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Mindfulness-Based Stress Reduction (MBSR) for
mindfulness and well-being in working adults:
A systematic review and intervention study

By

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Abstract

This thesis evaluates in two studies the effects of Mindfulness-Based Stress Reduction (MBSR) as a workplace intervention to improve well-being. The first study is a systematic review to ascertain the effect of MBSR upon mindfulness and well-being in working adults in RCT studies. Sixteen papers were meta-analysed, which resulted in a medium-sized, statistically significant effect of MBSR upon mindfulness ($g=0.50$, 95% CI [0.32, 0.68], $k=8$) and well-being ($g=0.54$, 95% CI [0.39, 0.69], $k=12$) compared to an inactive control group. Moderation analyses indicated that shortening MBSR, or removing the retreat day had no significant impact upon these effects. Follow-up effects were investigated for four studies, with a small significant effect upon well-being, but not mindfulness, however heterogeneity was high for this subset of studies.

The second study evaluates an MBSR intervention for staff in the UK National Health Service, assessing the long-term impact of MBSR upon well-being, mindfulness, psychological resilience and emotion regulation compared to a wait-list control group. Multi-level modelling found a statistically significant beneficial effect of MBSR upon well-being, mindfulness, resilience and cognitive reappraisal, which was maintained at follow-up for all outcomes except mindfulness. In a mediation model, MBSR was found to significantly increase mindfulness skills, which in turn was associated with increased resilience, which then increased well-being. MBSR training led to an increase in emotion regulation mediated by mindfulness, but this did not then mediate well-being. There were no mediating effects upon well-being at follow-up, but a direct effect of training upon well-being.

These studies characterise MBSR as an effective and modifiable means of improving well-being in working adults, which may work by making participants more mindful, more resilient to challenges, and therefore more positive in their judgements of well-being. The results are of benefit to academics and practitioners seeking interventions which are effective and appropriate at work.

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1 Introduction

This thesis is positioned at the intersection between ancient and immature concepts. Whilst Buddhist mindfulness is a centuries-old method for expanding conscious awareness, the recognition of well-being at work has by comparison had a remarkably brief lifetime; its important and far-reaching consequences for both individuals and organisations yet to be fully accepted and understood by many managers. Also in its infancy is the reconceptualisation of mindfulness as a secular (non-religious) method for altering cognitive processes and facilitating self-regulation outside of the ethical framework of Buddhist traditions. This reconceptualization has occurred within medical, clinical, and educational environments, as well as in the workplace. Irrespective of the backdrop however, all secular mindfulness training has a common aspiration; to allow those practising to develop a greater control over their own cognitions, attitudes and behaviours in order to improve their quality of life.

Despite this common purpose for mindfulness practitioners, consideration must be given to the unique conditions under which mindfulness training is presented, and the specific areas of life in which people seek change. With the dramatic growth of interest in mindfulness training as a stress-reduction intervention at work, secular mindfulness-based interventions have leapt the distance from a health context to the workplace prior to serious consideration of the applicability of these approaches to a healthy working population. Such populations may have very different motivations and existing commitments to those who are chronically ill, and employers necessarily become major stakeholders in the process. Dane (2015) cautions against an assumption that increased mindfulness is a benefit to all employees at all times, highlighting that mind-wandering, or a narrow attentional focus, may in some cases enhance task performance. As such, certain roles and job tasks that require expansive creativity, or pinpointed attention, may in fact suffer as a result of increased mindfulness. Evaluation of mindfulness interventions in the workplace is required in order to acknowledge these differences in context, and explore the impact they have on outcomes for different populations.

As mindfulness is now a mainstream concept in Western society and the demand for places on mindfulness training courses is high, it is important for research to continue to explore the benefits and challenges of mindfulness for employees. Particularly, research may ascertain if these benefits are similar or unique when compared to the

outcomes in other populations, or within specific occupational groups. For this reason, this thesis evaluates the impact of a standardised, evidence-based mindfulness training course – Mindfulness-Based Stress Reduction (MBSR) – when it is provided within the context of employment by conducting both a systematic review of the existing literature, and an intervention study of a workplace mindfulness course. Such research has the impact of informing academics, organisations, and occupational psychology practitioners of the thought processes, attitudes or practices that are altered when an employee is trained to become more mindful, and how these factors subsequently impact upon well-being at work. The specific aims of the thesis are detailed below.

1.1 Research Aims

In order to integrate the Buddhist philosophical foundations with contemporary research epistemology, a critical realist approach is adopted in this thesis, and is discussed further in Chapter 6, Section 6.1. To explore the aforementioned relationship between MBSR interventions and working populations, this research consists of two studies:

Study 1: Aims to analyse and evaluate the reported effect of MBSR for working samples within the extant research literature. A thorough and systematic search for existing intervention studies is followed by a meta-analysis of eligible papers in order to produce an overall estimate of the effect of mindfulness training for employees by measuring a range of outcomes related to well-being. Specific aims are identified in Chapter 3, at the end of Sections 3.1.2 and 3.2.3, and are listed again in Chapter 4, Section 4.2.

Study 2: Aims firstly to longitudinally evaluate a Mindfulness-Based Stress Reduction (MBSR) intervention and its impact upon mindfulness, workplace well-being, psychological resilience, and emotion regulation. Secondly, mediation analyses are conducted to explore the mechanisms by which mindfulness training leads to increased well-being. Hypotheses are stated within the literature review in Chapter 3, Sections 3.1.2, 3.2.3, 3.3.3, and 3.4.3, and are listed again at the start of Chapters 7 and 8.

The structure of the thesis that will address the research aims described above is detailed in the next section.

1.2 The Thesis Structure

Following on from this introduction, in Chapter Two, the origins of mindfulness as a concept and a practice will be reviewed, with critical analysis of how mindfulness might be appropriate as a workplace intervention. This review follows a chronological format: from early Buddhist philosophy; to twentieth-century adaptations of meditation techniques for a therapeutic context, and the simultaneous development of MBSR as a treatment for chronic pain; to the present dilemma of stress at work and possible treatment strategies.

Chapter Three continues the literature review with a focus upon the four areas of interest within this body of research: mindfulness, well-being, psychological resilience, and emotion regulation. Mindfulness and well-being at work are both key outcomes of Study 1 and Study 2, and the current literature regarding the effect of mindfulness-based interventions upon these will be appraised. Psychological resilience and emotion regulation are also of interest within Study 2, and a review of the importance of these elements within the workplace appears in the latter two sections of this chapter.

Chapter Four is the first of two chapters focussed upon Study 1 – a systematic review and meta-analysis of the effect of MBSR interventions upon well-being for working populations using randomised controlled trials (RCTs). The methodology of the systematic review is presented in Chapter Four. This includes details of the search protocol, the inclusion and exclusion process and the final collection of eligible studies. Chapter Five will then present the findings of the included sample and the meta-analysis.

Moving on to Study 2, Chapter Six details the methodology for a longitudinal, quasi-experimental intervention study of the use of Mindfulness-Based Stress Reduction in an NHS Trust, followed by reporting of the direct effects of MBSR in Chapter Seven. Chapter Eight then specifically reports the results of the analysis of mediation pathways between the outcome variables over time in order to explore the mechanisms by which change occurs.

The thesis concludes with Chapter Nine, summarising and then discussing the findings of each study in turn; their position within the existing research; the contributions made to theory, methodology, and practice; limitations, and future research directions. This is followed by a general discussion of both studies and final

conclusions. A full reference list and detailed appendices make up Chapters Ten and Eleven respectively.

Conclusion

In this short introductory chapter, the aims and structure of the thesis that follows have been detailed. The thesis is composed of two literature review chapters, two chapters relating to the systematic review and meta-analysis, and three chapters relating to the mindfulness NHS intervention study. With a final discussion chapter bringing the two research aims of the thesis together. The chapter that now follows will review the literature relating to the long history of mindfulness, it's more recent adaptation in healthcare, and the ongoing use of this format in a working population.

2 The Origins of Mindfulness

The purpose of this chapter is to outline the origin and evolution of secular (non-religious) mindfulness, and its value for a working population. This background is considered vital for a clear understanding of the nature of mindfulness as it is placed within a traditional Buddhist ideology, before it is transplanted into a new environment. Several Buddhist figures, publishers of Buddhist texts, and researchers, have been responsible for an increase in Western awareness of, and interest in, this traditionally Eastern concept, and this international knowledge-sharing has increased the presence of mindfulness in modern life, particularly as a means to improve health and well-being. During the 1960s and 1970s, a range of practitioners were applying Buddhist techniques for the cultivation of mindfulness in therapeutic contexts such as psychotherapy; some examples of this early incorporation will be considered. In particular, Jon Kabat-Zinn is one of the best-known pioneers of the use of mindfulness in contemporary medicine, and the Mindfulness-Based Stress Reduction (MBSR) course which he designed will be the focus of the present thesis as a vehicle for the improvement of mindfulness. The early shape and delivery of MBSR will be outlined here to provide supplementary context, followed by a discourse on the ways in which this Western conceptualisation of mindfulness has been utilised thus far. Finally, the scope for research in the arena of well-being at work will be outlined, at a time when increased numbers of mindfulness coaches and teachers are offering a work-based mindfulness training format.

2.1 Understanding Mindfulness

Mindfulness forms a core element of Buddhist teachings and has a prominent position in the framework within which Buddhists practise and train. The concept of moment-to-moment awareness which we call *mindfulness* is translated from the Pāli term *Satipaṭṭhāna* which comprises mindfulness (*sati*) and being present or attending (*utipaṭṭhāna*); this gives a concept akin to *attending with mindfulness* (Anālayo, 2003). Within the Pāli Canon – a collection of core Buddhist teachings (*dharma*) – the *Majjhima Nikāya* scripture is a discourse of the Buddha's teachings compiled between the third century BCE and the second century CE in the Theravada Buddhist tradition (Singh, 2008). This body of work contains the *Satipaṭṭhāna Sutta* which gives an account of the importance of mindfulness, and the use of a system of

meditation for its development. The importance of mindfulness within Buddhism was expressed in a teaching given by the Buddha to his followers;

Bhikkhus [Monks], this is the direct path for the purification of beings, for the surmounting of sorrow and lamentation, for the disappearance of pain and grief, for the attainment of the true way, for the realisation of Nibbāna – namely, the four foundations of mindfulness
(Ñāṇamoli & Bodhi, 1995, p.145)

This Sutta highlights the importance of mindfulness as a practice necessary for both the novice and the learned practitioner in order to overcome obstacles and unsatisfactory conditions in the pursuit of enlightenment (*Nibbāna*). Buddhist scholars describe mindfulness as 'bare attention' similar to that which occurs briefly when one first becomes aware of a stimulus, but has not yet labelled, judged, or identified it conceptually. *Sati* is enhanced through the development of this momentary raw perception into a longer, more tangible experience of stimuli in their crude states (Anālayo, 2003). During mindful development, after this first level of bare attention, two further stages of cognition are proposed. At the second stage, detail is added to bare attention and initial perceptual interpretation of stimuli occurs. Nyanaponika (1962) proposes that without mindfulness training, most individuals will continue to process experiences at these two levels, where knowledge can be broadened, but not deepened. The third cognitive stage is known as *Right Mindfulness* or *Right Attention* and can be developed through mindfulness training by not only lengthening the first stage of bare attention, but also by encouraging objective analysis of the contents of awareness in the second stage just as they are in the present moment; unaffected by prejudice, wishful thinking, or assumptions. With these developments, Right Mindfulness becomes possible; thought processes are devoid of misrepresentations and stimuli can now be inspected with clarity based upon their own properties, and at a distance from the observer's own subjective biases (Sangharakshita, 2007). This control over cognition gives practitioners the choice to decide how to respond to stimuli, instead of reacting habitually.

Prominent contemporary Buddhists have opened dialogue on the ancient definitions of mindfulness as an important pillar of Buddhist practice in the modern world, and have played a strong role in increasing the awareness of this traditionally Eastern perspective. For example, the Buddhist monk and scholar Thích Nhất Hạnh initiated the Engaged Buddhism movement during his peace activism throughout the Vietnam War and following his exile from Vietnam in 1975 (Miller, 2016). This movement encourages Buddhist monks and nuns to take their practice out into the world to

support communities and promote social activism, which has spread awareness of Buddhist concepts such as mindfulness. In addition, the Fourteenth Dalai Lama made his first visits to Europe and the United States of America in the 1970s (Dalai Lama, 1991), which further facilitated interest and understanding of Buddhist traditions in the West.

As well as these key Buddhist scholars, translators and publishers of Buddhist literature have also helped interest in Buddhism to thrive. In 1958, the founding of the Buddhist Publication Society in Sri Lanka, which translated Buddhist scripture and other collected works into English for an international audience, played a key role in Western access to Buddhist literature. The Director of the Buddhist Publication Society at that time asserted his;

...deep conviction that the systematic cultivation of Right Mindfulness...still provides the most simple and direct, the most thorough and effective, method for training and developing the mind for its daily tasks and problems as well as for its highest aim...
(Nyanaponika, 1962, p.7)

Although the Satipaṭṭhāna Sutta was written some 2000 years ago, the concept of mindfulness as the 'direct path' to enlightenment, has endured despite the radical transformations and revolutions which have brought about contemporary society. This belief in the benefits of mindfulness training across both temporal and cultural planes has been a driving force behind both Buddhist and secular groups wishing to reduce human suffering when faced with not only the exceptional, but also the mundane challenges of modern life (Maitreyabandhu, 2015).

