated with eye blinks (O'Regan, Rensink, & Clark, 1997) and by a cut or pan in a motion picture (Levin & Simons, 1997). Another study instructed participants to copy a model of a pattern of coloured blocks. During a saccade one or several blocks in the model were altered. Despite the changes occurring at "regions of interest", participants rarely noticed them (Hayhoe, Bensinger, & Ballard, 1998).

In a real-world study by Simons and Levin (1998) only 50% of the pedestrians detected the change from one actor to the next. For this study an experimenter holding a campus map asked unsuspecting pedestrians for directions to a nearby building. After 10-15 seconds of conversation, two other experimenters carrying a door passed between them. As the door passed, the first experimenter placed himself at the back of the door, and the experimenter who had been carrying that part of the door stayed behind and continued to ask for directions. In addition to having clearly distinguishable voices, the two experimenters also wore different clothing and differed in height by 5cm.

A similar series of change detection studies revealed that participants often do have a representation of some aspects of the pre-change scene even when they fail to report the change (Simons et al., 2002). Furthermore, the participants appeared to "discover" this memory and were able to explicitly report details of the changed object in response to probing questions (Simons et al., 2002). This finding raised the possibility that participants may have implicitly recorded the changes, which subsequently affected their performance (O'Regan, 2000).

Several researchers have proposed explanatory mechanisms of CB. Simons et al. (2002) contended that in general, properties of objects do not change instantaneously during disruptions (i.e., a person we are conversing with is unlikely to replaced by another person). As a consequence, our visual system may simply assume that the world is stable without wasting effort representing much of the detail (Simons et al., 2002). The world may be relied on as an "external memory" with details checked whenever needed, and the assumption that nothing changes without a signal (i.e., motion signal) (O'Regan, 1992).

CB has also been explained in terms of observers failing to detect changes because the changed display masks or overwrites the initial display (Rensink et al., 1997). Thus, any representation of the initial display that could subserve change detection is disrupted or eliminated by the appearance of the second display (or by the visual disruption) (Simons et al., 2002). Support for this hypothesis has stemmed from several studies (i.e., Rensink et al., 1997; Levin, Simons, Angelone, & Chabris, 2002). Alternative explanations to the overwriting hypothesis have included; first impressions, nothing is stored, everything is stored but nothing is compared, and feature combination (see Simons, 2000b for a detailed review of these models).

Rensink et al. (1997) advocated "that the visual perception of change in a scene occurs only when focused attention is given to the part being changed" (p.368). This proposal was based on evidence from the flicker paradigm, which demonstrated that changes to objects in the centre of interest (rather than peripheral or marginal interest changes) were more readily detected (Rensink et al., 1997). As such they are accorded higher priority in a limited capacity visual search (Levin & Simons, 1997). Support for the proposal also came from several studies (i.e., Simons, 2000b; Rensink, 2000; Rensink et al., 2000; Mack & Rock, 1998).

The research on CB highlights the importance of attention in the detection of changes to various stimuli. If mindfulness improves attentional processing, then observers with higher levels of mindfulness should detect changes in the CB paradigms more often and be less prone to CB than observers with lower levels of mindfulness.

Furthermore, researchers have postulated that attention has a limited capacity (Schneider & Shiffrin, 1977). It is thought that through the cultivation of mindfulness, attention is released from elaborative thinking, enabling more resources to be available to process information associated with immediate experience (Bishop et al., 2004). Mindfulness facilitates a direct observation of a range of objects as if for the first time, a quality that is often referred to as a "beginner's mind" (Bishop et al., 2004). This is in contrast to observing experiences through the filter of one's beliefs, assumptions, expectations, and desires (Bishop et al., 2004). Bishop et al. (2004) predicted that through mindfulness practice observers would not bring preconceived beliefs about what should or should not be present, which in turn should facilitate the identification of objects in unexpected contexts. The inattentional blindness task from cognitive psychology would be suited to test this prediction.

Inattentional blindness

Another phenomenon linked to focused attention research in the visual modality and early and late selection theories has also attracted interest from many researchers (Mack & Rock, 1998). It is our intuitive belief that salient or distinctive objects or events in our visual environment will capture our attention, particularly if these objects or events have behavioural consequences (Simons, 2000a). However this commonsense belief has been challenged over the past three decades as research has revealed that observers often fail to notice unexpected objects or events when they are engaged in attention demanding tasks (Mack & Rock, 1998; Simons, 2000a). Such an occurrence has been termed *inattentional blindness* (IB) (Mack & Rock, 1998). IB is thought to require the absence of divided attention (Rensink, 2000).

Mack and Rock (1998) utilised briefly presented static displays to explore the perception of unexpected objects. In their experiments observers decided which arm of a briefly presented cross was longer. After several trials, observers viewed a critical trial where an unexpected object (a small square) appeared alongside the cross. Afterwards, observers were questioned as to whether they had seen anything other than the cross. These researchers discovered a large degree of IB: approximately 25% of observers did not notice the unexpected object on the critical trial. However, even more interesting, was when observers attended to a cross presented parafoveally (away from fixation) and the unexpected stimulus appeared at fixation, nearly 75% showed IB. Unexpected objects with distinctive colours, motions, or orientations were also no more likely to be noticed than were simple black shapes (Mack & Rock, 1998).

Simons (2000a) suggested that attentional capture failed in Mack and Rock's (1998) experiments because the objects were static and presented too briefly. However, prior studies which had utilised the 'selective looking' paradigm reported similar high percentages of IB (Simons, 2000a). Selective looking tasks are a visual analogue of dichotic listening tasks and explore the detection of sustained, dynamic, unexpected visual events (Moray, 1959; Treisman, 1964b). In such tasks an observer is presented with two videotaped or filmed naturalistic events simultaneously, and instructed to attend selectively to one and to ignore the other (Becklen & Cervone, 1983).

In one selective looking task developed by Neisser and Becklen (1975), observers viewed a hand-slapping game superimposed on a display of three people passing a basketball (these displays were partially transparent). After several trials of following one event or the other, observers viewed several critical trials where an unexpected

event occurred in the ignored display (i.e., on one trial, the players in the hand game stopped and shook hands). Neisser and Becklen (1975) found that when observers were attending to one event, they usually did not notice the unexpected event in the ignored stream.

Another study combined the dynamic nature of the selective-looking paradigm, with the rigorous control of the static IB paradigm (Most et al., 2001). The researchers explored the roles of visual similarity, distinctiveness, and attentional set in the detection of unexpected objects (Most et al., 2001). When observers have an attentional set for a certain feature, only that feature will capture attention; if they do not expect that feature, it will not draw attention (Most et al., 2001). Across all conditions, only 50% of observers detected the unexpected object on the critical trial (Most et al., 2001). The findings also suggested that IB for ongoing dynamic events depends on both the similarity of the unexpected object to the other objects in the display and on the observer's attentional set (Most et al., 2001).

Further evidence of IB was derived from a selective-looking study that used a display with two superimposed teams, each playing with a ball game (Becklen & Cervone, 1983). The observers were instructed to monitor one of the two overlapping teams (e.g., the three players wearing the white shirts) and not the other (e.g., the three players wearing the black shirts). During this monitoring task, 67 of the 85 observers failed to see a transparent woman with an open umbrella appear from one side of the screen and walk across the display (Becklen & Cervone, 1983).

In a similar set of conditions, when the unexpected stimulus was a transparent person wearing a gorilla suit, approximately 73% of observers failed to notice it (Simons & Chabris, 1999). Simons and Chabris (1999) were concerned that the degree of IB may have been the result of some oddity of the displays (i.e., the partially transparent displays were not typical of observers real-world visual experience and thus may have impaired observer's ability to detect the unexpected object). These researchers created a set of displays in which all of the players and the unexpected object were opaque and could occlude each other. Despite the full visibility of the displays, on average, approximately 35% of observers did not see the fully visible umbrella woman or gorilla. Furthermore, in an extra condition, the opaque gorilla stopped halfway across the display, thumped its chest, and then exited on the other side of the screen. Surprisingly, 50% of observers failed to see the gorilla. High levels of IB were also found in a study of experienced pilots engaged in aircraft simulator exercises (Haines, 1991).

In an attempt to explain the mechanisms underlying IB, Mack and Rock (1998) postulated that without attention, visual features of the environment are not perceived at all (at least not consciously). More specifically Mack and Rock (1998) argued that "the perceptual object to which attention is directed exists at the level of implicit, unconscious perception, and only if attention is engaged by this object does it become an object of conscious perception" (p. 228). Furthermore, evidence from Mack and Rock's (1998) research point to the importance of stimulus meaning and salience in the capture of attention.

In support of Mack and Rock's (1998) contentions, it has been demonstrated that priming occurs for many stimuli that are not consciously perceived. Priming relates to a procedure whereby an observer is presented with a stimulus that is either below threshold, or shown under conditions in which it is not likely to be an object of attention (Mack & Rock, 1998). Subsequently, the identical or related stimulus is presented to an observer and some response is required (Mack & Rock, 1998). It is taken as evidence that implicit perception of that stimulus occurred if the participant's response shows the influence of the previously presented stimulus (Mack & Rock, 1998). Another failure of attention, called the 'attentional blink' (Raymond, Shapiro, & Arnell, 1992; Shapiro, 1994) provided further support for Mack and Rock's (1998) claims. When a series of stimuli are presented in rapid succession, an attentional blink occurs when observers fail to detect a second target item that occurs within 100-600 msec. after a first target is detected (Mack & Rock, 1998). Evidence of priming has also been shown when a word is presented during an attentional blink (Luck, Vogel, & Shapiro, 1996).

In a similar line of reasoning to CB, the IB research also emphasises the importance of attention in the detection of stimuli in unexpected contexts. Mindfulness is posited to cultivate attentional processing and thus observers with higher levels of mindfulness should detect the unexpected stimuli in the IB paradigms more often and be less prone to IB than observers with lower levels of mindfulness.