In addition, Windhorse Publications, a not-for-profit company founded in the UK-based Triratna Buddhist tradition, has published thousands of titles on various Buddhist topics, including the works of Western Buddhist scholars. Such publications provide educational literature about Buddhism and the challenges of maintaining Buddhist principles in modern Western society for a range of audiences and from a range of viewpoints. The publication of texts authored by the Western Buddhist community for the benefit of Western readers who are not necessarily Buddhists themselves, has fostered a greater understanding of contemporary Buddhism and how it may be successfully applied in Western cultures. Mindfulness in particular is currently a topic of great interest for both the general public and mainstream media, which has further assisted the current rise in academic, practitioner and public interest in secular mindfulness.

During the 1960s and 1970s, not only were prominent Buddhist figures travelling and publishing internationally, but Westerners who had travelled to study Buddhism in the East were also returning to England and the United States and beginning to experiment with the fusion of Eastern practices and Western contexts. Mindfulness meditation techniques were adopted within psychotherapy as a means to further develop a client-focused approach by encouraging individuals to attend to, and develop an executive-level oversight of, their own thoughts, feelings, and mental processes under the guidance of the therapist. Through a series of case studies, Deatherage (1975) explored how therapists have successfully employed mindfulness techniques with clients to develop the ability to observe and neutrally label mental processes without becoming involved in them. Cultivating this 'watcher self' is proposed to give strength and motivation to clients, which can help them become more receptive to the psychotherapy process.

During the same time period, mindfulness meditation was also proposed as a means by which therapists might enhance their own empathy by using the *watcher self* in client sessions to remain balanced, attentive, and unbiased (Schuster, 1979). The combinations of these two approaches would allow for an improvement in the therapeutic relationship, by refining the awareness of both the therapist and the client in their interactions – resulting in more progress during sessions. Even during this early exploration of mindfulness in therapy, calls were made for more scientific and objective evaluations of secular mindfulness, which had hitherto been largely subjective:

Some opportunity is now needed for professional workers such as doctors, social workers, and psychiatrists to learn the techniques of meditation, without the heavy overlay of Eastern philosophy, so that they can study its effects more precisely and assess its usefulness as a therapy technique.
(Fenwick, 1973, as quoted in Keefe, 1974, p. 485)

This research indicates the academic interest in mindfulness and its cultivation through meditation, and the recognition of the potential role of increased mindfulness within clinical psychology, during the same time period in which Jon Kabat-Zinn was exploring its potential benefits for patients with chronic pain.

In summary, since its entrance into the academic spotlight, mindfulness has been identified as a human capacity that is not limited to the contemplative traditions in which it has conventionally been cultivated. Whilst remaining at the centre of Buddhist heritage, mindfulness has also found a place in secular settings. This diffusion has been assisted by freedom of movement of scholars, experts, and

publishing houses, who have made mindfulness accessible to an international audience, transcending religious or ideological boundaries and cultural differences. This universal applicability of the principles of mindful living has perhaps been developed and championed by Jon Kabat-Zinn more than any other. As the founder of secular mindfulness training in the form of MBSR, Kabat-Zinn's introduction of an evidence-based, manualised stress-reduction course stimulated Western interest in this area, and, in parallel with the key figures discussed previously, created an interest which has endured and grown for almost 40 years. The development and relevance of MBSR over this time period will be discussed in the following section.

2.2 Mindfulness-Based Stress Reduction (MBSR)

During the spread of interest in mindfulness and meditation in the West, the work of Jon Kabat-Zinn has particularly stood out in its efforts to induct mindfulness practices into health-care contexts. It is over 35 years since the inception of MBSR (Kabat-Zinn, 1982), a group-based, eight-week course, focussed upon practising and strengthening mindfulness skills through meditation and yoga, and through being mindful during everyday activities. MBSR catalysed Western interest in contemplative practices as a form of behavioural medicine, giving rise to a family of further training courses collectively known as mindfulness-based interventions (MBIs). Other forms of MBI have been developed both in conjunction with, and separately to, MBSR, such as Mindfulness-Based Cognitive Therapy (MBCT; Williams, Teasdale, Segal, & Soulsby, 2000), which adds cognitive behavioural therapy techniques to MBSR in order to promote change of thought patterns and a reduction in rumination, particularly in the treatment of depression. Acceptance and Commitment Therapy (ACT) is another cognitive behavioural therapy intervention which uses mindfulness as a tool to increase awareness in the pursuit of a meaningful and values-based life, improving psychological flexibility and thus well-being (Flaxman & Bond, 2006). All of these interventions have been adapted for use in the workplace, however each takes a different approach to mindfulness, and uses it in the pursuit of different objectives. Within this thesis, evaluation and understanding of the effects of MBSR at work are the primary focus. Consideration will now be given to the format, content, and rationale behind MBSR as a means to enhance mindfulness and reduce stress, including an overview of the cognitive processes involved in becoming more mindful.

The MBSR course has been carefully constructed to exist and be understood independently of the Buddhist context. Kabat-Zinn attributes this to a need to avoid “the risk of it being seen as Buddhist, ‘New Age,’ ‘Eastern Mysticism’ or just plain ‘flakey’” (2011, p.282). This reflection on the design and initiation of the programme acknowledges the challenges involved in legitimising MBSR within mainstream medicine; a scientific arena high in scepticism regarding mind-body contemplative treatments. In response, a complicated balancing act between the embodiment of Buddhist teachings, an emphasis on the psychosomatic evidence base regarding meditation, and the normalisation of Eastern meditation and yoga without the attendant belief systems, was achieved. This balance was vital to the survival of the programme within the positivist context of the University of Massachusetts (UMASS) Medical School, including a course name which originally made no mention of mindfulness or meditation. In the first journal article regarding the Stress Reduction and Relaxation Programme (SRRP; 1982), Kabat-Zinn described the course as training in both self-regulation and the detached observation of bodily sensations for patients with a chronic pain condition who had not found relief via mainstream medical interventions. This allowed for a predominantly scientific cognitive framing of the process of stress reduction, within which meditation was one facilitative tool. This approach did not jeopardise the support of stakeholders who may have been sceptical of such ‘New Age’ methods. Whilst MBIs have now been embraced in Western medicine, this scepticism remains for some organisational stakeholders, requiring a continued focus on the appropriate branding of workplace interventions in order to inform but not mislead potential trainees.

Early evaluations of SRRP were encouraging. Results from the first three cycles of the course beginning in 1979, revealed self-reported improvements in pain of 35% or more for half of the 51 participants, and an extremely significant reduction in self-reported negative affect (Kabat-Zinn, 1982; see Chapter 3 Section 3.2.1 for detailed discussion of types of affect). Further evaluation of cohorts within the first two years showed substantial improvement in pain symptoms, reduced use of pain-relief medication, and long-term preservation of benefits for participants who maintained their meditation practice. Importantly, a comparison group of pain clinic patients receiving treatment-as-usual showed no significant change in symptoms during the same time period (Kabat-Zinn, Lipworth & Burney, 1985). These patient benefits were also still largely evident after a four-year follow-up (Kabat-Zinn, Lipworth, Burney & Sellers, 1987), thus demonstrating the long-term potential of mindfulness training

in a cohort that adheres to the practise requirements, and its capacity to improve symptoms beyond the existing chronic pain treatments.

Mindfulness continues to grow in acceptance and show positive results for a variety of populations. Over 20,000 patients have now completed MBSR courses at UMASS, and their Centre for Mindfulness has trained thousands of mindfulness teachers (Centre for Mindfulness, 2015). In the UK, there are currently almost four hundred mindfulness teachers on the UK Good Practice Guidance for Mindfulness-Based Teachers database (2019). The course is now used successfully as a participatory medical treatment for a range of mental health problems, including substance use disorders (Chiesa & Serretti, 2014), and depression and anxiety (Chiesa & Serretti, 2011). Furthermore, systematic reviews published by the Campbell Collaboration have shown small, positive effects of mindfulness-based training upon cognitive and socioemotional outcomes in school-aged children (Maynard, Solis, Miller & Brendel, 2017), and improved mental health in clinical and non-clinical adult populations (de Vibe, Bjørndal, Tipton, Hammerstrøm & Kowalski, 2012). Up-to-date systematic reviews of this kind are important in this burgeoning area of interest in order that the efficacy of courses and the quality of the extant research literature can be evaluated as a whole, whilst minimising risk of bias, allowing the overall effects of mindfulness-based interventions to be estimated and understood.

The Stress Reduction and Relaxation Programme was subsequently renamed as Mindfulness-Based Stress Reduction and reduced from ten weeks in length. The standard MBSR course comprises two-hour weekly group sessions for eight weeks, with a retreat day of mindfulness meditation. During weekly sessions, participants are facilitated by a teacher who will gradually introduce a series of mindfulness meditations, will lead meditation exercises, and will foster group discussion of experiences. “Languaging” the meditations is a careful craft which grounds them “in a credible universal dharma [teaching] context supported by science and clinical medicine” (Kabat-Zinn, 2009, p. x). It is the role of the course teacher to simultaneously encourage and embody the Buddhist dharmic principles which underpin MBSR, whilst using secular language and examples to illustrate key elements. The homework commitment is generally 45 minutes, six days per week, and includes practising audio-guided meditations, and regularly conducting daily tasks mindfully, such as brushing one’s teeth, showering, or eating a meal with full attention. Trainees are given a course workbook and audio-recordings of the relevant meditation exercises as learning aids. The commitment to practise in between

sessions is an important element of the process for two reasons; training time is needed to become familiar with the meditations; and participants need to make tangible progress whilst there is opportunity to raise questions within the group during the brief eight-week timeframe. Consequently, prospective trainees will often attend a screening interview before being accepted onto a course to ensure that they are suitably prepared and willing to engage with such a highly participatory curriculum. Screening also minimises the likelihood of participant attrition caused by unrealistic expectations.

A small collection of meditations is used during MBSR in order to practise mindfulness. The first meditation to be introduced is traditionally the body scan, which is usually conducted in a reclined position with attention given to each body-part in succession, for example, from feet to head (Kabat-Zinn, 2013). Short interventions are taught to supplement the longer body-scan, such as the three-minute breathing space, which is used in stressful or overwhelming situations to quickly focus attention back on the present moment as it is happening (Williams & Penman, 2011). Mindful movement practices, where basic hatha yoga sequences are carried out with awareness of the body, also help individuals to be more mindful of their own physical sensations (Burch & Penman, 2013). In addition, sitting meditations, where the participant maintains an upright, relaxed posture and concentrates on stimuli, such as breathing, sounds, or thoughts as they occur can also be used. These different practices may be more suited to specific situations, however all have a common effect upon cognition, which will be discussed below.

During meditation practice, it is normal to be distracted by other trains of thought, sounds, or emotions. When the meditator becomes aware that the mind has wandered from the original task, they are engaging in meta-cognition by stepping outside of this thought process and appraising it in an impartial manner. Upon this realisation, they may choose to let go of the distraction and consciously return attention to the original object. Each time an individual switches their attention back to the present moment this further strengthens the meta-cognitive process (Jankowski & Holas, 2014). As such, the meditator is no longer being driven by stimuli and their habitual responses to them, but is actively and objectively steering their attention towards an intended target. This opportunity for choice over how to respond to thoughts, feelings and events as they occur, without relying on automatic tendencies, is one way in which mindful individuals are able to break old habits and change their perception of external and internal stimuli.

Despite its secular nature, MBSR remains attuned to Buddhist ethics and attitudes. In order to protect this strong foundation, the course is based upon seven core attitudinal constructs which help to cultivate mindful attention in the way intended in Buddhist dharma. The attitudinal foundations of mindfulness described by Kabat-Zinn (1994) are non-judging, patience, trust, a beginner's mind, acceptance, letting go, and non-striving. The attitude these elements create when these key concepts are combined and consciously invoked during practice provides ideal conditions under which mindfulness can flourish. These foundations are at the heart of one of the most popular and oft-quoted definitions of mindfulness as "paying attention in a particular way: on purpose, in the present moment, and non-judgmentally" (Kabat-Zinn, 1994, p.4). As such, when one is attending mindfully to thoughts, feelings or experiences, this should be done without being critical, as if seeing them for the first time, and accepting and trusting oneself to perceive them as they actually are. This should be done with patience as the mind may wander, or be distracted by other things. This conception aligns with that described by Anālayo (2003), who identifies clearly knowing, diligence, and an absence of discontentment and desires as the mental qualities required for Right Mindfulness. By letting go of preconceived wants or needs related to the object of interest, a general curiosity about the object itself can arise, which is not influenced by a need for it to appear or behave in a particular way. The popularity of Kabat-Zinn's definition of mindfulness, and proposed alternative academic definitions are discussed in more depth in Chapter 3, Section 3.1.

In summary, MBSR as a therapeutic intervention has continued to grow in popularity across the last four decades, assisted by the exponential growth of public interest and consequent availability of mindfulness-based interventions. Careful crafting of the course structure and content has allowed for a secular format whilst preserving the core elements of Buddhist teachings which were discussed in the previous section. The process of recognising when the mind has wandered, and then returning it to its original focus, and the various exercises and meditations which are employed within MBSR have been outlined, to provide context for further discussion of the ways in which MBSR may provide stress-reduction and enhanced well-being within a working population. The existing framework for stress-reduction interventions at work, and this potential for mindfulness-based interventions will be discussed in the following section.

Throughout this thesis, the terms 'traditional' and 'standard' MBSR will be used to refer to MBSR courses that adhere to the course curriculum described in this

subsection, with at least 16 hours of contact time with the mindfulness teacher (eight, two-hour weekly sessions). This traditional form of MBSR will later be compared to other versions of MBSR which tend to be modified to be shorter in length, or to exclude the retreat day.

2.3 Stress and Well-Being at Work

In developing the rationale for an investigation of MBSR as a well-being intervention within the workplace, the current section will acknowledge the existing landscape of workplace stress in which the intervention must be situated. The positive and negative contributors to well-being will be considered, as well as their relationship with performance at work. The provision of Management Standards by the Health and Safety Executive (HSE; 2007), and the academic positioning of stress interventions at a primary, secondary, or tertiary level (Murphy, 1988), are then analysed. Finally, MBSR will be positioned within the workplace well-being context, and recent reviews and research of mindfulness at work will be called upon when considering the opportunity for a novel contribution to this field.

The concept of well-being can be defined as an assessment of general quality of life based upon one's personal range of affective states (Diener, Suh, Lucas & Smith, 1999). Traditionally, clinical psychology has concentrated on negative aspects of well-being using a deficit-focussed or problem-orientated approach. Conversely, the relatively new movement of positive psychology is concerned with studying and developing human potential in order that individuals may flourish and extend their positive capacities (Seligman & Csikszentmihalyi, 2000). As a middle way between these two approaches, Diener and colleagues (1999) highlight the importance for well-being researchers to investigate "...the entire range of well-being from misery to elation" (p. 277) in order to reflect the approach and avoidance elements of human experience which influence quality of life.

When applied to a working context, well-being describes one's judgement of the quality of affective experiences at work (Warr, 1990). The affective states – from misery to elation – which predicate the quality of working lives are vital in our understanding of how stressors impact the individual. Stress and stress-related psychological disorders are common in the workplace; the Labour Force Survey (LFS) indicates that 15.4 million working days were lost to work-related stress in Great Britain in the year 2017-18, with an average of 26 days of sickness per sufferer (HSE, 2019). It is remarkable that this figure has increased by approximately 5 million since

I began this PhD, from 10.5 million in 2011-12 (HSE, 2013). These findings show the high cost in lost working days to the employer, and the personal burden of work-related stress, which as a health complaint has one of the longest average days absent per case within the survey. The damaging effects of work-related stress for employees and employers highlight a great need for research into well-being at work which will not only facilitate organisational understanding of the triggers and catalysts of stress, but also propose best practice and wellness approaches which can be integrated into working systems by staff at all levels in order to safeguard against the onset of stress, and minimise its negative effects.

From a positive psychology perspective, wellness approaches as proposed above have a more important function than merely minimising stress. High levels of well-being are themselves linked to a wide range of positive organisational and individual outcomes which allow staff, and by extension organisations, to flourish. In particular, longitudinal studies have shown links between high psychological well-being and candidate interview success, job retention, employment in roles with more autonomy, increased prosocial behaviour, and higher performance and creativity ratings from supervisors (Lyubomirsky, King & Diener, 2005). Such findings convey the value of high well-being in its own right, not merely as a defence against the negative consequences of stress. Almost two decades ago, Danna and Griffin (1999) made the case for well-being and its attendant value in the areas of performance, health, absenteeism and turnover, at a time when well-being at work was under-researched and poorly understood. The rise in academic and practical interest, and comprehension during the intervening time, has preceded a growing acknowledgement within organisations that the enhancement and maintenance of employee well-being is important for individual health and performance, and may also produce a competitive advantage at company level as proactive investment in staff well-being may help to attract and retain excellent employees (Black & Frost, 2011).

In order to assist organisations in fulfilling their legal requirements with regards to health and safety at work, the HSE produce the Management Standards (HSE, 2007), which provide examples of best practice to protect the wellness of employees based around six work-specific factors which can significantly impact a person's well-being at work. These factors include the demands placed on the employee, the control they have over their work, the level of support they receive and their relationships with others, levels of role clarity, and the management of organisational change. The Standards not only describe the ideal experience for each of these factors in order to

sustain a healthy workplace, but also require systems to be in place when problems arise and employees experience work-related stress or other psychological disorders.

There are three levels at which interventions may be staged in the workplace; primary, secondary and tertiary. Although the HSE recommends stress-related improvements are made at the primary, organisation-wide level, many stress management interventions are delivered at a secondary or tertiary level (Murphy, 1988). Primary level interventions are enacted across an entire organisation and as such can initiate influential and pervasive change to workplace culture and practice (Bond & Bunce, 2001). For stress interventions, change at this level has the aim of reducing stress and boosting well-being for all employees (Karasek, 2004). Such an all-encompassing strategy, whilst attractive in its inclusivity also necessitates large-scale planning and investment in order to succeed, and therefore can seem less attractive than lower-level interventions. Furthermore, primary interventions have been criticised when utilised in stress-reduction cases, as they oversimplify the issues faced by individual employees and their unique responses to stressors (Briner & Reynolds, 1999). Such criticisms coupled with the scale and cost of primary level interventions mean that organisation-wide stress interventions are rare.

In secondary interventions, general coping strategies for stressors in the workplace are presented, and tertiary interventions can focus on more chronic levels of stress, potentially in a situation where the employee is unfit for work, and often in a one-to-one context. An obvious benefit of secondary interventions is the opportunity for several stress-management techniques to be presented within one training curriculum, providing a tool-kit of methods which employees can trial and adapt to their circumstances. However, this efficiency again has the potential to gloss over individual needs and any particular stressors which may require more specific measures (Cooper, Dewe & O'Driscoll, 2001). Tertiary-level interventions can address the need for specificity in some stress cases, and although this can require a costly bespoke strategy, often the return on investment is such that the intervention costs are fully recouped by the organisation if an employee is able to return to work (MacLeod, 2008). One significant consequence of this focus upon individuals and their stress responses is the implication that stress management is the responsibility of the employee; meanwhile, organisation-wide factors which may contribute to the stress of many remain unchallenged (Le Blanc, de Jonge & Schaufeli, 2008). The critical evaluation of each of these intervention levels suggests that a blended approach to stress management would be ideal, allowing major organisational

stressors and risk factors to be addressed at the primary level, whilst more general stress-prevention strategies, and specific stressors and responses are examined at the secondary and tertiary levels respectively. By using appropriate interventions at these three levels depending on the particular context, interventions can be operationalised to their full potential for the benefit of individuals and organisations.

Mindfulness-based techniques as workplace stress interventions have the potential to function at either the secondary or tertiary level. Firstly, they could be incorporated into stress intervention toolkits at the secondary level as one of several possible methods by which people can actively guard against stress. In these instances, an MBSR course could be offered to interested employees who are motivated to manage their stress by practising mindfulness, but are not currently experiencing debilitating levels of stress. Alternatively, MBSR may be offered at the tertiary level to employees who are absent from work due to workplace stress, and are offered the intervention as a means of progressing towards a return to work. As stated previously in Section 2.1, meditation exercises were already being employed in clinical practice by psychotherapists in the 1970s, and further to this, Murphy and Schoenborn (1987) recognised the use of meditation as a cognitive, secondary intervention in the management of stress at work. This early use of meditation as stress prevention at the secondary level demonstrates that implementing contemplative practices in organisations is not novel, despite the impression given by the current public appetite and interest in mindfulness, and has paved the way for the use of MBSR at work.

Although there is on-going interest in mindfulness as an aid to workplace well-being, and a clear need for effective interventions to tackle the rising number of working days lost due to workplace stress, there is still a dearth of research into the application of mindfulness in organisations; including how and why changes to well-being may arise. A search of the Web of Science database for 2016 returned 667 academic titles containing the term 'mindfulness' (American Mindfulness Research Association, 2017), however less than five percent of these articles regard working populations. This highlights the current need for organisational scholars to continue to extend the exploration of this area to test current theories of mindfulness and build a strong knowledge base from which to inform stakeholders of the benefits and challenges which may arise from MBIs.

In their recent comprehensive review of the workplace mindfulness literature, Good and colleagues (2016) identify and appraise not only the areas which have been investigated thus far, but also issues of interest which management scholars have yet

to scrutinise. Chiefly among these open questions is how mindfulness might lead to a change in well-being at work, with the suggestion that resilience may be an important part of this mechanism. The recognition of these opportunities to advance current understanding of workplace mindfulness, with a particular focus upon resilience, is encouraging given that resilience is one of the facets of well-being which is addressed in the main study of this thesis. Furthermore, research by Hülshager and colleagues has indicated improvements to emotion regulation after mindfulness training, by encouraging objective appraisals of potentially emotive stimuli (Hülshager, Alberts, Feinholdt & Lang, 2013). Due to the promising nature of these early findings, the role of emotion regulation as a mediator – an intermediary variable that helps to explain the observed relationship between mindfulness training and well-being – will also be explored within this thesis. The extant research regarding resilience and emotion regulation at work will be discussed in Chapter 3.

In summary, MBSR has the potential to fit into a schema of stress-reduction interventions at work, either at the secondary or tertiary level. As a secondary intervention, employees who are at risk of stress-related ill-health can be given the opportunity to integrate mindfulness in to their existing strategies in an attempt to remain well. Such interventions are common in an organisational context and preliminary evidence has shown their benefits when measuring a range of mental health outcomes. However, a recent review of the literature suggests that resilience and emotion regulation are two areas of workplace well-being in which the role of mindfulness-based stress training has yet to be thoroughly investigated. As such, this thesis focuses upon psychological resilience and emotion regulation in addition to general work-place well-being. The possible interactions of these three variables with mindfulness will be reviewed in the following chapter.

Conclusion

This chapter has reviewed the historic development of the concept of mindfulness over the course of more than 2,000 years. Mindfulness is the ability to create and sustain a pause between the experience of a stimulus, and its reaction, in order to be open and fully receptive to the world around us as it is expressed in the present moment. Since the 1960s, mindfulness has been embraced in the West and used as a tool for reducing reactivity to chronic pain, supporting psychotherapy relationships, and coping with stressors in the workplace, at a time when work-related stress, is

continuing to rise (HSE, 2019). Exactly how mindfulness interventions work, and the outcomes of research evaluations in this field, will be the subject of Chapter Three.

3 Mindfulness and its Outcomes at Work

This chapter of four parts will review the existing research literature that has helped to inform and refine the present thesis of work. Firstly, following on from the discussion of the origins of mindfulness in Section 2.1, secular mindfulness will be examined from a theoretical perspective. Academic conceptions of mindfulness in a general sense and within the workplace will be appraised, including evidence from research. Next, in a development of Section 2.3, Warr's model of workplace well-being will be reviewed as a framework for evaluating the effects of mindfulness interventions upon well-being at work, followed by research findings linking mindfulness and well-being. In the third section, psychological resilience theory and evidence will be appraised, particularly in the context of work, including its potential relationships with mindfulness and well-being. Finally, the emotion regulation literature will be reviewed and then applied to the workplace as it relates to mindfulness and well-being. At the conclusion of each section, hypotheses for Study 2 relating to the variables under discussion will be proposed, and where relevant, the aims of the systematic review (Study 1) will be highlighted as they relate to the literature.

3.1 Mindfulness

Mindfulness has been a difficult concept to define within the academic literature. As discussed in Section 2.2, authors often use Jon Kabat-Zinn's definition of mindfulness as "paying attention in a particular way: on purpose, in the present moment, and non-judgmentally" (1994, p. 4). Indeed, mindfulness scholars across a range of research domains use this definition in some form (e.g. Shapiro et al., 2006; Chiesa & Serretti, 2011; Lomas et al., 2017a). In 2004, a proposed operational definition of mindfulness was published as a collaboration between several academic experts that extends Kabat-Zinn's definition into a two-stage process:

...we see mindfulness as a process of regulating attention in order to bring a quality of nonelaborative awareness to the current experience and a quality of relating to one's experience within an orientation of curiosity, experiential openness, and acceptance. We further see mindfulness as a process of gaining insight into the nature of one's mind and the adoption of a de-centred perspective on thoughts and feelings so that they can be experienced in terms

of their subjectivity (versus their necessary validity) and transient nature (versus their permanence).
(Bishop et al., 2004, p. 234)

This suggested operational definition of mindfulness has only been partially integrated into subsequent mindfulness research since its publication, with versions of these two definitions being quoted by different researchers (Reb et al., 2015). Research validating the Toronto Mindfulness Scale (TMS: Lau et al., 2006), which was designed to address the two parts of the operational definition proposed by Bishop et al., (2004), found support for only the second stage (mindfulness as decentering), and not for the first stage (mindfulness as a temporary state of directed attention and attitude). Despite this limited uptake, most other definitions demonstrate variations on two themes of a concept which involves: a) Attention to the present moment (e.g. Teasdale, Williams & Segal, 1995; Baer et al., 2006; Dane & Brummel, 2014; de Vibe et al., 2012; Good et al., 2016; Hülshager et al., 2013), and b) An attitude which is open, curious and non-judgemental (e.g. Baer et al., 2006; de Vibe et al., 2012; Hülshager et al., 2013). It is evident from the existing research that a context-free definition of mindfulness is preferred over a domain-specific version (i.e. a specific definition of mindfulness in the workplace) – this reflects the meta-cognitive nature of mindfulness, which transcends domain boundaries. In this thesis I adopt Kabat-Zinn's definition – as Kabat-Zinn designed MBSR, this definition encapsulates the type of mindfulness specifically being aimed for within this training programme.