Also of interest is whether mindfulness is an inherent trait, which varies in the normal population (i.e., are some individuals more inclined to have higher levels of mindfulness than others?). If mindfulness does vary in the population, is there a particular scale, which captures this? Brown and Ryan (2003) formulated such a scale, termed the mindfulness attention awareness scale (MAAS). Although not extensively researched, the MAAS provides a starting point for assessing dispositional levels of

mindfulness, as it can be used on any group and not just mindfulness practitioners. Brown and Ryan (2003) believe that the attentional component of mindfulness is important which is reflected in their development of the MAAS. The IB and CB tasks from the attention research in cognitive psychology would compliment the use of the MAAS because these tasks reflect the limitations of attentional processing in the visual modality.

This experiment

Can mindfulness enhance attentional processing for the detection of stimuli in unexpected settings, and improve performance on tasks requiring the detection of changes? Although training in mindfulness has been associated with salutary effects for a variety of health related outcomes, there is no evidence that mindfulness leads to enhanced processing of perceptual information in the present moment. Given that mindfulness is postulated to cultivate heightened attention and awareness, this provides the perfect opportunity to investigate mindfulness in relation to visual attention tasks.

In this study I used Brown and Ryan's (2003) mindfulness attention awareness scale (MAAS) to assess dispositional levels of mindfulness from a sample of New Zealand adults. A high mindfulness group and a low mindfulness group were tested on IB and CB tasks taken from attention research in cognitive psychology. The IB and CB tasks were chosen because of their real world value as complex, naturalistic scenes, thus complimenting the types of experiences asked about in the MAAS. Brown and Ryan (2003) highlighted the importance of the attentional component of mindfulness in their scale construction and the IB and CB tasks are suited to test this because they also rely on attention. IB pertains to inabilities to see unattended items, whereas CB relates to a failure to see unattended changes.

This study had three primary aims. Firstly, I examined whether the MAAS was valid and tapped into attention and would thus be applicable for use with adults in New Zealand (scores on the MAAS were also investigated in terms of differences in gender, age, and meditation). Secondly, I predicted that participants with higher levels of mindfulness would detect the unexpected stimulus in the IB task more often than participants with lower levels of mindfulness. Finally, I predicted that participants with higher levels of mindfulness would detect more changes in the CB task than participants with lower levels of mindfulness.

Method

Participants

Initially, 66 females and 48 males (M = 42.95 years, age range 22-65 years) were recruited by means of a snowball sampling technique from Whangarei, New Zealand. Potential participants were provided with a general description of the research. After consent was gained participants completed the MAAS (Brown & Ryan, 2003). Based on the scores from the MAAS, participants from the two tail ends of the scoring distribution were invited into the next stage of the research.

For inclusion into the second stage of the research, participants were required to be native English speakers, have normal or corrected-to-normal vision, and be able to sit at a computer screen for the half an hour duration of the research. Six participants declined to be involved and three participants were unable to be contacted. Participants whose score was next on the scoring list were contacted until sufficient numbers for each group were reached. A total of 23 participants were included in the high mindfulness group and 28 participants were included in the low mindfulness group. Thirty-four participants were female (67%) and 17 were male (33%) (M = 43.5 years, age range, 22-65 years). Thirteen participants in the sample meditated (seven meditated everyday, two meditated three to four times a week, and four meditated infrequently). Each participant received a $10 Whitcoulls gift voucher. A summary sheet detailing the findings of the study was sent to participants who indicated that they were interested. This research was conducted in accordance with Massey University's human ethics guidelines.

Apparatus/Materials

MAAS

Brown and Ryan's (2003) 15-item MAAS measures the frequency of mindful states in day-to-day life, using both general and situation specific statements. The MAAS was chosen for use in this study over other mindfulness scales such as the Toronto mindfulness scale (TMS) developed by Bishop et al. (2004) because I needed a dispositional measure of mindfulness that could be used with any group and not just with mindfulness practitioners. The MAAS is a self-report instrument with a single factor. Participants rated each item according to how frequently or infrequently they currently have each experience. In an attempt to control for socially desirable responding participants were asked to answer according to what really reflected their

experience rather than what they thought their experience should be. Ratings were recorded on a six-point Likert scale, where 1 = almost always, and 6 = almost never, with 2, 3, 4, and 5 being points in between. Items were distributed across cognitive, physical, emotional, interpersonal, and general domains. Sample statements included, 'I could be experiencing some emotion and not be conscious of it until some time later', and 'It seems I am "running on automatic" without much awareness of what I'm doing'. The numbers endorsed for the scale items were added together and divided by 15 to obtain the final score. Higher scores on the MAAS reflected higher levels of dispositional mindfulness. The first group (23 participants) with the higher levels of dispositional mindfulness were chosen from a cut-off score of 4.46 or above. The second group (28 participants) with the lower levels of dispositional mindfulness were chosen with cut-off scores of 3.60 or lower (a copy of the MAAS can be found in appendix 1).

In an American national adult sample (N = 239), the average MAAS score was 4.22 (SD = .63). A sample of fifty Zen meditators showed an average MAAS score of 4.29, (SD = .66) compared to a matched control group (M = 3.97, SD = .64). The temporal stability of the MAAS was examined in an independent sample of 60 American introductory psychology students over a four-week interval. The intraclass correlation (equivalent to a Pearson *r* with two measures) was .81 ($p < .0001$). Test-retest score agreement found that time 1 (3.78) and time 2 (3.77) mean scale scores were not significantly different, $t(59) = .11$. An additional sample of 239 American adults (age range 18-77, M = 43.27 years) provided confirmation of the MAAS factorial structure and reliability.

The convergent and discriminant validity of the MAAS was assessed using a variety of existing scales. The MAAS was correlated at a moderate level with emotional intelligence from the trait meta-mood scale (TMMS; Salovey, Mayer, Goldman, Turvey, & Palfai, 1995 cited in Brown & Ryan, 2003) (Samples A, D, and E: rs = .46, .42, .37 $p < .0001$). Modest positive correlations were found with the NEO personality inventory (NEO-PI; Costa & McCrae, 1992 cited in Brown & Ryan, 2003) openness to experience (Sample A: rs = .18, $p < .01$) and the NEO five-factor inventory (NEO-FFI; Costa & McCrae, 1992 cited in Brown & Ryan, 2003) openness to experience (Samples D and E: rs = .12 and .19, $p < .05$). The MAAS was most strongly related to the mindful engagement subscale of the mindfulness/mindlessness scale (MMS; Bodner & Langer, 2001 cited in Brown & Ryan, 2003) (Samples D and E: rs = .39 and .33, $p < .0001$).

Comparisons with the self-consciousness scale (SCS ; Fenigstein et al., 1975 cited in Brown & Ryan, 2003) found no correlation with the private self-consciousness subscale (Samples A, D, E, and F: rs = .03, .03, .05, -.05, p < .05). Negative relations were found with both the public self-consciousness subscale of the SCS (Samples A, D, E, and F: rs = -.14, -.15, -.02, and –.18, p < .01) and the social anxiety subscale of the SCS (Samples A, D, E, and F: rs = -.36, p < .0001, -.19, p < .01, -.33, p < .0001, and –.29, p < .01). The MAAS was unrelated to the self-monitoring scale-revised (Snyder & Gangestad, 1986 cited in Brown & Ryan, 2003) (Sample B: rs = -.03, p < .01). In comparison to the rumination-reflection questionnaire (RRQ; Trapnell & Campbell, 1999 cited in Brown & Ryan, 2003) the MAAS was unrelated to the reflection subscale (Samples A, D, and E: rs = .06, .16, .20, p < .05) and inversely related to the rumination subscale (Samples B, D, and E: rs = -.39, -.29, -.38, p < .0001).

The MAAS was also correlated with several well-being scales. As a personality trait, neuroticism has been consistently related to poorer psychological well-being (Brown & Ryan, 2003). The MAAS was moderately related to lower levels of this trait as assessed by the neuroticism scales from the NEO-PI and NEO-FFI (Sample A: rs = -.56, p < .0001).

IB

The IB task was from the laboratory of Simons and Chabris (1999). This display showed a team of players wearing white shirts and a team of players wearing black shirts, both throwing a ball to members of their team simultaneously. Participants were instructed to count the passes made by the team wearing white shirts. About half way through the segment an opaque black gorilla entered the display, stopped halfway across the display, turned to face the camera, thumped its chest, and then exited on the other side of the screen.

CB

The CB segments (labelled 'surprise party' 'parade', 'zoo', and 'phone call') were from the laboratory of Levin and Simons (1997). In the first three displays participants viewed short colour DVD clips depicting a conversation between two actors. During the segments various changes were made to items in the display (e.g., the plates on the table changed colour, and a scarf one of the actors was wearing appeared and disappeared across cuts to the display). A total of nine changes were included in the surprise party display, five changes in the parade display, and seven changes in the zoo display. The 'phone call' segment was a silent display, which showed an actor sitting at a desk who

then leaves his desk to answer the telephone in the corridor. This segment involved a change from one actor to another.

Procedure

This study was conducted off campus and so extra concern was given to try to create pseudo-laboratory type conditions. The participants who agreed to be involved with the second stage of the research were contacted by telephone to arrange a time suitable for testing. Each participant was individually tested in their home between the hours of 9am and 4pm to ensure similar lighting levels. Greetings and personal introductions were exchanged upon arrival. Telephones, radios, televisions, or any electrical devices, which may have caused a distraction, were turned off during the testing procedure. Pets were tied up and any other members of the house were asked to leave for the duration of the testing. Ten participants gave written consent to be videotaped during the procedure to ensure treatment integrity. A set of standardised instructions was followed for the testing of each participant (see appendix 2).