The review will begin by considering existing theory regarding mindfulness in general, and then evaluating the more recent generation and application of theory concerning workplace mindfulness in particular. The second element of this section will examine the impact of mindfulness at work, mindfulness as an enduring trait, changes in mindfulness as a result of training, and the specific aims for Study 1 and hypotheses regarding mindfulness at work within Study 2 will then be outlined.

3.1.1 Theories of Mindfulness

In a progression of Chapter 2, this section will consider the current theoretical approach to secular mindfulness within this thesis. Theories regarding how mindfulness might operate have been scarce, with most research focussed upon testing whether mindfulness interventions 'work' – initially within healthcare settings (Shapiro, Carlson, Astin & Freedman, 2006) – but now across a range of specific domains including the workplace. In 2006, Shapiro and colleagues proposed a theory of the mechanisms of mindfulness as a means to stimulate more deductive research

into the process by which mindfulness occurs, and the areas that may be impacted as a result. This model of the mechanisms of mindfulness forms the theoretical underpinning for this thesis and will be discussed in detail below.

Shapiro et al. (2006) identify three axioms of mindfulness: intention, attention, and attitude. They furthermore highlight the parallels between this model and Kabat-Zinn's (1994) definition above, which describes mindfulness as paying attention (Attention) purposefully (Intention), and in a particular way (Attitude). These axioms are proposed as the core building blocks of mindfulness, working together in a positive feedback loop as shown in the top half of Figure 3.1.

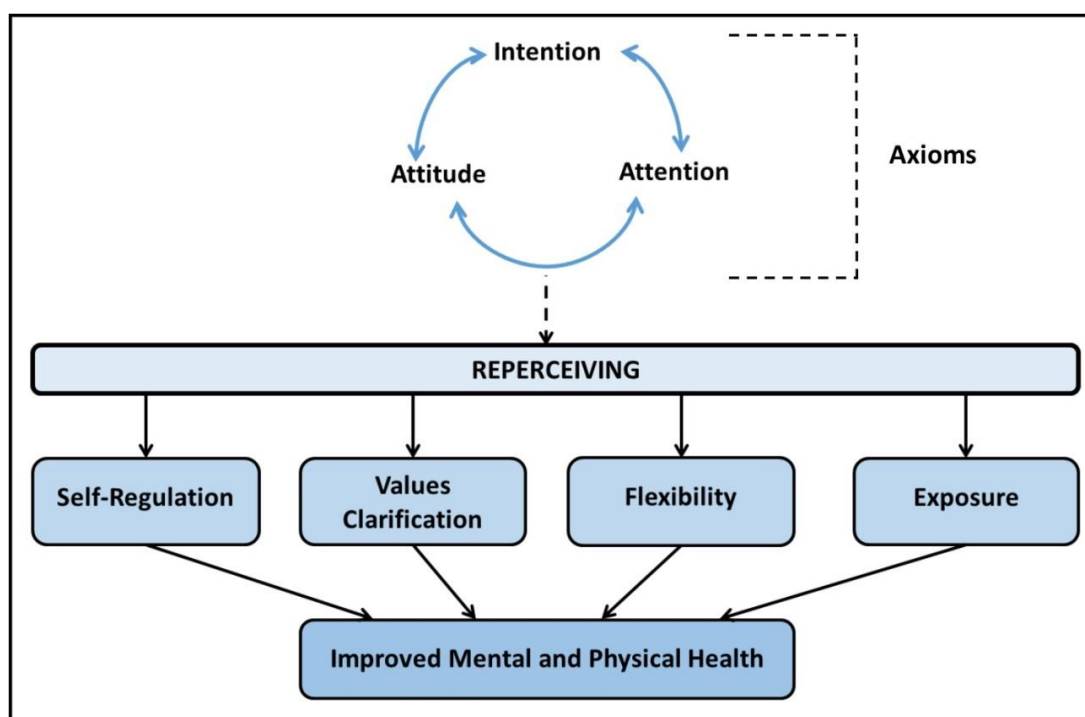


Figure 3.1. Diagram of a model of the mechanisms of mindfulness proposed by Shapiro and colleagues (2006).

Intention describes the importance of a “personal vision” or motivation for beginning or continuing a mindfulness practice, and is an aspect that is less explicit in secular mindfulness instruction than in Buddhist practice (Kabat-Zinn, 1990, p. 46). This should be distinguished from a goal or aim; it is not the case that individuals have a destination constantly in mind that is driving them on. Instead, it is a wish for change and a vision of an alternative, more positive way of being which provides a catalyst for action. In this sense, intention is a push from the present situation, as opposed to a pull from a future goal. The intention axiom is not explicitly mentioned in the two common mindfulness definitions outlined in Section 3.1 above, although it is integral to the concept of mindfulness in Buddhist philosophy. As discussed in Section 2.1,

Right Mindfulness is part of Buddhist practice, which is embedded in an ethical framework that shapes intention. The clarity and cognitive control of Right Mindfulness, along with ethical precepts motivate Buddhists to reduce human suffering via skilful actions (Kabat-Zinn, 1990; Shapiro et al., 2006; Chiesa, 2013). Research with meditators developing their practice has shown that intention changes along a continuum over time such that novice meditators primarily have self-regulatory intentions, whereas meditators with more experience cite self-exploratory intentions. Moving further along this continuum, long-term meditators describe intentions focussing upon self-liberation (Shapiro, 1992). If this finding is applied to the workplace, it may be that employees sign up for mindfulness training with a narrow intention of reducing their work-related stress, or enhancing their well-being at work, but that with regular practice the intention may shift in a more inclusive direction, with increased value placed upon empathy, cooperation, and compassion, both in and out of work.

The axiom of attention describes present-moment attention to internal and external stimuli, and directed attention as a form of self-regulation, whereby any judgement or interpretation of events is deferred and the contents of consciousness are experienced objectively (Shapiro et al., 2006). As discussed in Section 3.1 above, attention is one of the key features of most definitions of mindfulness and also integral to 'bare attention' within Buddhism, which is the first of the three stages of mindfulness (Nyanaponika, 1962; see Section 2.1 for a discussion).

Finally, the attitude axiom refers to the quality of attention adopted when being mindful, as described in Kabat-Zinn's seven attitudinal foundations previously discussed in Section 2.2 (non-judging, patience, trust, a beginner's mind, acceptance, letting go, and non-striving; 1994). This axiom aligns with the second element of the common definition described in the introduction to Section 3.1 above. Attitudes form a core concept within psychological research, where they are defined as "...an evaluation of an object of thought. Attitude objects comprise anything a person may hold in mind, ranging from the mundane to the abstract, including things, people, groups, and ideas" (Bohner & Dickel, 2011, p. 392). Based upon this understanding, it could be said that the cognitive act of mindfulness during meditation is constantly presenting opportunities for the evaluation of thought objects. Attitudinal evaluations generally involve judgements of favour or disfavour (Allport, 1935) and thus by encouraging an adaptive and curious attitude to these objects, an individual may

avoid a more negative, judgemental, and potentially self-critical stance, which could detrimentally affect the quality of mindful experience.

As shown in the lower half of Figure 3.1, Shapiro and colleagues (2006) propose that the interaction of these three axioms to deliberately attend to the present moment, in a manner that is open and non-judgemental, activates a meta-mechanism of 'reperceiving', which effects four processes: self-regulation and self-management; values clarification; cognitive, emotional and behavioural flexibility; and exposure; which are direct outcomes themselves, as well as pathways to improved mental and/or physical health.

Within this model, reperceiving, also referred to as decentering, is an overarching process of cognitive change arising from the enhancement of the three axioms. As a result, an individual connects with their own awareness of events, as opposed to the content of the events themselves (Orzech, Shapiro, Brown & McKay, 2009). This process allows for more objective processing of subjective thoughts and emotions. A similar component of mindfulness known as *change in perspective on the self* is proposed by Hölzel et al (2011) as a mechanism of mindfulness practice based upon psychological and neurological research. In support of this concept, Kerr, Josyula and Littenberg (2011, p. 80) found that participants in an MBSR course diarised the development of an "observer self" during training which suggested that this objective perception of experience was the hallmark of progress in mindfulness practice. These concepts of self-as-observer embody a shift in perception from one who is entrenched in and subsumed by experience, to one who is able to watch with a level of executive perspective over unfolding events which parallels Schuster's (1979) 'watcher self' as a therapeutic technique discussed in Section 2.1.

The four direct outcomes described in the model are affected by the reperceiving process and in turn have an effect upon mental and physical well-being. As such, if one is able to view emotions and thoughts objectively without being caught up in the experience of them, one is more likely to be able to self-regulate and -manage these thoughts and consciously choose how to respond. Similarly, this neutral stance can also help to clarify personal values and give opportunity for reflection regarding the personal relevance of inherited family or cultural values. With regards to cognitive, behavioural, and emotional flexibility, this model proposes that when situations are perceived impartially without over-identification with the content, it is more likely that an individual will be flexible in their response. This flexibility is a result of the gap created between stimulus and response, which discourages habitual responses and

allows more creative approaches. Finally, increased exposure is the fourth mechanism in the model to mediate the impact of mindfulness upon well-being. Exposure as a therapeutic technique is used extensively by health care practitioners (e.g. Hofmann & Smits, 2008), and the model proposes that after decentering, experiencing situations and emotions which might usually be distressing or painful may become easier, facilitated by the ability to allow thoughts, feelings and stimuli to arise and fade away in the mind – a skill which is actively developed during mindfulness training. Tests of the many variables within Shapiro and colleagues' model are infrequent, however, and the limited research evidence will be discussed below.

Carmody, Baer, Lykins, and Olendzki (2009), found partial support for the above model using self-report measures from MBSR participants. Results showed a strong relationship between mindfulness/reperceiving and psychological health, which was partially mediated by changes in values and flexibility. However, self-regulation and exposure – despite increasing after the intervention – were not found to predict changes in psychological health. Some support has also been found for reperceiving following MBSR (Dobkin, 2008) and for the immediate effect of mindful breathing for decentering when compared to active control groups (Feldman, Greeson & Senville, 2010). Furthermore, Orzech and colleagues (2009), found that both mindfulness and decentering increased following intensive mindfulness training, and that this increase predicted subsequent increases in well-being. Based upon these findings, it appears that Shapiro and colleagues' proposed theory has some support, however much of the literature in this area is more concerned with the evaluation of mindfulness-based interventions, than with progressing conceptual standpoints and theories. The evaluative evidence for these mindfulness interventions will be discussed below.

This subsection has critically discussed the theoretical mechanisms of mindfulness that underpin this research. The axioms of mindfulness, the process of reperceiving, and the direct mechanisms which are proposed to impact upon physical and mental well-being have been outlined, and deductive research support based upon this theory has been presented. The following subsection will appraise the research literature relating specifically to working populations, in order to deduce suitable hypotheses for the process and outcomes of mindfulness training for occupational samples.

3.1.2 Workplace Mindfulness

Mindfulness at work is not often studied for its own sake; research generally prioritises the relationship of mindfulness with variables that are considered valuable to organisations and/or employees, and in many intervention studies mindfulness itself is not measured as an outcome variable (de Vibe et al., 2012; Lamothe, Rondeau, Malboeuf-Hurtubise, Duval & Sultan, 2016). Later sections of this chapter will consider the workplace relationship of MBSR with well-being (Section 3.2.3), resilience (Section 3.3.3), and emotion regulation (Section 3.4.3) in preparation for Studies 1 and 2. As an introduction to these critical reviews and as a demonstration of the potential salutary effects of increased mindfulness at work, the current subsection will first examine trait mindfulness – the natural degree to which an individual is mindful without training – and the relationship this disposition has with workplace characteristics. Understandably, stakeholders require some assurances when considering an investment in mindfulness training at work: Firstly, if mindfulness is a stable trait, will mindfulness training be able to meaningfully impact upon baseline levels? Secondly, correlational research does not confirm the presence or direction of a causal relationship – will increasing mindfulness levels lead to workplace benefits? Longitudinal intervention research assessing the effect of MBSR training upon a range of outcomes can evidence MBSR as a viable and effective means of improving mindfulness levels, which in turn leads to positive organisational outcomes. This aim motivates the present subsection. Well-being is arguably the most commonly researched outcome of workplace mindfulness training, moreover, Good and colleagues (2016) distinguish performance and interpersonal relationships as further areas of interest when considering mindfulness at work. These two areas will be reviewed briefly before a more detailed analysis of well-being outcomes in Section 3.2.3.

Performance.

A significant, positive relationship has been found between trait mindfulness and supervisor-rated performance, which prevails when controlling for employee work engagement (Dane & Brummel, 2014). Furthermore, supervisor mindfulness has demonstrated significant positive relationships between leader mindfulness and follower job performance, and with follower in-role performance (Reb, Narayanan & Chaturvedi, 2014). Going beyond task and job performance ratings, findings from Zhang, Ding, Li and Wu's (2013) study within nuclear power stations, showed that high levels of present-moment awareness were positively related to safety performance for workers with complex tasks, but had a negative relationship with

safety for workers with simple tasks. This research shows important differential effects that should be considered in the workplace, and provides a rare negative perspective on mindfulness as a potential hindrance within simple, yet safety-critical job roles. Trait mindfulness has also been linked to extra-role activities, showing a positive correlation with organisational citizenship behaviours (Reb, Narayanan & Ho, 2015), and a negative correlation with counter-productive and deviant behaviours (Reb, Narayanan & Ho, 2015; Krishnakumar & Robinson, 2015). Mindfulness as a potential means to extend positive extra-role behaviours could have important consequences for organisations wishing to develop a productive and citizenship-based working culture, making performance one compelling reason to explore causal relationships with mindfulness through the manipulation of mindfulness levels. The causal effect of mindfulness training has been shown in an MBSR intervention with RCT design where mindfulness training leads to a significant increase in performance in terms of teacher efficacy when compared to a control group (Flook et al., 2013), as well as several small effect sizes found in a recent review (Lomas et al., 2017a), suggesting that this field is in need of further research utilising more robust research designs.

Workplace Relationships.

With an increased capacity to objectively appraise workplace interactions and respond in less habitual ways, more mindful individuals could be expected to experience better relationships and less conflict at work. As the majority of occupations involve regular collaboration and/or interaction between individuals, this is an area of interest to organisational stakeholders. In the aforementioned study by Reb et al., (2014) the positive relationship between supervisor trait mindfulness and follower well-being was mediated by follower perceptions that their needs in the leader-follower relationship were being satisfied. Furthermore, Liang and colleagues (2016) found that the expression of hostility as abusive supervision between leaders and followers was moderated by the leader's level of trait mindfulness such that those low in trait mindfulness are more likely to display abusive supervision towards a difficult subordinate than those high in trait mindfulness. Additionally, in their randomised controlled trial evaluating the effect of MBSR for teachers, Kemenev et al (2011) found that teachers being asked for a second time, post-intervention to discuss a difficult relationship issue with their spouse whilst under observation maintained a stable level of hostility, compared to a control group who exhibited significantly increased hostility towards their spouse during the second discussion. The ability to regulate emotions at work has also been linked to improved

relationships for employees (Hülshager & Schewe, 2011), and is one potential mediator of the effects of mindfulness training upon workplace well-being which will be discussed in further detail in Section 3.4.3. Some evidence is provided here regarding the impact of mindfulness upon relationships, however, these findings are limited as much of the research is cross-sectional and the direction of the correlational relationship between mindfulness and performance in these cases cannot be determined. More research is needed to explore workplace-specific relationships including within leadership and teamwork situations (Good et al., 2016), and the use of longitudinal studies with a control group for comparison would aid the determination of the direction of this relationship.

The evidence reviewed in this subsection indicates a potential for mindfulness to have beneficial effects in the workplace. Systematic reviews suggest that where mindfulness is measured, there is generally a significant effect of mindfulness interventions; Lamothe et al. (2016) state that 14 out of 17 studies measuring mindfulness in health care staff and students showed improvements following an intervention. Additionally, Lomas, Medina, Ivtzan, Rupprecht & Eiroa-Orosa (2017a) found similar results for 12 out of 14 interventions involving educators. As these reviews have focused on specific occupational groups, a key aim of Study 1 is to estimate the effect of MBSR training upon mindfulness skills across all working populations, and then to assess if any reported benefits are maintained at a follow-up:

Aim 1: To ascertain the mean effect of MBSR training upon the mindfulness skills of working populations, using meta-analysis.

Aim 2: To ascertain the mean effect of MBSR training upon the mindfulness skills of working populations at a follow-up measurement point beyond the end of the intervention, using meta-analysis.

In studies outside of the workplace, the effects of MBSR upon mindfulness skills, measured using the FFMQ have indicated significant increases in mindfulness after training in both uncontrolled (Carmody et al., 2009) and randomised controlled trials (Bränström, Kvillemo, Brandberg & Moskowitz, 2010) and it is therefore expected that mindfulness as measured by the FFMQ (Baer et al., 2006) will increase when an MBSR intervention is delivered by a competent trainer.

Hypothesis 1a) Participation in MBSR within the workplace will be related to an increase in mindfulness skills, as measured by the FFMQ (Baer et al., 2006) when compared to a control group, 1b) which is maintained at a six-month follow-up.

Despite the promising outcomes reported in much of the literature discussed so far, there remain a number of questions around mindfulness interventions and their efficacy which have no definitive answer. The traditional format of MBSR has been altered in many ways, and reviews of findings have tended to amalgamate this variety of interventions – as a result, one aim of the meta-analysis in Study 1 is to examine the moderating effect of reducing the course content upon mindfulness skills and also well-being where they are measured as an outcome, and whether the inclusion or exclusion of a silent day-retreat within the programme moderates the effect of MBSR upon mindfulness and well-being.

Aim 3: To ascertain the effect upon mindfulness and well-being outcomes of a reduced programme of MBSR, when compared to studies which include the standard minimum of 16 hours contact time, using moderated meta-analysis.

Aim 4: To ascertain the effect upon mindfulness and well-being of MBSR programmes which include a retreat day, compared to those which omit this from the traditional MBSR format, using moderated meta-analysis.

In conclusion, Section 3.1 has provided grounding within contemporary, secular mindfulness research. The differing definitions of mindfulness, the theoretical mechanisms proposed by Shapiro and colleagues (2006), and the potential impact of mindfulness upon performance and relationships at work, have been considered. The following section will consider well-being at work and its relationship with mindfulness.

3.2 Well-Being

As defined in Section 2.3, well-being is an evaluation of quality of life based upon affective experiences, with workplace well-being presenting a domain-specific evaluation of affect related to work. The measurement, analysis, and evaluation of workplace well-being within this thesis are grounded within Peter Warr's theoretical framework of happiness and unhappiness at work (Warr, 1990; Warr, 2007; Warr, Bindl, Parker & Inceoglu, 2014). Within this framework, well-being is hedonic in nature and focuses on the experience of core affect. As well-being is of primary interest for both of the studies within the present research, Warr's approach will

provide the theoretical framework for its exploration. The origins of this theory within the circumplex model of core affect, whereby affect is plotted in a circle rather than on a linear scale, (Russell, 1980) will provide initial context, followed by a review of Warr's approach to well-being as a function of core affect sampled from around the affective circumplex. Finally, the research evidence from RCTs and reviews investigating the effect of MBSR and similar interventions at work will be critically appraised.

3.2.1 Theories of Well-Being

The circumplex model of core affect is one conceptualisation of well-being, which has been developed and researched in a range of contexts (Warr, 2007). Core affect is defined as the smallest possible building block of an emotion or mood; it is "...primitive, universal, and simple" (Russell, 2003, p. 148), and the circumplex exists as a metaphor in two-dimensional space for psychological experience, whereby all affect items are inter-correlated, and mapped in a circle (Yik, Russell & Steiger, 2011). The affect circumplex is concerned with the range of experiences of core affect, which are a function of two factors: affective valence, and mental activation (Russell, 1980; Russell, 2003; Yik et al., 2011). Affective valence denotes the degree to which affect is pleasant (positive) or unpleasant (negative) and mental activation, or arousal, may be explained as the level of energy integral to an affective experience, from low to high. As shown in Figure 3.2, these two axes are independent and bipolar in nature, and their combination as core affect can be plotted around a circumplex depending on their relative weights.

Much existing affect research has focused on a single dimension, for example, affect that is positive or negative, and this is reflected in scale development within this field (e.g. The Positive and Negative Affect Schedule; Watson et al., 1988). The PANAS was originally described as a measure of positive and negative affect, although the forms of core affect included in the scale were only those with high activation (occupying the upper two quadrants in Figure 3.2). This narrow banding of high activation terms such as 'excited' and 'nervous' effectively ignores the low activation half of the circumplex and affect such as 'relaxed' or 'calm' (Feldman Barret & Russell, 1999; Warr, 2007; Warr et al., 2014). This limited measurement of core affect motivated the development of a more comprehensive self-report measure; the MultiAffect Indicator (MAI; Warr et al., 2014), which is discussed within the next subsection.

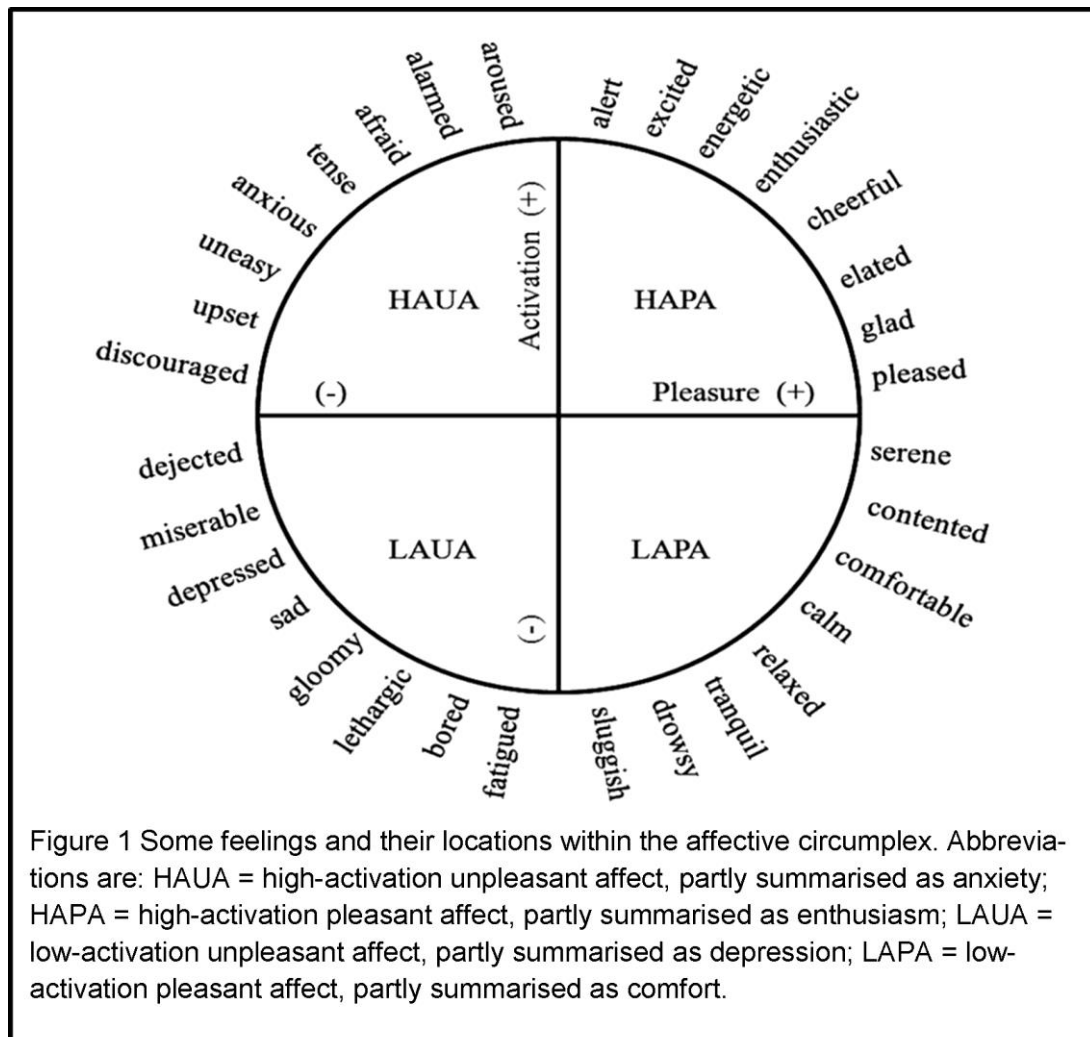


Figure 3.2. Diagram of the affective circumplex. From “Four quadrant investigation of job-related affects and behaviours.” Warr et al., 2014. *European Journal of Work and Organizational Psychology*, 23(3), 342-363. Copyright [2013] by Taylor and Francis.

3.2.2 Workplace Well-Being

The work of Peter Warr applies theories of affect as a function of valence and activation to workplace well-being research in order to examine core affect at work at its smallest unit of measurement, which is a component of more complex emotions and moods. The MAI measures the frequency of feelings from each quadrant of the affective circumplex in a self-report format. The quadrants of core affect reflect four possible combinations of high activation (HA) or low activation (LA), and pleasant affect (PA) or unpleasant affect (UA). In a series of validation studies, Warr and colleagues (2014) found that a four-factor structure – dividing the results by quadrants – was the best fit for data from a large sample across four studies, when compared to models combining all items, or dividing them along one dimension of either unpleasant-pleasant, or high-low activation. The four quadrants will be described in turn, beginning in the upper left quadrant of Figure 3.2 and proceeding clockwise.