To control for the variability of the background visual details in each participant's home, a large piece of cardboard (two metres long by 90cm high) folded into three sides was used to surround the computer screen during every test. The computer and cardboard surround was set up on either a table or a desk. The chair was positioned 100cm from the computer screen. The computer was an Acer Aspire 3000 with a screen measuring 15 inches diagonally. For the DVD clips requiring sound, a speaker was set up to the right of the computer to enhance the sound quality (Figure 1 shows the set up of the computer screen, chair, speaker, and cardboard surround).

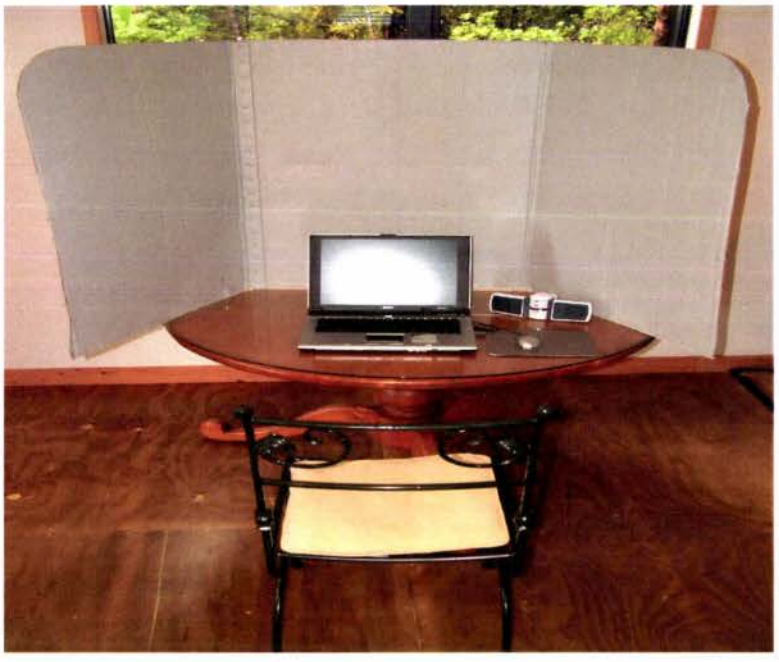

Figure 1: The computer set-up for the IB and CB tasks.

After distractions were minimised, each participant was given an information sheet to read. The information sheet contained the researcher and supervisor's contact details, the research aim, the participant's role, confidentiality and rights statements, and project contacts (a copy of the information sheet can be found in appendix 3). Any questions or concerns from the participants were clarified. Each participant was invited to sign the consent form, which also asked for a mailing address if they wanted to receive a summary of the findings (a copy of the consent form can be found in appendix 4). Participants were instructed to sit down in the chair next to the computer, and were asked whether they were comfortable and ready to proceed.

The IB task had to be conducted first out of all of the tasks because it was essential that participants were not aware that there would be an unexpected event. Participants were asked to carefully read the instructions on the screen and any clarification to questions asked was given. The researcher stated "at the end of this clip I want you to tell me how many passes the team wearing the white shirts made with the ball". Immediately after participants watched the clip, the researcher recorded the number of passes they had observed on a piece of blank paper. If the participants did not spontaneously report the presence of the gorilla, they were then asked, "did you see anything unusual or unexpected occur in the clip?" The clip was shown a second time if

participants did not identify the gorilla. For the second viewing, participants were instructed not to count the passes.

After the IB task a demographic questionnaire was given to each participant to complete. The questionnaire asked for details of age, gender, occupation, marital status, cultural group, whether participant's meditated (if so how often, and for how long each time), hobbies/interests, and sports/exercise (a copy of the demographic questionnaire can be found in appendix 5). Next, the change blindness tasks were selected. Each participant viewed the four clips in a counterbalanced order. Before each clip was shown, participants were encouraged to pay attention to the storyline of the conversations (primary task). This was to try to emulate a naturalistic scene. Participants were also instructed to make a mental note of any changes that they observed (secondary task). Immediately after each segment was viewed, participants were asked, "did you notice anything change during that clip?" The researcher recorded the responses on a blank piece of paper. This procedure was followed until all segments had been viewed and responses to each segment had been recorded.

On completion of the experiment participants were given the opportunity to clarify any questions or concerns that may have arisen throughout the experimental phase. Each participant was thanked for their time and participation in the study. A two-page flyer outlining mindfulness and a $10 Whitcoulls gift voucher was distributed (a copy of the mindfulness flyer can be found in appendix 6).

Results

Part 1:

Evaluation of the data for the MAAS scores of the initial sample pool of 114 participants showed an average score of 4.03, (SD = .70). The range of scores was between 1.93 and 5.33. There was no evidence that the MAAS score distribution was not normal: a Kolmogorov-Smirnov test for goodness-of-fit was insignificant (Kolmogorov- Smirnov Z = .76; p > .05). In comparison to the average MAAS scores for this study, a national sample of 239 adults (average age = 43.27) from Brown and Ryan's (2003) study showed an average MAAS score of 4.22, (SD = .63).

Part 2:

Scores on the MAAS were investigated in terms of differences in gender, age, meditation, and attentional task (IB and CB).

1. High/Low mindfulness

A 1-tailed t-test for independent samples indicated that the high mindfulness group (N = 23) had significantly different average MAAS group scores (M = 4.81, SD = .19) than the lower mindfulness group (N = 28) (M = 3.15, SD = .46), t (49) = 16.21, p < .05. Thus demonstrating that the two groups were distinct.

2. Gender

An examination of male (N = 17) and female (N = 34) group scores for the MAAS using a 2-tailed t-test for independent samples showed that the average score differences between females (M = 3.82, SD = .91) and males (M = 4.04, SD = .93) was non-significant, t (49) = -.82; p > .05.

3. Age

To determine whether there was a statistical association between participant's age (M = 43.49, SD = 11.72) and their MAAS scores (M = 3.89, SD = .91) a 2-tailed Pearson correlation was calculated. The results showed a non-significant correlation, r = .02; N = 51; p > .05.

4. Meditation

It was predicted that meditators would have higher average MAAS scores than non-meditators. However, the means showed that non-meditators (N = 38) had higher scores (M = 3.93, SD = .90) than the meditators (N = 13) (M = 3.81, SD = .96). Assessment of group scores for meditators and non-meditators was conducted with a 2-tailed t-test for

independent samples. The t-test showed the average score differences between meditators and non-meditators was non-significant, $t(49) = -.41$, $p > .05$. Note that Brown and Ryan's (2003) study showed that a sample of Zen meditators (N = 50) had a higher average MAAS score ($M = 4.29$, $SD = .66$) than a matched comparison group ($M = 3.97$, $SD = .64$).

Attentional tasks

1. Inattentional blindness task

The IB task was scored as follows: 1 = gorilla detected, 0 = gorilla not detected. Three scores were omitted from the IB task due to confounds, leaving a total of 48 scores. The confounds were related to participants having prior knowledge of the IB task. Initial evaluation of the data showed very low overall detection rates of the gorilla. Four participants (8%) detected the gorilla, and the remaining participants did not detect the gorilla. All four participants who detected the gorilla belonged to the high mindfulness group (17% of the high mindfulness group, 0% of the low mindfulness group). A 1-tailed t-test for independent samples showed significantly higher MAAS scores for detectors than non-detectors, $t(46) = 2.05$; $p < .05$. The average MAAS group score for this task for the four participants who detected the gorilla was ($M = 4.77$, $SD = .23$) compared to the remaining participants who did not detect the gorilla ($M = 3.85$, $SD = .88$).

2. Change blindness tasks

The 'surprise party', 'parade', and 'zoo' displays were scored by allocating one point for each correct change detected. There were a total of nine changes in the surprise party display, five changes in the parade display, and seven changes in the zoo display. One score from the CB tasks was omitted due to the participant not following instructions, leaving a total of 50 scores. Average mean scores for the three CB tasks were as follows; 'party' ($M = .64$, $SD = .69$), 'zoo' ($M = 1.44$, $SD = 1.51$), 'parade' ($M = .82$, $SD = .94$). Two tailed Pearson correlations were calculated for associations between scores for the party, zoo, and parade tasks. The association between party and zoo scores was significant, $r = .31$; $N = 50$; $p < .05$. The correlation between party and parade scores was significant, $r = .53$; $N = 50$; $p < .05$. Additionally, the correlation between zoo and parade scores was significant, $r = .34$; $N = 50$; $p < .05$. Hence in comparing MAAS groups the three tasks were combined as they all correlated with each other. A 2-tailed Pearson correlation investigating the association between the total

scores for party + zoo + parade, and the average MAAS scores for all participants showed a non-significant result, $r = -.13$, $N = 50$; $p > .05$*.

The CB task labelled 'phone call' was scored as follows: 1 = change of actor detected, 0 = change of actor not detected. In the 'phone call' display, five participants (10%) detected the change of actor, and the remaining participants did not detect the actor change. Participants in the high mindfulness group detected the actor change (17%, N = 4) more often than the participants in the low mindfulness group (4%, N = 1), $t(48) = -1.68$; $p < .05$. The average group score for this task for the five participants who detected the actor change was ($M = 4.54$, $SD = .80$) compared to the remaining participants who did not detect the actor change ($M = 3.83$, $SD = .91$).

* Also t-test non-significant.

Discussion

This study explored whether the mindfulness scale (MAAS) reflects enhanced attentional processing. I used the MAAS to assess dispositional levels of mindfulness in an adult sample. A primary aim of the study was to investigate the applicability of the MAAS with New Zealand adults. Additionally, IB and CB paradigms used in attention research were utilised to assess the association between mindfulness and attentional performance. The main results of this study support the use of the MAAS with New Zealand adults. The results also support the hypotheses that participants with higher levels of mindfulness would detect the unexpected stimulus in the IB task and report more changes in the CB task than participants with lower levels of mindfulness. This finding supports the MAAS as measuring mindfulness in relation to attention. The results will be examined with respect to previous predictions and the considerations and limitations raised by this study will be outlined. Furthermore, the potential applications of these findings will be addressed in addition to suggested areas of future research.

Brown and Ryan (2003) initially validated the MAAS on American student, adult, and cancer samples. Demographic information indicated that the sample pool of 114 participants who completed the MAAS in this study ranged in age from 22 to 65 years ($\underline{M}$ = 42.95). The national adult sample (N = 239) from Brown and Ryan's (2003) study ranged in age from 18 to 77 years ($\underline{M}$ = 43.27). The MAAS scores for the 114 participants in this study appeared to be normally distributed ($\underline{M}$ = 4.03, $\underline{SD}$ = .70). The national adult sample from Brown and Ryan's (2003) study also appeared to have normally distributed scores ($\underline{M}$ = 4.22, $\underline{SD}$ = .63). In addition, a matched comparison group (N = 50) from Brown and Ryan's (2003) Zen meditation study showed an average MAAS score of 3.97 ($\underline{SD}$ = .64). The similarity of the average ages, average scores, and standard deviations for the sample in this study and the samples in Brown and Ryan's (2003) research provided preliminary support for the use of the MAAS with New Zealand adults. However, because this study did not use random sampling, there is the possibility of bias and distortion with the selection of this sample, raising a possible issue with generalisability (Hayes, 2000).

Evaluation of the scores for the MAAS indicated that this scale appears to differentiate between high and low mindfulness groups. This provided support for

Brown and Ryan's (2003) claim that the MAAS is sensitive to individual differences in mindfulness.

A comparison of male and female scores on the MAAS showed no significant differences. This finding suggests that gender is unrelated to levels of mindfulness. Associations between age and MAAS scores also revealed no significant differences. This result indicates that age is unrelated to levels of mindfulness.

Meditation

It was predicted that meditators would have higher average MAAS scores than non-meditators. However, an analysis of the results revealed no significant differences in scores for these two groups. In fact, the results indicated that the meditation group had lower average MAAS scores than the non-meditators. This finding is interesting in the light of evidence from Brown and Ryan's (2003) study which showed significantly higher average MAAS scores for Zen meditators compared with a matched comparison group.

A possible explanation to account for this difference may lie in the composition of the meditation group in this study. In addition to the small number of meditators (N = 13), participants within this group also detailed a diverse range of meditation practices. For instance, five individuals meditated daily, two participants meditated three to four times a week, and four participants meditated infrequently. Such varying meditation practices may not have provided a uniform sample of meditators, thus impacting upon the findings.

On the 'tell us about yourself' questionnaire three questions asked about meditation practices. These included; 'do you meditate?', 'if yes how often?', and 'how long do you meditate for each time?' The questions may not have been specific enough, as some participants who responded to these questions described their meditation practice more in terms of concentrated prayer. Mindfulness meditation practice involving focusing on the breath and using the breath as an anchor whenever the mind becomes distracted may be quite conceptually different from engaging in concentrated prayer. However, Fabbro, Muzar, Bellen, Calacione, and Bava (1999) suggested that there can be significant reductions of simultaneous thought arousal with recitation of prayer, indicating it also acts as a mindfulness technique.

Furthermore, one participant who claimed to meditate daily had the second to lowest score on the MAAS out of 114 participants. The practice of meditation is postulated to enhance mindfulness (Thera, 1962) so this finding is confusing. Perhaps this participant

was more mindful of his mindlessness, and thus scored himself really low on the MAAS, whereas others may not be aware/mindful of their lapses.

Inattentional blindness

The results indicated that the participants who detected the unexpected stimulus had higher MAAS scores than the participants who did not detect the unexpected stimulus. Note that the average MAAS group score for the participants who detected the unexpected stimulus was very high ($\underline{M}$ = 4.77, $\underline{SD}$ = .23), so perhaps very high levels of mindfulness were required. However, the results must be interpreted cautiously due to the low detection rates (8%). Although there are no other studies I am aware of to compare this result, the findings are in accordance with the prediction made by Bishop et al. (2004) who postulated that mindfulness should facilitate object identification in unexpected settings because individuals would not bring preconceived beliefs about what should or should not be present. Furthermore, it has been postulated that attentional capacity is limited (Schneider & Shiffrin, 1977), but Bishop et al. (2004) believed that mindfulness assists in releasing elaborative thinking, which in turn allows more resources to be made available to process information related to current experience. In light of the findings of this study, the predicted mechanism of increased attentional capacity associated with mindfulness has preliminary support.

The low detection rates in the IB task are interesting. Research conducted by Simons and Chabris (1999) using the same paradigm reported detection rates of 42%. Note that the conditions used here were (gorilla, opaque, easy, and white). In Simons and Chabris (1999) study only 12 participants were involved in these same conditions, but still 42% saw the gorilla. Hence, the sample size should have been more than adequate in this study. A possible explanation for the discrepancy between detection rates in past research and this study may lie in the different sample characteristics of the participants involved. For example, past research utilised university students, whereas the participants in this study were on average older in age.

Change blindness

For the change blindness tasks it was predicted that participants in the high mindfulness group would detect more changes than participants in the low mindfulness group. Correlations between the total scores for the 'surprise party', 'parade', and 'zoo' and levels of mindfulness were not significant. However, for the task labelled 'phone call' the change of actor was detected significantly more often by participants in the high mindfulness group than the low mindfulness group. Although this result provided

support for the hypothesis, such a finding must be interpreted cautiously due to the low overall detection rates. In this study, only 10% of the participants detected the change of actor. In comparison, Levin and Simon's (1997) study showed 33% of the 40 participants reported the actor change in the phone call clip.

Together, the results of the IB and CB tasks support the MAAS as a measure of mindfulness in relation to attention.

Considerations/Limitations

Scores for the MAAS may have suffered from a number of distortions such as socially desirable responding and memory biases, a problem with many self-report inventories (Groth-Marnat, 2003). The MAAS included instructions to answer according to what really reflected participant's experience rather than what they thought their experience should be. However, many participants may have inflated their scores in order to 'look good'. Additionally, the scale responses may have been affected by factors such as the participant's mood, fatigue, illness, impatience, distractions, time of day, and a tendency to score leniently, circle the central scale items, or extreme ends of the scale items at the time they filled out the scale (Groth-Marnat, 2003).

The problem may not lie in the honesty of scoring, but may be an inherent flaw within the MAAS itself. The MAAS is a relatively new scale, which has not been extensively researched or validated. Although the MAAS claims to measure dispositional levels of mindfulness, the scale may in fact be measuring something unrelated to mindfulness. In addition several mediating or moderating variables such as level of education, or socio-economic status may have an impact on the relationship between the MAAS and levels of mindfulness.

Brown and Ryan (2003) contended that mindfulness is an individual difference characteristic and hence the MAAS assesses dispositional levels of mindfulness. However, Bishop et al. (2004) conceptualised mindfulness as a state-like phenomenon that is elicited and maintained by regulating attention. These researchers developed the Toronto mindfulness scale (TMS), a 10-item instrument designed to measure mindfulness in response to a specific meditation experience (Hayes & Feldman, 2004). However, the TMS does not assess a more general tendency to experience mindfulness in daily experiences (Hayes & Feldman, 2004). Bishop et al. (2004) contended that the situational specificity of mindfulness can be tested with the TMS, and memory biases would be minimised and reliability increased. However, the MAAS was selected for use over the TMS in this study, as I wanted to measure 'disposition'.

An alternative explanation for the findings in this study may be that the sizes of the monitors in which the displays were presented may have contributed to different detection rates. The size of the screen used in this study was 15 inches. However, the study conducted by Simons and Chabris (1999) used a variety of television monitors, ranging from 13 to 36 inches (diagonal) in screen size to present the DVD clips. Detection rates were still approximately 50% regardless of screen size, so this does not seem to be the likely cause of the discrepancy.

A further possibility may be related to the variable settings (individual homes) in which the participants in this study were tested. Measures were taken to provide uniformity of the testing conditions, such as placing the cardboard screen behind the computer to eliminate visual background disturbances, and eliminating background noises to the best extent possible. However, the fact that participants were tested in their own homes may have resulted in possible confounds. Perhaps participants did not treat the study seriously or had a more relaxed attitude towards the study, than they might have had in a laboratory style setting. The uniformity of the laboratory setting may have given rise to higher detection rates. However, the settings in which this study was conducted may have been more 'natural' and hence had higher ecological validity. Furthermore, reactivity effects and demand characteristics, which can occur in both laboratory and real-world settings, may have impacted upon the findings of the study (Groth-Marnat, 2003).

The CB study by Simons and Levin (1998) explored interactions with pedestrians on the street with variable background distractions. These researchers found similar rates of CB as the studies conducted under controlled laboratory conditions. Although there have been no studies conducted with real world interactions for the IB paradigm, Simons and Levin's (1998) study supports the notion that the setting in which the participants were tested did not constitute a major threat to the validity of the study.

Implicit attentional capture for both the IB and CB tasks cannot be ruled out in this study either. For instance, Fernandez-Duque and Thornton (2000) conducted research on the way that attention relates to nonconscious (or implicit perception) of change. These researchers showed observers a pair of stimuli (one presented after the other) and asked the observers to report if there was a change between the two. Even when observers had no visual experience of change, forced choice guessing or indirect reports showed above-chance accuracy in determining which of the two test items was the one that changed (Fernandez-Duque & Thornton, 2000).

Rensink (2000) also suggested that a brief visual experience may cause or alter some form of priming for successive events over the next few seconds. Levin and Simons (1997) suggested the possibility that observers may be able to discriminate the pre-change actor in the phone call clip from other actors not in the scene when given a recognition or priming task.