Firstly, high activation unpleasant affect (HAUA) includes feelings of fear, alarm, and uneasiness, in a quadrant that might be broadly labelled as anxiety. The affect experiences are clearly negative in nature to varying degrees, but also include an element of high energy expenditure and immediacy in their expression. Next, the quadrant on the upper right of the circumplex is a combination of both high activation and pleasant affect (HAPA) which may be labelled as enthusiasm. Feelings in this quadrant include glee, elation, and excitement and depict positive affect, which again involves energetic expression. The combination of low activation and pleasant affect (LAPA) found in the lower right quadrant is expressed in feelings such as contentment, serenity, and calmness and is broadly labelled as comfort. This low-energy, positive category is associated with satisfaction and safety. Finally, the lower left quadrant can be labelled as depression and is characterised by feelings which are low in activation with unpleasant affect (LAUA), such as gloom, sadness, and dejection. The combination of low energy and low pleasure generally describes affective states of unmotivated dissatisfaction (Warr & Inceoglu, 2012, Warr et al., 2014).

The MAI can be combined (after reverse-scoring unpleasant quadrants) to give an overall score for well-being, however this combination precludes exploration of the more nuanced elements of affect at the heart of well-being. Studies have linked the four quadrants of the affective circumplex with environmental and individual characteristics at work, with findings supporting the discriminant features of the quadrants of the affective circumplex in the work domain. For example, Warr and Inceoglu (2012) proposed employee engagement as a manifestation of the enthusiasm quadrant (high activation, pleasure), and job satisfaction as comfort (low activation, pleasure) and demonstrated their contrasting relationships with perceived person-job fit, such that satisfaction and person-job fit were negatively correlated, but engagement and person-job fit were positively correlated. This research demonstrates the benefit of going beyond a composite score, or a positive/negative affect dichotomy and including motivational intensity along the activation axis. Furthermore, Warr and colleagues (2014), found that enthusiasm is more strongly positively related to desirable extra-role behaviours than is comfort, and that the relationship between enthusiasm and positive work behaviours is at its strongest when the behaviours are voluntary. Furthermore, in terms of negative-affective states, the link between depression and negative work behaviours was stronger than the link between anxiety and negative work behaviours. These findings are rare instances of the application of the affective circumplex model and the differential

relationships between the four quadrants and workplace factors, and provide support to a four-quadrant model of affect in which each quadrant embodies discrete relationships with workplace variables. The present study aims to extend these investigations by measuring well-being in the work domain as a function of valence and activation, by sampling the frequency of a range of affective states from around the circumplex using the MAI.

3.2.3 Mindfulness and Well-Being at Work

The investigation of mindfulness and particularly the use of MBIs at work is developing rapidly. Along with the areas of performance and relationships outlined in Section 3.1.2, the interaction between mindfulness and well-being at work is one of the primary interests in this growing field (Good et al., 2016), perhaps due to the focus upon stress reduction attached to interventions such as MBSR. Exploration of the relationship between MBSR and well-being at work is the primary aim of this thesis of research, therefore, as a preface; this subsection will narratively review some key primary studies of this relationship. For the purposes of this narration, the results focus upon two key occupational groups reflecting the prevalence of mindfulness interventions within certain sectors, and allowing a focus upon their unique findings. Research with health care professionals and educators, plus interventions with mixed occupations will be appraised. The main findings will be summarised, and well-being aims for Study 1 and hypotheses for Study 2 will be presented.

Health Care Professionals (HCPs).

Several existing studies have explored the benefits of MBSR for HCPs, with some focusing on nursing staff or physicians specifically, or on a range of roles within health care. Interventions in this sector characterise nursing and other health care professions as extremely demanding roles, with high instances of stress and burnout. In addition, any improvements in HCP well-being have the potential to positively impact upon patient care (Cohen-Katz et al., 2004). In line with this demanding environment, a condensed version of MBSR is often adopted to fit more easily into a busy working schedule (e.g. Mackenzie, Poulin & Seidman-Carlson, 2006; Moody et al., 2013; Manotas, Segura, Eraso, Oggins & McGovern, 2014)

Health care staff, and particularly those in nursing are commonly found to be high in burnout and are one of the most often researched occupational groups in the burnout literature (Maslach, Schaufeli & Leiter, 2001). Burnout is defined as “a psychological syndrome that involves a prolonged response to chronic interpersonal stressors on the job” (Leiter & Maslach, 2009, p. 332). There are three proposed components to

this syndrome, measured within three sub-scales of the Maslach Burnout Inventory (Maslach & Jackson, 1984): these are feelings of extreme exhaustion (the emotional exhaustion subscale), becoming cynical and detached from the job role (the depersonalization subscale), and feelings of being inefficient and unaccomplished in one's job (the personal accomplishment subscale). This scale is self-report and high scores for emotional exhaustion and depersonalization, and a low score for personal accomplishment indicate high levels of burnout. As a result, it is not surprising that most studies include burnout as an outcome of interest for HCPs.

In a study published in three parts, Cohen-Katz and colleagues investigated the effects of a traditional MBSR course within a sample of 27 nursing staff in Pennsylvania, USA (Cohen-Katz et al., 2004; Cohen-Katz et al., 2005a; Cohen-Katz et al., 2005b). The study showed that compared to the control group, trainee self-report scores improved for mindfulness on the Mindful Attention Awareness Scale (MAAS, Brown & Ryan, 2003), and emotional exhaustion and personal accomplishment burnout subscales. Scores on the depersonalisation subscale did decrease; however, this change did not reach statistical significance. There were also fewer clinical cases of psychological distress within the training group after the intervention, as measured using the Brief Symptom Inventory (BSI; Derogatis & Melisaratos, 1983), however the authors highlight that this measure is usually used on clinically unwell populations and may not be appropriate here.

In another study utilising the traditional MBSR format, Shapiro and colleagues (Shapiro, Astin, Bishop & Cordova, 2005) designed an RCT to investigate the effects of mindfulness training with a range of HCPs in California, United States. The research design involved the random allocation of 38 participants to either the experimental group or a wait-list control group and did not include any follow-up measurements. This research was limited by attrition in the intervention group, leaving only ten participants who completed the MBSR training. Despite reduced statistical power, significant improvements were found in terms of perceived stress and self-compassion. Burnout, mental ill health symptoms, and satisfaction with life also changed in the expected direction relative to the control group; however, these results were not statistically significant. In this study, dropouts were mostly attributed to lack of time or increased workload, and the authors suggest that the full MBSR course may not be suitable for staff who cannot commit to the participation and homework practice required without creative implementation by organisations.

Two further key RCTs retained the traditional MBSR format, both of which were conducted in Spain. Asuero, Queraltó, Pujol-Ribera, Berenguera, Rodriguez-Blanco, and Epstein (2014) measured changes in self-reported mindfulness, burnout, mood, empathy, and personal habits, within Spanish primary health care professionals. Amutio, Martínez-Taboada, Delgado, Hermosilla, and Mozaz (2015a) measured mindfulness and burnout across all participants, but also monitored weekly blood pressure and heart rate for the experimental group when evaluating the effects of MBSR upon physicians. Both studies found reductions in burnout, increases in mindfulness skills, and within each study, other indicators of well-being also improved, including heart rate, blood pressure, mood, and physician empathy. In addition, during a 10-month period after MBSR training by Amutio and colleagues (2015), improvements in outcomes were maintained, including blood pressure, which was also positively correlated with reported home practice of mindfulness exercises. Although the maintenance period was uncontrolled, it nevertheless supports the concept that practice must continue after the course ends in order to foster medium- to long-term benefits.

Other intervention studies used a condensed version of MBSR totalling 15 hours or less. Burnout was a key outcome for two studies; in a four-week intervention totalling only two hours of contact time, Mackenzie, Poulin and Seidman-Carlson (2006) found that trainee emotional exhaustion and depersonalisation were improved relative to the control group, as were measures of life satisfaction and relaxation. In contrast, Moody et al. (2013) found no significant effects of a 15-hour mindfulness intervention upon burnout, stress, or depression self-ratings in paediatric oncology nursing staff. These participants worked in a particularly demanding role, with baseline scores showing high levels of burnout, and average perceived stress scores that were more than one standard deviation higher than the national (US) average. Finally, in a four-week MBSR programme with a total of eight hours contact time, Manotas, Segura, Eraso, Oggins, and McGovern (2014) found significant improvements relative to the control group on measures of mindfulness, perceived stress and symptoms of depression and anxiety for a Hispanic sample of Columbian healthcare employees. These mixed results give an uncertain picture of condensed MBSR courses; shortened courses are often in response to recognition that employees already have numerous competing demands on their time, however, the fact that the employees under investigation are highly stressed and time pressured may be a confounding factor in the success of these short interventions. For example, Manotas and colleagues (2014) highlight that 22 out of 66 participants in their intervention group

failed to attend the first session citing work demands. Participants least likely to have time to comply with the homework requirements, and therefore possibly realising the smallest gains, may need to be offered alternative low-intensity interventions.

A systematic review of MBSR-derived interventions for HCPs found 39 studies that were either RCTs, quasi-experimental, or pre-post uncontrolled designs involving HCPs or health care students (Lamothe et al., 2016). The review indicates that where measured, most studies reported a decrease in perceived stress (17 studies), about half reported improvements in burnout (nine studies), most studies reported improvements in anxiety (10 studies), and an increase in mental well-being (six studies). These findings are in line with much of the research from primary studies already examined in the previous paragraphs. Lamothe and colleagues (2016) highlight that none of the studies in their review analyse mindfulness as a mediator, and only 17 measure mindfulness at all. This again shows that manipulation checks are not being conducted to confirm that mindfulness is the variable via which the benefits of mindfulness training are realised.

These studies show that generally, an MBSR programme for HCPs yields positive effects upon stress and burnout that are also shown in some shorter versions of the course. The exception here is Moody and colleagues' (2013) intervention, which examined a highly stressed and burnt-out population of nursing staff in Israel and the US. The paper does not report whether there are any differential effects between the countries, despite finding that US trainees practised significantly more often than Israeli trainees did, suggesting that cultural differences may affect the suitability of this intervention. It is also possible that fitting this training and homework practice into the working lives of staff that are already overloaded by their job roles is not appropriate. This is reflected in statements from some participants that the course commitment was creating more stress in their lives. The need for emotional resilience for those working in oncology-related fields is highlighted as a motivation for the aforementioned systematic review of MBSR interventions in health care (Lamothe et al., 2016). An interesting issue is thus raised when using MBIs in highly stressed occupational groups; when these participants are already at the upper limits of their coping abilities, do work demands need to be reduced before they can take on the added challenge of an intensive stress-management intervention? In addition, mindfulness is not measured in all studies, therefore it is difficult to determine whether these interventions achieved their primary goals of making people more mindful, which may have helped to explain the mixed results.

Educators.

Teachers and teaching assistants are another commonly sampled group, all of which described here cite the highly stressful nature of teaching (e.g. Flook, Goldberg, Pinger, Bonus & Davidson, 2003; Benn, Akiva, Arel & Roeser, 2012), and a subsequent motivation to find effective stress-reduction programmes. Many of the studies also highlight the additional benefits for students if their teachers become more mindful and less stressed (e.g. Roeser et al., 2013). Both of these motivations explain the high number of studies involving teaching staff.

A strong focus on stress-reduction for this occupational group has resulted in primarily well-being-related outcome measures, and the most common outcomes were perceived stress, burnout, anxiety, and depression, as well as mindfulness skills. In addition, although interventions were based upon MBSR, these were often modified, or shortened to fit into a busy teaching schedule. For example, Flook and colleagues (2013) describe the use of modified MBSR training with a course tailored specifically to teachers and the classroom, where trainees chose the duration of the homework to make this more flexible. In another study, Benn and colleagues (2012) utilised the SMART-in-Education (Stress Management and Relaxation Techniques) programme, which incorporates approximately 70% of the MBSR training, with additional focus upon emotions, kindness, and compassion. In this case, training was for a similar number of hours, but condensed into twice-weekly meetings over a five-week period. This training method was also used by Roeser and colleagues (2013) with a different sample of teachers, who this time attended once per week across eight weeks.

For these three interventions, the authors found that relative to the control group, trainees improved significantly on ratings of: mindfulness skills, self-compassion (Benn et al., 2012; Flook et al., 2013; Roeser et al., 2013); stress, anxiety and depression (Benn et al., 2012; Roeser et al., 2013); burnout (Flook et al., 2013; Roeser et al., 2013); psychological distress (Flook et al., 2013); and negative affect, and empathic concern (Benn et al., 2012). Most findings were maintained or continued to increase if a follow-up was conducted. In addition, Benn and colleagues (2012), and Roeser and colleagues (2013) used a number of biological and attentional outcome measures such as cortisol levels, blood pressure and tests of sustained attention, but found no significant improvements on these following mindfulness training. These findings indicate that MBSR, which has been adapted to the needs of its target audience, has a positive effect on teachers' perceptions of their own psychological distress and well-being, but does not suggest that the levels of

stress, as indicated by certain biological measures, were changed during the time frame under study.

In a further study, an intensive 42-hour mindfulness and emotion regulation training course was conducted in the US with 82 female school teachers (Kemeny et al., 2012). This detailed study assessed a range of psychological, behavioural, and cognitive self-report measures or tasks. Improvements were found in self-reported rumination, depression, trait negative and positive affect, and mindfulness. Furthermore, behavioural tasks indicated an improvement in emotion recognition, improved performance on a compassion-related lexical decision procedure, and a reduction in hostility in a marital interaction task with a partner or spouse. Most benefits were maintained after a substantial five-month follow-up. However, the majority of physiological tests including measures of blood pressure showed no significant change after training compared to the control group. By assessing several outcomes using different methods, this study avoids common-method bias, and measures a number of behavioural outcomes that are rarely considered and provide insight into the application of mindfulness in real-life situations such as the benefits in relationships with others that could be beneficial when working through conflict with colleagues.