A further possibility to explain the results relates to levels of arousal and effort. Eysenck (2001) stated that a person who is highly aroused exerts much effort on the task. Eysenck (2001) postulated that the high levels of arousal may impair performance due to narrowing of attention and a reduced ability to discriminate between task relevant and task irrelevant stimuli, however, the high level of effort will improve performance. This makes it impossible to predict whether performance will be improved or impaired (Eysenck, 2001). In relation to this study, it may not be mindfulness at all that influenced the results, but rather a combination of effort versus arousal. However, individuals who are more mindful may be more relaxed and hence there may be less narrowing of attention.

Another point of concern is in relation to how the participant's responses were recorded for the IB and CB tasks. For instance, immediately after participants had viewed the IB task, they were asked how many basketball passes they had counted and this was written down. If the participant did not spontaneously report seeing the gorilla they were asked, "did you see anything unusual or unexpected occur in the clip?" The participant's responses were then recorded on paper. Similarly after participants viewed each CB clip I asked, "did you notice anything change during that clip?" If participants said "yes", I wrote down the changes. In contrast, in the IB study conducted by Simons and Chabris (1999) participants were asked to write down their count(s) on paper immediately after they had viewed the clip. For all additional responses the participants were asked to write down their responses on paper. Similarly, for the 'phone call' clip in Levin and Simon's (1997) study, participants were handed a response form that asked to "please write a brief description of the video you saw." If the written response did not mention the change from one actor to another, the experimenter directly asked the participant if he or she had noticed the person change. Of interest is whether the oral report method in this study compared to the written response methods in Simons and Chabris (1999) and Levin and Simon's (1997) studies impacted upon the results. Are more or less attentional resources needed for oral responses compared to written responses? Perhaps the oral interaction with the experimenter may have provoked

anxiety in some participants and thus distorted (inhibited recall of changed items) their responses.

A further issue with the methodology of this study relates to the surprise party, zoo, and parade clips from the CB tasks. For these clips participants were instructed to attend to the conversation between the actors as well as notice any changes. In cognitive research attentional capacity has been estimated to be about five items (Pylyshyn & Storm, 1988). Perhaps attending to both the conversation and the changes overloaded the participant's attentional capacity.

Although there are various considerations and limitations that need to be addressed, this study provides support for the MAAS as a measure of mindfulness in relation to attention. The proposal that mindfulness is associated with enhanced attentional processing also has preliminary support.

Potential applications

The results of the present study support an association between high levels of mindfulness and enhanced attentional processing. Such an association may have important applications for a variety of everyday activities. In relation to the efficacy of mindfulness interventions, mindfulness training may also be of assistance for psychologists during the psychotherapy process. Mindfulness teaches individuals to let go of preconceived expectations, and to adopt a beginner's mind. These qualities may assist in a heightened awareness of client's body language and emotional signals. Indeed, Martin (1997) asserted that mindfulness encourages the therapist to enter a task-oriented state in which attitudes such as controlling the situation, being right, or maintaining therapist self-esteem give way to a quiet, more limber, non-reactive, and non-biased response.

Nearly 50% of fatal automobile accidents are attributed to some driver related factors including inattention and distraction (National Highway Traffic Safety Administration, 1999 cited in Simons, 2000a). Individuals with high levels of mindfulness may be more adept at focusing and sustaining their attention to the task of driving. It is postulated that this ability would minimise driver distraction and inattention, and thus help to lower the number of car accidents, and the costs associated with such accidents.

In a similar fashion, high levels of mindfulness may help to minimise work related accidents, again through the ability to focus and sustain attention to the task at hand. High-pressure occupations such as air traffic controllers, pilots, surgeons, and so on, who are responsible for the safety of many lives may well benefit from mindfulness

training. Mindfulness also has the potential to help with worker productivity through enhanced attentional processing.

Sports psychologists may find the techniques taught in mindfulness applicable to enhancing sporting performance in a range of sports. Focused and sustained attention is important in gymnastics, skiing, target shooting, tennis, golf, and several other sports which require high levels of concentration and the right mind-set to perform well.

Parents may find mindfulness skills useful in attending to their children's needs without being preoccupied with past or future concerns.

Future research

Several areas warrant further investigation. In relation to the meditation findings, it would have been informative to ask on the demographic questionnaire how many years participants had practiced meditation, as Brown and Ryan's (2003) study found a positive association between the number of years members in the Zen group had practiced meditation and their scores on the MAAS. The meditation question on the questionnaire should have included a space for participants to describe the type of meditation practice they engaged in. This would address whether the meditation practice was related to mindfulness meditation or concentrated prayer, which may have different implications for the findings. Also, it would be informative to investigate the conceptual similarities or differences between mindfulness meditation practice and concentrated prayer and the implications these would pose for attention.

Another area of future research relates to concerns with the honesty of reporting and response biases on the MAAS. If time had allowed I would have conducted a reliability check on this scale by asking the participants to complete the scale again two weeks later, then compared the scores for the two time intervals. Also, it would have been informative to ask the participant's significant other to fill out the MAAS on behalf of the participant to examine any possible discrepancies in scoring. It may be important to examine whether the participant's educational levels and socio-economic status would influence the relationship between the MAAS and levels of mindfulness.

The MAAS was chosen for use in this study because I wanted to measure disposition. However, the Toronto mindfulness scale – TMS (Bishop et al., 2004) may be a promising tool in the future to assess the attentional components of mindfulness for tasks similar to those outlined in this study. More specifically, it may be fruitful to investigate whether engaging participants in a mindfulness technique (such as a guided

meditation exercise) immediately prior to the IB and CB tasks would enhance performance on such tasks.

Several additional areas warrant further investigation and include the following. Because this study did not utilise a random sample, it would be interesting to see if similar results would be obtained with a random sample. Would a laboratory setting yield different detection rates than the more natural settings in which this study was conducted? Would different computer screen sizes contribute to different detection rates? Can the results be attributed to mindfulness, or have participant's levels of arousal and effort influenced the findings? Would oral versus written responses for the attentional tasks impact upon the results? Would omitting the instructions to keep track of the conversation in the CB task have helped participants to detect more changes, because more attentional resources may have been available?

Furthermore, to address the concern of implicit attentional capture, future research utilising priming or forced choice recognition tasks may be informative. For instance, in the IB task if participants did not report the presence of the gorilla when asked if they had seen anything unusual or unexpected occur during the DVD clip, a forced-choice guessing task could be utilised. Participants could be instructed to respond to two pictures, one of which showed a gorilla, and asked if they had detected any of these images during the IB task. If the percentage of observers who chose the gorilla image showed above-chance accuracy, then this would suggest implicit attentional capture. The utilisation of priming tasks directly after the IB and CB clips would also provide evidence for failures of perception versus failures of memory (or implicit attentional capture) (Wolfe, 1999).

Although several areas of potential research have been mentioned, some additional ideas are as follows. Would a more mindful person be more or less affected by changes that involved emotional content? Would mindfulness vary according to different contexts? (i.e., would an individual be more mindful at work versus at home?) Can mindfulness enhance attentional processing in other sensory modalities such as hearing and tactile stimulation? Are cultural variables associated with mindfulness? Is there a genetic component to mindfulness? Are there identifiable changes to the brain associated with mindfulness training?

Conclusion

In conclusion, the results of this research support the applicability of the MAAS for use with adults in New Zealand. In addition although several studies have demonstrated

the efficacy of mindfulness for a number of health related outcomes, there are no known studies which have investigated whether mindfulness is associated with enhanced attentional processing. The results of this study provide preliminary support for the contention that mindfulness as measured by the MAAS is associated with enhanced attentional processing. More specifically, the results suggested that the individuals who detected the unexpected stimulus in the IB task and who detected the changes in the CB tasks had higher MAAS scores than those who did not. This supports Bishop et al's. (2004) predictions, that mindfulness would be associated with improvements in sustained attention and switching, as well as facilitate the identification of objects in unexpected settings. Finally, mindfulness shows promise as a tool for enhancing attentional processing in a variety of applications such as psychotherapy, driving, work, and sporting processes.

References

Astin, J.A. (1997). Stress-reduction through mindfulness meditation: Effects on psychological symptomatology, sense of control, and spiritual experiences. *Psychotherapy and Psychosomatics, 66,* 97-106.

Baer, R.A. (2003). Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical Psychology: Science and Practice, 10,* 125-143.

Beck, A.T. (1976). *Cognitive therapy and the emotional disorders.* New York: International Universities Press.

Becklen, R., & Cervone, D. (1983). Selective looking and the noticing of unexpected events. *Memory & Cognition, 11*, 601-608.

Benson, H. (1975). *The relaxation response*. New York: Morrow.

Bishop, S.R. (2002). What do we really know about mindfulness-based stress reduction? *Psychosomatic Medicine, 64*, 71-84.

Bishop, S.R., Lau, M., Shapiro, S., Carlson, L., Anderson, N.D., Carmody, J., Segal, Z.V., Abbey, S., Speca, M., Velting, D., & Devins, G. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice, 11*, 230-241.

Broadbent, D.E. (1958). *Perception and communication*. Oxford: Pergamon.

Brown, K.W., & Ryan, R.M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology, 84*, 822-848.

Brown, K.W., & Ryan, R.M. (2004). Perils and promise in defining and measuring mindfulness: Observations from experience. *Clinical Psychology: Science and Practice, 11*, 242-248.

Carlson, L.E., Speca, M., Patel, K.D., & Goodey, E. (2004). Mindfulness-based stress reduction in relation to quality of life, mood, symptoms of stress and levels of cortisol, dehydroepiandrosterone sulphate (DHEAS) and melatonin in breast and prostate cancer outpatients. *Psychoneuroendocrinology, 29*, 448-474.

Carlson, L.E., Ursuliak, Z., Goodey, E., Angen, M., & Speca, M. (2001). The effects of a mindfulness meditation-based stress reduction program on mood and symptoms of stress in cancer outpatients: 6-month follow-up. *Supportive Care in Cancer, 9*, 112-123.

Craik, F.I.M., Govoni, R., Naveh-Benjamin, M., & Anderson, N.D. (1996). The effects of divided attention on encoding and retrieval processes in human memory. *Journal of Experimental Psychology: General, 125*, 159-180.

Curry, S.J., Marlatt, G.A., Gordon, J., & Baer, J.S. (1988). A comparison of alternative theoretical approaches to smoking cessation and relapse. *Health Psychology, 7,* 545-556.

Davidson, R.J., Kabat-Zinn, J., Schumacher, J., Rosenkranz, M., Muller, D., Santorelli, S.F., Urbanowski, F., Harrington, A., Bonus, K., & Sheridan, J.F. (2003). Alterations in brain and immune function produced by mindfulness meditation. *Psychosomatic Medicine, 65*, 564-570.

Deutsch, J.A., & Deutsch, D. (1963). Attention: Some theoretical considerations. *Psychological Review, 70,* 80-90.

Ellis, H.C., & Hunt, R.R. (1993). *Fundamentals of cognitive psychology*. Madison, WIS: Brown & Benchmark.

Eysenck, M.W. (2001). *Principles of cognitive psychology.* London: Psychology Press.

Fabbro, F., Muzar, A., Bellen, R., Calacione, T., & Bava, A. (1999). Effects of praying and a working memory task in participants trained in meditation and controls on the occurrence of spontaneous thoughts. *Perceptual & Motor Skills, 88*, 765-770.

Fernandez-Duque, D., & Thornton, I.M. (2000). Change detection without awareness: Do explicit reports underestimate the representation of change in the visual system? *Visual Cognition, 7,* 324-344.

Grimes, J. (1996). On the failure to detect changes in scenes across saccades. In K. Akins (Ed.), *Perception* (pp. 89-110). New York: Oxford University Press.

Grossman, P., Niemann, L., Schmidt, S., & Walach, H. (2004). Mindfulness-based stress reduction and health benefits: A meta-analysis. *Journal of Psychosomatic Research, 57*, 35-43.

Groth-Marnat, G. (2003). *Handbook of psychological assessment* (4th ed.). New Jersey: John Wiley & Sons, Inc.

Haines, R.F. (1991). A breakdown in simultaneous information processing. In G. Obrecht & L.W. Stark (Eds.), *Presbyopia research: From molecular biology to visual adaptation* (pp. 171-175). New York: Plenum Press.

Hanh, T.N. (1976). *Miracle of mindfulness*. Boston: Beacon.

Hayes, N. (2000). *Doing psychological research.* Buckingham: Open University Press.

Hayes, S.C. (1994). Content, context, and the types of psychological acceptance. In S.C. Hayes, N.S. Jacobson, V.M. Follette, & M.J. Dougher (Eds.), *Acceptance and change: Content and context in psychotherapy* (pp. 13-32). Reno, NV: Context Press.

Hayes, A.M., & Feldman, G. (2004). Clarifying the construct of mindfulness in the context of emotion regulation and the process of change in therapy. *Clinical Psychology: Science and Practice, 11*, 255-262.

Hayes, A.C., Strosahl, K., & Wilson, K.G. (1999). *Acceptance and commitment therapy*. New York: Guilford Press.

Hayhoe, M., Bensinger, D.G., & Ballard, D.H. (1998). Task constraints in visual working memory. *Vision Research, 38*, 125-137.

Ito, J.R., Donovan, D.M., & Hall, J.J. (1988). Relapse prevention in alcohol aftercare: Effects on drinking outcome, change process, and aftercare attendance. *British Journal of Addiction, 83*, 171-181.

Kabat-Zinn, J. (1982). An outpatient program in behavioural medicine for chronic pain patients based on the practice of mindfulness meditation: Theoretical considerations and preliminary results. *General Hospital Psychiatry, 4*, 33-47.

Kabat-Zinn, J. (1990). *Full catastrophe living: Using the wisdom of your body and mind to face stress, pain, and illness*. New York: A Delta Book.

Kabat-Zinn, J. (1994). *Wherever you go there you are: Mindfulness meditation in everyday life*. New York: Hyperion.

Kabat-Zinn, J., Lipworth, L., & Burney, R. (1985). The clinical use of mindfulness meditation for the self-regulation of chronic pain. *Journal of Behavioural Medicine, 8*, 163-190.

Kabat-Zinn, J., Lipworth, L., Burney, R., & Sellers, W. (1987). Four-year follow-up of a meditation-based program for the self-regulation of chronic pain: Treatment outcomes and compliance. *Clinical Journal of Pain, 2,* 159-173.

Kabat-Zinn, J., Massion, A.O., Kristeller, J., Peterson, L.G., Fletcher, K.E., Pbert, L., Lenderking, W.R., & Santorelli, S.F. (1992). Effectiveness of a meditation-based stress reduction program in the treatment of anxiety disorders. *American Journal of Psychiatry, 149*, 936-943.

Kabat-Zinn, J., Wheeler, E., Light, T., Skillings, A., Scharf, M.J., Cropley, T.G., Hosmer, D., & Bernhard, J.D. (1998). Influence of a mindfulness meditation-

based stress reduction intervention on rates of skin clearing in patients with moderate to severe psoriasis undergoing phototherapy (UVB) and photochemotherapy (PUVA). *Psychosomatic Medicine, 60,* 625-632.

Kaplan, K.H., Goldenberg, D.L., & Galvin, N.M. (1993). The impact of a meditation-based stress reduction program on fibromyalgia. *General Hospital Psychiatry, 15,* 284-289.

Klee, S.H., & Garfinkel, B.D. (1983). The computerised continuous performance task: A new measure of inattention. *Journal of Abnormal Psychology, 11*, 487-495.

Koons, C.R., Robins, C.R., Tweed, J.L., Lynch, T.R., Gonzalez, A.M., Morse, J.Q., et al. (2001). Efficacy of dialectical behaviour therapy in women veterans with borderline personality disorder. *Behaviour Therapy, 32*, 371-390.

Kristeller, J.L., & Hallett, C.B. (1999). An exploratory study of a meditation-based intervention for binge-eating disorder. *Journal of Health Psychology, 4*, 357-363.

Kutz, I., Leserman, J., Dorrington, C., Morrison, C., Borysenko, J., & Benson, H. (1985). Meditation as an adjunct to psychotherapy. *Psychotherapy and Psychosomatics, 43*, 209-218.

Kuyken, W., & Brewin, C.R. (1995). Autobiographical memory functioning in depression and reports of early abuse. *Journal of Abnormal Psychology, 104,* 585-591.

Lazarus, R.S., & Folkman, S. (1984). *Stress, appraisal, and coping.* New York: Springer.

Levin, D.T., & Simons, D.J. (1997). Failure to detect changes to attended objects in motion pictures. *Psychonomic Bulletin & Review, 4*, 501-506.

Levin, D.T., Simons, D.J., Angelone, B.L., & Chabris, C.F. (2002). Memory for centrally attended changing objects in an incidental real-world change detection paradigm. *British Journal of Psychology, 93,* 289-303.

Levitin, D.J. (2002). *Foundations of cognitive psychology: Core readings*. United States of America: Massachusetts Institute of Technology.

Linehan, M.M. (1993a). *Cognitive-behavioural treatment of borderline personality disorder*. New York: Guilford Press.

Linehan, M.M. (1993b). *Skills training manual for treating borderline personality disorder*. New York: Guilford Press.

Linehan, M.M., Armstrong, H.E., Suarez, A., Allmon, D., & Heard, H.L. (1991). Cognitive-behavioural treatment of chronically suicidal borderline patients.

Archives of General Psychiatry, 48, 1060-1064.

Linehan, M.M., Heard, H.L., & Armstrong, H.E. (1993). Naturalistic follow-up of a behavioural treatment for chronically parasuicidal borderline patients. *Archives of General Psychiatry, 50,* 157-158.

Linehan, M.M., Tutek, D., Heard, H.L., & Armstrong, H.E. (1994). Interpersonal outcome of cognitive-behavioural treatment for chronically suicidal borderline patients. *American Journal of Psychiatry, 51*, 1771-1776.

Luck, S., Vogel, E., & Shapiro, K. (1996). Word meanings can be accessed but not reported during the attentional blink. *Nature, 383*, 616-618.

Mack, A., & Rock, I. (1998). *Inattentional blindness*. United States of America: Massachusetts Institute of Technology.

Majumdar, M., Grossman, P., Dietz-Waschkowski, B., Kersig, S., & Walach, H. (2002). Does mindfulness meditation contribute to health? Outcome evaluation of a German sample. *The Journal of Alternative and Complementary Medicine, 8,* 719-730.

Marlatt, G.A. (1994). Addiction, mindfulness, and acceptance. In S.C. Hayes, N.S. Jacobson, V.M. Follette, & M.J. Dougher (Eds.), *Acceptance and change: Content and context in psychotherapy* (pp. 175-197). Reno, NV: Context Press.

Marlatt, G.A., & Gordon, J.R. (1985). *Relapse prevention: Maintenance strategies in the treatment of addictive behaviours.* New York: Guilford Press.

Martin, J.R. (1997). Mindfulness: A proposed common factor. *Journal of Psychotherapy Integration, 7*, 291-312.

Massion, A.O., Teas, J., Hebert, J.R., Wertheimer, M.D., & Kabat-Zinn, J. (1995). Meditation, melatonin, and breast/prostate cancer: Hypothesis and preliminary data. *Medical Hypotheses, 44*, 39-46.

Miller, J.J., Fletcher, K., & Kabat-Zinn, J. (1995). Three-year follow-up and clinical implications of a mindfulness meditation-based stress reduction intervention in the treatment of anxiety disorders. *General Hospital Psychiatry, 17*, 192-200.