In a systematic review, Lomas and colleagues (2017a) found 17 intervention studies of the impact of mindfulness upon well-being and performance for educators. The review concludes that the majority of interventions reported improvements on a range of well-being outcomes including anxiety, burnout, depression, stress, well-being and satisfaction. Which mirror the findings of the primary studies also discussed earlier in this section.

In summary, various mindfulness-based interventions have been published with participants working in education. These studies have found many psychological benefits, particularly in the perceived reduction of stress and mental ill-health of intervention participants, which are still evident where MBSR training has been modified to suit the needs of teachers. It is note-worthy that in two of the studies, physiological or biological measures of stress did not change after the intervention despite self-reported improvements, although it is not clear why this is the case.

Various Occupational Groups.

Other key RCT studies exist which include occupations outside of teaching and healthcare. For example, Davidson et al. (2003) examine changes associated with

an MBI within a biotechnology corporation in the US studying the effects upon immunity and brain functioning in an eight-week MBSR course. Electroencephalography (EEG) results showed increased activity in the left side anterior region, which is related to positive affect, and this increased further at a four-month follow-up. The trainee group were also found to have more antibodies for an influenza vaccine compared to the control group, with the degree of increase in left-sided activation predicting the degree of increase in antibodies for the vaccine. State and trait anxiety were also measured through self-report methods and were found to improve for trainees relative to the control group. This research shows that there are observable biological effects for working adults who are trained to be more mindful, which have been weak or absent in the previously discussed studies (e.g. no effect on salivary cortisol measure in Roeser et al., 2013). Davidson and colleagues (2003) did not find a significant change on the Positive and Negative Affect Scale despite the increase in brain activity related to positive affect. This may suggest sequential improvements at the neurological, psychological and physiological levels respectively such that physiological effects take longer to develop than brain-based or self-reported psychological changes, and would explain why many of the biological measures used thus far have not yielded significant improvements in samples who are still novices in the practice of mindfulness.

Klatt, Buckworth, and Malarkey (2009) studied a modified six-week MBSR course with 48 faculty and staff at a large US university and found significant improvement in mindfulness and perceived stress relative to the control group. Sleep quality for both groups improved during the training, but there were no significant differences in cortisol levels. The authors believe that compared to clinical populations, working adults may have less motivation to persevere with a traditional mindfulness course in the absence of debilitating health problems, and have less time available to attend sessions and practise the methods. This was the rationale for Klatt and colleagues' (2009) implementation of a 'low-dose' version of MBSR reducing sessions to one hour in length and homework requirements to 20 minutes. Furthermore, all parts of this course could be completed in office clothing and the yoga component was office-friendly. This modified version of MBSR still produced positive results in terms of mindfulness and perceived stress, suggesting that it is an appropriate modification for a busy working population, however this study did not include a follow-up therefore maintenance of these positive effects is not confirmed.

Finally, Hülshager, Alberts, Feinholdt, and Lang (2013) recruited 101 working adults from the general population employed within interactive service jobs in the Netherlands and Belgium, exploring the effects of a self-taught 10-day mindfulness programme using diary methods. The authors recruited employees including teachers, nurses, physicians, waiters, and clerks. The trainees received a self-taught programme based upon MBSR and MBCT consisting of a workbook, guided meditations on audio CD, and emails introducing the daily practice. Participants using these materials were found to be significantly less emotionally exhausted (measured with the MBI), and more satisfied with their jobs. Further analysis showed that the causal effect of the training upon burnout was mediated by emotion regulation (see Section 3.4.3 for further discussion). This study is one example that highlights the efficacy of interventions that are not in the traditional, face-to-face, group format and introduces a new method of assessing daily changes using diaries. The field is now sufficiently developed to combine single studies into reviews, which will now be considered.

One meta-analysis and one systematic review of the effects of mindfulness at work can help to direct the aims of Study 1, and inform hypotheses predicting the impact of MBSR upon well-being in Study 2 (Virgili, 2015; Lomas et al., 2017b). Originally published online in 2013, Virgili's meta-analysis was one of the first attempts to synthesise findings from mindfulness interventions for working populations. This study had rather broad inclusion criteria, resulting in acceptance of a number of uncontrolled studies of poor quality, and interventions other than MBSR, however the results give some insight into this developing field. A medium-to-large effect size (Hedges' $g=0.68$, 95% CI [0.48, 0.88], $k=10$; see Chapter 4, Section 4.5.3 for explanation of Hedges' g standardised effect sizes) of mindfulness training upon psychological distress was found when analysing a subgroup of studies that included a control group. This meta-analysis confirms that the psychological health benefits of mindfulness documented in other fields are also present in working populations. In another review, Lomas et al., (2017b) reviewed 112 papers involving a broad range of workplace mindfulness intervention studies, 48 of which were RCTs and 64 were non-randomised or uncontrolled. These papers showed a majority improvement in well-being related outcomes including stress and well-being. In order to develop these findings, with stricter inclusion criteria relating to study design and intervention format in order to reduce bias, the primary aim of the meta-analysis in Study 1 is to assess the effect of MBSR upon well-being for working populations. As discussed in Section 3.1.2, this primary aim will be followed up by a series of moderation analyses

to determine the effects of reducing the intervention length, and excluding the retreat day, and by also analysing the mean effects after a follow-up period upon well-being, for studies where this information has been reported.

Aim 5: To ascertain the mean effect of MBSR training upon the well-being of working populations, using meta-analysis.

Aim 6: To ascertain the mean effect of MBSR training upon the well-being of working populations at a follow-up measurement point beyond the end of the intervention, using meta-analysis.

In summary, benefits of a mindfulness training intervention were also found in studies including diverse occupational groups, allowing these findings to be generalised somewhat to the wider population. A self-taught system was also found to be effective where these changes made the course more accessible to healthy working adults. The combination of findings outlined in this section has resulted in the following hypothesis regarding the impact of MBSR training in Study 2:

Hypothesis 2a) Participation in MBSR within the workplace will be related to an increase in well-being at work, as measured by Warr et al.'s (2014) MultiAffect Indicator, when compared to a control group, 2b) which is maintained at a six-month follow-up.

This section has considered the theory behind workplace well-being, and the mostly beneficial effects of mindfulness training upon staff well-being in areas including depression, anxiety, burnout, and stress. Less common, however, is the measurement of positive psychological outcomes, and a focus on more positive indicators of well-being such as work engagement was a recommendation of a recent systematic review of mindfulness interventions for teaching staff (Lomas, et al., 2017a). Furthermore, most studies only analyse the interaction between the outcome and the experimental group (trainee or control) over time, but not the process by which this interaction may occur. Study 2 will include a measure of resilience; a positive psychological construct, and explore how the mindfulness skills learnt in an intervention might improve well-being through increases to resilience in a mediated model. Resilience has been identified as one of the areas of occupational mindfulness in need of further investigation (Good et al, 2016), and this inclusion will add to knowledge of this important variable and its place in the process by which mindfulness training impacts well-being. The hypothesised role of resilience will now be considered.

3.3 Resilience

According to Tugade and Fredrickson, “psychological resilience refers to effective coping and adaptation although faced with loss, hardship, or adversity” (2004, p. 320). This broad definition can be applied to a multitude of challenging human experiences, and has been studied to understand responses to childhood maltreatment (Nasvytienė, Lazdauskas & Leonavičienė, 2012), sporting performance (Bryan, O’Shea & MacIntyre, 2017), bereavement (Sandler, Wolchik & Ayers, 2007) and substance addiction (Harris, Smock & Tabor Wilkes, 2011). When considering the well-being of employees in the workplace, it is clear from the previous section that positive coping and adaptation strategies are protective factors against stress and ill-health at work, making this an area of interest to occupational psychology researchers and workplace stakeholders who wish to maintain a healthy workforce. Often, mindfulness courses are advertised as a workplace intervention to ‘boost resilience’, however there has been little research to test this. In Study 2, psychological resilience is measured as an outcome and mediator in order to test practitioner claims about the effect of mindfulness training upon resilience, and furthermore to explore the mechanism by which resilience might mediate the effect of mindfulness upon well-being.

This section of the literature review will begin by critically reviewing existing theory regarding psychological resilience, as it has developed in the last three decades. Attention will then turn to the specific application of resiliency theory in the workplace, and the empirical research that explores resilience at work. Finally, the relationship between mindfulness, resilience, and well-being at work will be considered. Existing research into this relationship will be appraised, and hypotheses regarding the impact of MBSR upon resilience, and the potential mediating role of resilience between mindfulness and well-being at work will be presented.

3.3.1 Theoretical Resilience

As defined above, psychological resilience is the ability to bounce back and grow positively from difficult or challenging situations. It can also be understood in terms of the qualities exhibited by resilient individuals (Jackson, Firtko & Edenborough, 2007). These qualities – identified via inductive phenomenological methods during the first wave of resilience research – include curiousness, self-confidence and self-discipline, flexibility, and emotional stamina (Giordano, 1997). Subsequent to the identification of these qualities, research then progressed to the development of

theoretical explanations of how these qualities might be acquired or developed by individuals (Richardson, 2002).

One such theory of these mechanisms is the resiliency model (Richardson, Neiger, Jensen & Kumpfer, 1990; Richardson, 2002), which proposes that an individual begins in a state of personal balance and when an event arises which cannot be successfully negotiated using existing coping methods, a disruption occurs. During disruption, an individual is out of their comfort zone and must disorganise and then reintegrate their sense of balance in order to accommodate the event and its consequences. The resiliency model proposes four types of reintegration that may occur in order to resolve a disruption: resilient reintegration, reintegration back to homeostasis, reintegration with loss, and dysfunctional reintegration, as shown in Figure 3.3 below.

Resilient reintegration is the most positive outcome following a disruption, as the individual not only overcomes the disruption, but also uses the opportunity for growth, and to acquire new coping skills and personal insight. These learning experiences will equip the individual with new protective factors leading to increased resilience in the face of future challenges. In contrast, reintegration back to equilibrium (homeostasis) involves a resistance to change and an effort to return to the status quo before the disruption occurred, providing little opportunity for learning. When a substantial life event is experienced, reintegration can involve loss, whereby the worldview is reorganised with fewer protective factors than previously, and in the case of dysfunctional reintegration, the coping response to disruption is destructive, such as the abuse of substances. Based upon resiliency theory, attempts to increase resilience could either focus upon building protective factors and a person's confidence to deploy them, thus reducing the number of events which are perceived as disruptions, or have an impact on the reintegration process, in order to facilitate resilient reintegration.

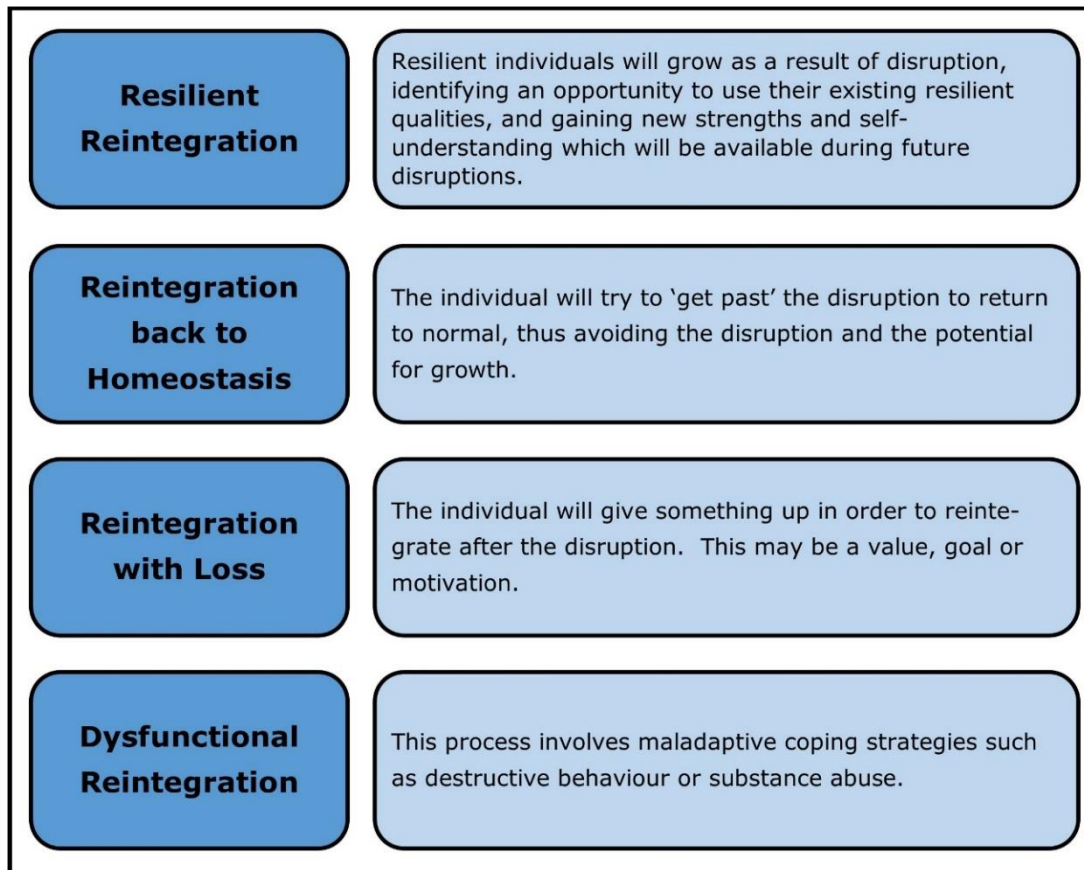


Figure 3.3. Four types of reintegration in the resiliency model (Richardson, 2002).