Mills, N., & Allen, J. (2000). Mindfulness of movement as a coping strategy in multiple sclerosis: A pilot study. *General Hospital Psychiatry, 22*, 425-431.

Moray, N. (1959). Attention in dichotic listening: Affective cues and the influence of instructions. *Quarterly Journal of Experimental Psychology, 11*, 56-60.

Moray, N. (1969). *Attention: Selective processes in vision and hearing.* London: Hutchinson.

Most, S.B., Simons, D.J., Scholl, B.J., Jimenez, R., Clifford, E., & Chabris, C.F. (2001). How not to be seen: The contribution of similarity and selective ignoring to sustained inattentional blindness. *Psychological Science, 12*, 9-17.

Neisser, U., & Becklen, R. (1975). Selective looking: Attending to visually specified events. *Cognitive Psychology, 7*, 480-494.

Norman, D.A. (1968). Toward a theory of memory and attention. *Psychological Review, 75*, 522-536.

O'Regan, J.K. (1992). Solving the 'real' mysteries of visual perception: The world as an outside memory. *Canadian Journal of Psychology, 46*, 461-488.

O'Regan, J.K. (2000). Thoughts on change blindness. In L.R. Harris & M. Jenkin (Eds.), *Vision and attention.* United States of America: Springer Verlag.

O'Regan, J.K., Rensink, R.A., & Clark, J.J. (1997). Picture changes during blinks: Not seeing where you look and seeing where you don't look. *Investigative Ophthalmology and Visual Science, 38*, S707.

O'Regan, J.K., Rensink, R.A., & Clark, J.J. (1999). Change-blindness as a result of "mudsplashes". *Nature, 398*, 34.

Orme-Johnson, D.W. (1984). Autonomic stability and transcendental meditation. In D.H. Shapiro, Jr., & R.N. Walsh (Eds.), *Meditation: Classic and contemporary perspectives* (pp.510-518). New York: Aldine.

Pashler, H. (1988). Familiarity and visual change detection. *Perception & Psychophysics, 44,* 369-378.

Phillips, W.A. (1974). On the distinction between sensory storage and short-term visual memory. *Perception & Psychophysics, 16*, 283-290.

Posner, M.I., & Rothbart, M.K. (1992). Attentional mechanisms and conscious experience. In A.D. Milner & M.D. Rugg (Eds.), *The neuropsychology of consciousness* (pp. 91-111). Toronto: Academic Press.

Pylyshyn, Z.W., & Storm, R.W. (1988). Tracking multiple independent targets: Evidence for a parallel tracking mechanism. *Spatial Vision, 3*, 179-197.

Randolph, P.D., Caldera, Y.M., Tacone, A.M., & Greak, M.L. (1999). The long-term combined effects of medical treatment and a mindfulness-based behavioural program for the multidisciplinary management of chronic pain in west Texas. *Pain Digest, 9*, 103-112.

Raymond, J., Shapiro, K., & Arnell, K. (1992). Temporary suppression of visual processing in an RSVB task: An attentional blink? *Journal of Experimental*

Psychology: Human Perception and Performance, 18, 849-860.

Rees, G., Frackowiak, R., & Firth, C. (1997). Two modulatory effects of attention that mediate object categorization in human cortex. *Science, 275*, 835-838.

Reibel, D.K., Greeson, J.M., Brainard, G.C., & Rosenzweig, S. (2001). Mindfulness-based stress reduction and health-related quality of life in a heterogeneous patient population. *General Hospital Psychiatry, 23*, 183-192.

Rensink, R.A. (2000). Visual search for change: A probe into the nature of attentional processing. *Visual Cognition, 7*, 345-376.

Rensink, R.A., O'Regan, J.K., & Clark, J.J. (1997). To see or not to see: The need for attention to perceive changes in scenes. *Psychological Science, 8,* 368-373.

Rensink, R.A., O'Regan, J.K., & Clark, J.J. (2000). On the failure to detect changes in scenes across brief interruptions. *Visual Cognition, 7*, 127-146.

Rogers, R.D., & Monsell, S. (1995). Costs of a predictable switch between simple cognitive tasks. *Journal of Experimental Psychology, 124*, 207-231.

Roth, B., & Creaser, T. (1997). Mindfulness meditation-based stress reduction: Experience with a bilingual inner-city program. *The Nurse Practitioner, 22,* 150-176.

Segal, Z.V., Williams, J.M., & Teasdale, J.D. (2002). *Mindfulness-based cognitive therapy for depression.* New York: The Guilford Press.

Schneider, W., & Shiffrin, R.M. (1977). Controlled and automatic human information processing: 1. Detection, search, and attention. *Psychological Review, 84*, 1-66.

Schwartz, G.E. (1982). Disregulation and systems theory: A biobehavioural framework for biofeedback and behavioural medicine. In D. Shapiro et al. (Eds.), *Biofeedback and behavioural medicine* (pp. 27-56). New York, Aldine.

Schwartz, G.E. (1984). Psychobiology of health: A new synthesis: In B.L. Hammonds and C.J. Scheirer (Eds.), *Psychology and health: Master lecture series*. (Vol. 3, pp. 145-195). Washington D.C: American Psychological Association.

Shapiro, K. (1994). The attentional blink: The brain's eyeblink. *Current Directions in Psychological Science, 3*, 86-89.

Shapiro, S.L., & Schwartz, G.E. (2000). Intentional systemic mindfulness: An integrative model for self-regulation and health. *Advances in Mind-Body Medicine, 16*, 128-134.

Shapiro, S.L., Schwartz, G.E., & Bonner, G. (1998). Effects of mindfulness-based stress reduction on medical and premedical students. *Journal of Behavioural*

Medicine, 21, 581-599.

Simons, D.J. (1996). In sight, out of mind: When object representations fail. *Psychological Science, 7*, 301-305.

Simons, D.J. (2000a). Attentional capture and inattentional blindness. *Trends in Cognitive Sciences, 4*, 147-155.

Simons, D.J. (2000b). Current approaches to change blindness. *Visual Cognition, 7*, 1-15.

Simons, D.J., & Chabris, C.F. (1999). Gorillas in our midst: Sustained inattentional blindness for dynamic events. *Perception, 28*, 1059-1074.

Simons, D.J., Chabris, C.F., Schnur, T., & Levin, D.T. (2002). Evidence for preserved representations in change blindness. *Consciousness and Cognition, 11*, 78-97.

Simons, D.J., & Levin, D.T. (1997). Change blindness. *Trends in Cognitive Sciences, 1*, 261-267.

Simons, D.J., & Levin, D.T. (1998). Failure to detect changes to people during a real-world interaction. *Psychonomic Bulletin & Review, 5*, 644-649.

Singh, N.N., Wahler, R.G., Winton, A.S.W., & Adkins, A.D. (2004). A mindfulness-based treatment of obsessive-compulsive disorder. *Clinical Case Studies, 3*, 275-287.

Speca, M., Carlson, L.E., Goodey, E., & Angen, M. (2000). A randomised, wait-list controlled clinical trial: The effect of a mindfulness meditation-based stress reduction program on mood and symptoms of stress in cancer outpatients. *Psychosomatic Medicine, 62*, 613-622.

Strosahl, K.D., Hayes, S.C., Bergan, J., & Romano, P. (1998). Assessing the field effectiveness of acceptance and commitment therapy: An example of the manipulated training research method. *Behaviour Therapy, 29*, 35-64.

Styles, E.A. (1997). *The psychology of attention*. Britain: Psychology Press Ltd.

Teasdale, J.D., Segal, Z., & Williams, J.M.G. (1995). How does cognitive therapy prevent depressive relapse and why should attentional control (mindfulness) training help? *Behaviour Research and Therapy, 33*, 25-39.

Teasdale, J.D., Williams, J.M., Soulsby, J.M., Segal, Z.V., Ridgeway, V.A., & Lau, M.A. (2000). Prevention of relapse/recurrence in major depression by mindfulness-based cognitive therapy. *Journal of Consulting and Clinical Psychology, 68*, 615-623.

Thera, N. (1962). *The heart of Buddhist meditation: A handbook of mental training*

based on the Buddha's way of mindfulness. London: Rider and Company.

Thera, N. (1972). *The power of mindfulness.* San Francisco, CA: Unity Press.

Treisman, A.M. (1964a). Verbal cues, language, and meaning in selective attention. *American Journal of Psychology, 77*, 206-219.

Treisman, A.M. (1964b). Monitoring and storage of irrelevant messages in selective attention. *Journal of Verbal Learning and Verbal Behaviour, 3,* 449-459.

Williams, K.A., Kolar, M.M., Reger, B.E., & Pearson, J.C. (2001). Evaluation of a wellness-based mindfulness stress reduction intervention: A controlled trial. *American Journal of Health Promotion, 15*, 422-432.

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

Wolfe, J.M. (1999). Inattentional amnesia. In V. Coltheart (Ed.), *Fleeting memories: Cognition of brief visual stimuli* (pp. 71-94). Cambridge, MA: MIT Press.

Zettle, R.D., & Raines, J.C. (1989). Group cognitive and contextual therapies in treatment of depression. *Journal of Clinical Psychology, 45*, 438-445.

Appendices

Appendix 1 – Mindfulness Attention Awareness Scale

Mindfulness Attention Awareness Scale (MAAS) Brown and Ryan (2003)

Day- to-Day Experiences

Instructions: Below is a collection of statements about your everyday experience. Using the 1-6 scale below, please indicate how frequently or infrequently you currently have each experience. Please answer according to what really reflects your experience rather than what you think your experience should be. Please treat each item separately from every other item.

1	2	3	4	5	6
Almost Always	Very Frequently	Somewhat Frequently	Somewhat Infrequently	Very Infrequently	Almost Never

I could be experiencing some emotion and not be conscious of it until some time later.	1 2 3 4 5 6
I break or spill things because of carelessness, not paying attention, or thinking of something else.	1 2 3 4 5 6
I find it difficult to stay focused on what's happening in the present.	1 2 3 4 5 6
I tend to walk quickly to get where I'm going without paying attention to what I experience along the way.	1 2 3 4 5 6
I tend not to notice feelings of physical tension or discomfort until they really grab my attention.	1 2 3 4 5 6
I forget a person's name almost as soon as I've been told it for the first time.	1 2 3 4 5 6
It seems I am "running on automatic" without much awareness of what I'm doing.	1 2 3 4 5 6
I rush through activities without being really attentive to them.	1 2 3 4 5 6
I get so focused on the goal I want to achieve that I lose touch with what I'm doing right now to get there.	1 2 3 4 5 6
I do jobs or tasks automatically, without being aware of what I'm doing.	1 2 3 4 5 6
I find myself listening to someone with one ear, doing something else at the same time.	1 2 3 4 5 6
I drive places on "automatic pilot" and then wonder why I went there.	1 2 3 4 5 6
I find myself preoccupied with the future or the past.	1 2 3 4 5 6
I find myself doing things without paying attention.	1 2 3 4 5 6
I snack without being aware that I'm eating.	1 2 3 4 5 6

Appendix 2 – Standardised instructions for inattentional blindness and change blindness tasks

Standardised instructions

- Greetings and personal introductions.
- Distribution of information sheet – get participant to read through the sheet while researcher sets up the computer.
- Clarify any questions or concerns participant may have.
- Invite participant to sign the consent form.
- Minimise distractions (i.e., take phone of the hook, turn off television, stereo, tie pets up and so on).
- Ask participant to be seated at the computer. Ask if they are comfortable and ready to proceed.
- Choose inattentional blindness task.
- Get participant to carefully read instructions, clarify task if needed.
- Tell participant they will be asked at the end of the clip to report how many passes were made by the team wearing white shirts.
- Participant to watch clip and count passes.
- Ask participant how many passes were made by the team wearing white shirts?
- Researcher to record answer on a sheet of paper.
- Ask participant if they saw anything unusual or unexpected occur while they watched the clip if they haven't already reported the gorilla.
- Researcher to record answer on a sheet of paper.
- Show the clip again if participants did not detect the gorilla, with instructions to not count the passes this time.
- Invite participant to fill out the demographic questionnaire.
- Choose change blindness task 'surprise party'*.
- Explain that the changes that they detect will be recorded at the end of each clip.
- Also explain that they will need to pay attention to the conversation in each clip as they will be tested on it later.
- Participant to watch clip.
- Researcher to record any changes on paper.
- Choose change blindness task 'zoo.'
- Participant to watch clip.
- Researcher to record changes.
- Choose change blindness task 'parade'.
- Participant to watch clip. Researcher to record changes.
- Choose change blindness task 'phone call'.
- Participant to watch clip. Researcher to record changes.
- Distribute mindfulness flyer and gift voucher and thank participant for their assistance.

* Each participant to be shown change blindness clips in a counterbalanced order.

Appendix 3 – Information Sheet

The influence of mindfulness in attention based tasks

Researcher Introduction

This piece of research is being conducted by Alana Marshall, a Masters student in the School of Psychology at Massey University. The research is being supervised by Dr. Heather Buttle, an academic staff member in the School of Psychology at Massey University, and Dr. Ian Evans, the head of the School of Psychology at Massey University. Should you have any questions or concerns about the study, Alana's contact details are:

Telephone: [redacted]

Email [redacted]

Dr. Heather Buttle's contact details are:

Telephone: 09 4140800 ext 41221

Email: h.buttle@massey.ac.nz

Dr. Ian Evan's contact details are:

Telephone: 06 3505799 ext 2070

Email: i.m.evans@massey.ac.nz

Research Aim

Mindfulness is a state of being attentive to and aware of what is taking place in the present. This study aims to investigate the influence of mindfulness when individuals view DVD clips of varying scenes.

Your Role

At the beginning of the study you will be asked to complete a short questionnaire which asks you to rate your level of mindfulness. Based on the scores of the mindfulness questionnaire, fifty individuals will be invited into the next stage of the research to allow for adequate statistical analyses of the data. The study will then require you to view a short DVD clip individually and answer questions relating to the DVD. You will also be asked to complete a short questionnaire which asks for information such as age, gender, ethnicity, occupation, and so on. Finally, you will be required to view four more short DVD clips and again answer a few questions related to the DVD clips. This study aims to look at group differences in the data through statistical analyses and how mindfulness may or may not lead to improved attentional control.

- You should feel confident in filling out questionnaires, and should have English as your first language.
- You will receive a $10 Whitcoulls gift voucher as reimbursement to cover the time involved in the half an hour study.
- You should be prepared to be seated at a computer screen for the duration of the study.

Confidentiality

- While you gave your name to the researcher when enquiring about the study, the information collected from you during the study is assigned a unique number that keeps your data anonymous.
- The data remains confidential with only the researcher and supervisors having access. It will remain secure at all times, with paper based data held in a locked

filing cabinet in Dr. Heather Buttle's office and computer based data stored on a computer. The data will be kept for five years and then destroyed.

Your Rights

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- decline to answer any particular question;
- withdraw from the experimental session at any point, and withdraw your data up to a month after the experimental session was conducted;
- ask any questions about the study at any time during participation;
- provide information on the understanding that your name will not be used unless you give permission to the researcher;
- be given access to a summary of the project findings when the study is concluded (please indicate on the consent form that you wish to receive a summary).

Project Contacts

- If you have any question before, during, or after the study, please contact the researcher or supervisors as detailed above. The researcher and supervisors will be more than happy to answer any queries.
- This project has been reviewed, judged to be low risk, and approved by peer review under delegated authority from the Massey University Human Ethics Committee. If you have any concerns about the conduct of this research, please contact Professor Sylvia Rumball, Assistant to the Vice-Chancellor (Equity & Ethics), telephone 06 3505249, email: humanethics@massey.ac.nz

Appendix 4 – Consent Form

The influence of mindfulness in attention based tasks

Consent Form

This consent form will be held for a period of five years

I have read the information sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I agree to participate in this study under the conditions set out in the information sheet.

Signature: . . . . . Date: . . . . . .

Full Name – Printed: . . . . . .

If you would like to receive a copy of the summary findings (when study is complete) please tick below, and leave a contact address (physical or email).

____ Address for mailing summary:_____

Appendix 5 – Demographic Questionnaire

Tell us about yourself

Age:_____

Gender: Male Female

Occupation:_____

Marital Status:_____

Which cultural group do you most identify with:_____

Do you meditate? Yes No

If yes how often?_____

How long do you meditate for each time?_____

Hobbies/Interests:_____

Sports/Exercise:_____

Appendix 6 – Mindfulness Flyer

Let us take a closer look at mindfulness

Throughout our daily lives many of our most precious moments are lost to automatic, mindless thinking. We routinely and unknowingly waste enormous amounts of energy because of our minds tendency to be caught up in the past and to anticipate and worry about the future. In addition our unwillingness or inability to stay in our present moment experience regardless of its desirability can lead to many forms of escape or avoidance behaviours such as alcohol or drug abuse, or can trigger excessive anxiety and/or depressive feelings. This stress can become compounded when faced with a serious medical condition, a chronic disease, or chronic pain.

Although there is no magical cure for the stress and pain we experience in our daily lives, there are skills available which can help us to see into the true nature of our minds and to become more connected with our thoughts, feelings, and behaviours. Mindfulness offers such a tool. Mindfulness has been described as bringing one's complete attention to the present experience on a moment-to-moment basis. The value and benefits of mindfulness have been recognised in many Eastern countries for the past 2500 years. Indeed, the systematic cultivation of mindfulness is most frequently aligned with Buddhist meditative practices. However, mindfulness stands on its own as a powerful vehicle for self-understanding and healing. One of its major strengths is that it is not dependent on any belief system or ideology, so that its benefits are accessible for anyone to test for himself or herself.

Mindfulness can be cultivated through meditation practice. The individual needs to find a quiet, distraction free place to sit or lie down in order to focus on the breath. A starting timeframe of 5-10 minutes is initially set with the individual building the meditation practice up to 30-45 minutes or longer. Whenever attention wanders from the breath to inevitable thoughts and feelings that arise, the individual will simply take notice of them, accept each object without making judgements about it or elaborating on its implications, additional meanings, or need for action. Attention is then refocused back to the breath. This process is repeated each time that attention wanders from the breath. The individual is encouraged to use the same general approach outside his or her formal meditation practice as much as possible by bringing awareness back to the here and now during the course of the day. This means using the breath as an anchor whenever a general lack of awareness is noticed or that attention has become focused on streams of thoughts or worries.

Cultivating mindfulness enhances our ability to tap into and focus on our own wasted energies. In doing so we learn to calm down enough to enter and dwell in states of deep relaxation, which in turn nourishes and restores the body and mind. At the same time it makes it easier for us to see with greater clarity the way we actually live and therefore how to make changes to enhance our health and the quality of our life. Mindfulness also helps us to channel our energy more effectively in stressful situations, or when we are feeling threatened or helpless. This energy comes from inside us and is therefore always within our reach and potential control. Thus mindfulness is a powerful vehicle leading to the discovery of deep realms of relaxation, calmness, and insight within yourself.

Within psychology, mindfulness training has been incorporated into numerous stress reduction programmes worldwide. The scientific literature has suggested that

mindfulness interventions may lead to reductions in a variety of problematic conditions including pain, stress, anxiety, depressive relapse, and disordered eating amongst others.

Should you be interested in learning more about mindfulness, the following books may be helpful:

- **Full Catastrophe Living** by Jon Kabat-Zinn (1990)
- **Wherever You Go There You Are** by Jon Kabat-Zinn (1994)
- **Being Peace** by Thich Nhat Hanh (1987)
- **Peace Is Every Step** by Thich Nhat Hanh (1991)