Based upon the resiliency model, it can be seen that ideally one would possess sufficient protective factors to combat any potential stressors or life events. In reality, however, disruptions to one's worldview and coping capacity are occurring constantly – from minor discrepancies to major life events. This fluctuation in potential stressors requires a dynamic system for building and deploying resilient qualities, in order to promote resilient reintegration, over alternative approaches. Resilience at work is particularly important if employees are to maintain good well-being whilst navigating a range of workplace demands.

3.3.2 Resilience and Well-Being at Work

Psychological resilience in the workplace is a growing area of interest, for which the Chartered Institute of Personnel and Development (CIPD) have published an evidence-based developmental guide for researchers and practitioners (CIPD, 2011). Having a resilient workforce is believed to give organisations a competitive edge and the ability to thrive in difficult market conditions. The CIPD resilience guide includes mindfulness techniques as a suggested intervention at the individual level, alongside other psychology-based methods. This acceptance and advocacy is an illustration of the growing credibility of contemplative techniques within the workplace and is an

important example of the ways in which evidence-based practitioner reports from recognised institutes can help organisations to make informed decisions regarding the welfare of their staff.

Perhaps the most prominent perspective on resilience in the workplace comes from the construct of psychological capital (PsyCap; Luthans & Youssef, 2004; Luthans, Youssef & Avolio, 2007; Luthans, 2002), which focuses upon positive psychological concepts which have beneficial effects within organisations, including hope, optimism, resiliency and self-efficacy. The focus upon these four arises from criteria for concepts that are "...positive, unique, measurable, developable, and performance related..." (Luthans & Youssef, 2004, p. 153). Within this workplace framework, the definition of resiliency corresponds with the context-free definition at the beginning of Section 3.3 and is characterised as "...when beset by problems and adversity, sustaining and bouncing back and even beyond... to attain success" (Luthans, Youssef & Avolio, 2015, p. 2). When grounded in the work domain, examples of events which could disrupt, disorganise, and ultimately lead to the need for an employee to reintegrate their conceptualisation of work, could be positive or negative – such as being promoted or fired, and also planned or unplanned – such as choosing to work on a new project, or having a disagreement with a colleague.

Luthans and colleagues designed both a measurement scale and a short intervention in order to test further the concept of psychological capital. The Psychological Capital Questionnaire (PCQ; Luthans, Avolio, Avey & Norman, 2007) has been developed using items from four existing measures of hope, optimism, resiliency and self-efficacy. Furthermore, the Psychological Capital Intervention (PCI; Luthans, Avey, Avolio, Norman & Combs, 2006; Luthans, Avey, Avolio & Peterson, 2010) is designed as a short intervention to boost each of the four areas of PsyCap. Further development and evaluation of these scales is lacking and further research on the concept of PsyCap in general is needed, as Luthans and colleagues (2010) acknowledge, however results of research have indicated a small but statistically significant increase in PsyCap and performance at work, with analyses indicating a core factor of psychological capital, with the predicted four latent variables. In a further study with students, a similar small yet significant improvement in PsyCap was found (Luthans, Luthans & Avey, 2014). As such, there is some support for the concept of PsyCap at work, and for the role of resilience within this, however, this specific approach to resilience is somewhat different to other approaches within the workplace literature as will be discussed below.

The definition of resilience within PsyCap includes a focus upon bouncing back and going beyond previous performance in the pursuit of success (Luthans & Youssef, 2004). However, it could be argued that even in the case of resilient reintegration, whereby protective factors and skills are developed, the purpose or manifestation of these is not necessarily one of increased work performance. The PsyCap model takes a resource-based approach to psychological capital, and the ways in which this human resource can be leveraged to gain competitive advantage (e.g. Luthans, Youssef & Avolio, 2007), and as such is less compatible with the approach of the current research, which explores the value of increased mindfulness and resilience for the benefit of the individual and their well-being.

Evaluations of resilience interventions in the workplace are rare within the literature, however a small number of studies with varying levels of methodological quality have been published. In recent years, two reviews have endeavoured to draw this body of intervention research together in order to analyse general patterns and outcomes (Robertson, Cooper, Sarkar & Curran, 2015; Vanhove, Herian, Perez, Harms & Lester, 2016). These two reviews will be critically appraised in turn, including a comparison of their respective findings.

A systematic review of resilience training interventions by Robertson and colleagues (2015) found only 14 eligible studies from working populations and cite this small number as the reason they did not carry out a meta-analysis. As is common in fields which are in the early stages of empirical development, methodological sophistication and quality were limited in the majority of studies, including four study designs without a control group, and six studies in which resilience was not operationally defined. Instances of selective reporting of results and lack of blinding of researchers as to group membership of participants also contributed to an assessment of high risk of bias overall across the included papers. The criteria upon which an intervention was assessed to be resilience-based are not clear, although all of the included interventions are described as resilience training in the review. Despite these issues, the review has value as the first of its kind, and as an impetus for future research addressing the limitations of the field thus far. Only half of the six studies which measured resilience reported a significant increase post-intervention, however, the benefit of interventions for mental health and well-being was the strongest finding in the narrative review, leading to a cautious conclusion that resilience training may be effective in this area. Furthermore, the heterogeneity of training approaches currently implemented results in an uncertainty regarding which elements of the interventions

are the 'active ingredients' responsible for any benefits found. In concluding the review, the authors provide a number of guidelines for the future direction of workplace resilience research; these include improved methodological quality, a unified resilience definition, and designs that incorporate mediators to establish *how* resilience interventions exert effects.

In a review submitted for publication during the same year, Vanhove et al. (2016) identified 37 studies involving resilience-building training interventions that were subsequently meta-analysed. One criteria for inclusion required studies to focus specifically on psychosocial protective factors such as self-efficacy and optimism, which previous research had linked to resilience, as opposed to general approaches to wellness. A modest (but significant) effect size ($d=.21$, 95% CI [0.13, 0.29], $k = 42$, $n = 16,348$) was found for resilience-building interventions across all psychosocial, performance and well-being measures when combined; a much smaller effect than that estimated by Robertson et al. (2015). Moderation analyses confirmed hypotheses that study design (between/within participant comparisons), comparison group (active/inactive control group) and participant assignment (random/non-random), all modified the effect of the interventions, whereby less-rigorous designs produced larger effect sizes, suggesting that bias in these designs is inflating the true effects of the interventions. Vanhove and colleagues extend the recommendations of Robertson et al. by calling for more follow-up measurements to assess the long-term effects of training, and further exploration of moderators that contribute to the magnitude of intervention effects.

The considerable difference in the results of these two reviews is perhaps a further reflection of an emergent research field, where differences in the definition of resilience interventions and the specificity of search terms has resulted in disparate sample sizes and necessarily different methods of synthesis. The reviews share an awareness of this still-developing field and draw only tentative conclusions, but their findings nevertheless suggest that resilience, which has been manipulated via intervention research, has the potential to positively impact upon subjective well-being.

In summary, there is a small body of literature addressing the role of resilience in the workplace, how it can be altered using interventions, and its corresponding impact upon employee well-being. Research in this area lacks the maturity to speak confidently about the benefits of resilience-building in the workplace, and yet the industry is replete with interventions without a strong evidence-base that are boldly

making these claims. The claim that mindfulness interventions are resilience-building is a further example of this, and one that will be examined within Study 2 of this thesis.

3.3.3 Mindfulness, Resilience and Well-Being at Work:

A number of synergies become apparent when reviewing the literature from the mindfulness and resilience fields; these provide compelling support for the concept of resilience as a mechanism by which mindfulness improves well-being. This subsection will begin with a discussion of how the process of mindfulness may positively interact with the process of resilience, which in turn positively impacts upon well-being. Following the outline of this theoretical model, the existing literature linking mindfulness, resilience, and well-being for working populations will be appraised. This subsection will conclude with a presentation of the third hypothesis for Study 2.

Within Shapiro and colleagues' (2006) proposed theory of the mechanisms of mindfulness as presented in Figure 3.1, the axioms of mindfulness (intention, attention, and attitude) facilitate re-perceiving, which consequently enables self-regulation, values clarification, flexibility and exposure. There are two points at which mindfulness may positively interact with resilience. Firstly, mindfulness may nurture resilient *qualities* within an individual, and secondly, mindfulness may facilitate the resiliency *process*. These two theoretical relationships are discussed in further detail below.

With regard to resilient qualities, it is clear from the literature that there is a degree of conceptual overlap between the processes that benefit from re-perceiving as proposed by Shapiro and colleagues, and the protective factors of resiliency. For example, Richardson et al. (1990) identify self-mastery, and personal introspection and assessment of personal resources, as protective factors that facilitate resilient reintegration; these also fall within the category of self-regulation identified within Shapiro et al.'s (2006) model of mindfulness mechanisms. Similarly, value/behavioural congruence is considered a protective factor in the resiliency model, and clarification of values is a process that is believed to be facilitated by the re-perceiving process. The importance of values within resilience is highlighted within the PsyCap approach, where it is proposed to enrich cognitive, affective and behavioural processes and create a connection to a potentially meaningful future during adversity (Luthans, Youssef & Avolio, 2007). Flexibility is another factor common to both models, which allows an individual to adapt to, or create change within, an environment. This overlap suggests that mindfulness and resilience have

an existing relationship, whereby mindfulness is either positively correlated with protective factors, or clarifies the direction and strength of these qualities.

Moving on to the impact upon the resiliency process, mindfulness may influence resilience, and consequently well-being, at several opportunities, with a combination of both mindfulness and resilience potentially leading to improvements in well-being.

Right from the first sign of disruption a mindful person will be more likely to appraise the life event or potential stressor with an attitude that is open and non-judgemental. This will allow for an objective evaluation of the potential for disruption, and an equally objective assessment of the existing coping skills and protective factors available. If there are sufficient protective factors, homeostasis will be maintained, and the event will not cause any disruption. This more accurate forecasting of the impact of current challenges could also be altered by mindful re-perceiving, which allows one to remain in the present and avoid catastrophising, so that any initial emotional response is tempered by a detached observation of one's own feelings and strengths which will also preserve self-efficacy.

When looking for appropriate responses to a disruption, in order to reintegrate resiliently "the process is an introspective experience in identifying, accessing, and nurturing resilient qualities" (Richardson, 2002, p. 312). A more mindful individual should be more attentive to internal stimuli and therefore susceptible to cues that a resilient response is required, and more aware of the most appropriate coping method.

The link between mindfulness and resilience has been made in some cases within the research literature, with some of the interventions within the two reviews discussed in Section 3.3.2 containing components of mindfulness training. For example, in an RCT investigating a Mindfulness with Metta Training Programme which took place as a weekend retreat for social workers (Pidgeon, Ford & Klaassen, 2014), follow-up scores one-month post-retreat showed significant improvements in mindfulness and self-compassion which were maintained when measured four-months post-intervention. In addition, resilience showed a delayed improvement at the four-month post-retreat measurement point. Furthermore, Mealer et al. (2014) conducted a two-day, multimodal resilience workshop followed by a 12-week intervention period for intensive care unit (ICU) nurses, including a 2-hour session with an MBSR instructor, and audio materials to continue mindfulness practice throughout the intervention period. In this RCT, significant improvements in

depression were found for the intervention group nurses, and significant improvements in resilience and post-traumatic stress disorder were found for both the intervention and control group post-intervention. The authors discuss the possibility of crossover effects across the groups, whereby benefits to one individual are passed on to others nearby, leading to improvements for both groups; a strong social network was one intended outcome of the programme, which makes the proposed crossover effects plausible.

These findings indicate an assumption that mindfulness is one method by which resilience can be improved, although in the cases described above, mindfulness and resilience are not measured within the same study, and mediation analyses were not performed to test this relationship. Furthermore, mindfulness is often offered as part of a multimodal resilience programme, in which it is impossible to tell which component or components are responsible for any significant changes. In an attempt to explore this relationship further, Study 2 will allow for statistical tests of mediation to indicate the mechanisms by which changes in job-related well-being occur, and determine if resilience is part of the mechanism by which mindfulness impacts upon well-being, as measured using the Connor-Davidson Resilience Scale (CD-RISC; Connor & Davidson, 2003). This scale was identified as one of the most reliable and valid measures in a meta-analysis of a range of resiliency scales, and is deemed a suitable instrument for the measurement of adult resiliency (Windle, Bennett & Noyes, 2011).

Based upon the theorised relationship between mindfulness, resilience, and well-being, and the limited existing research in this area discussed above, the following hypothesis is proposed:

Hypothesis 3a) Participation in MBSR within the workplace will be related to an increase in personal resilience, as measured by the CD-RISC (Connor & Davidson, 2003), when compared to a control group, 3b) which is maintained at a six-month follow-up.

3.4 Emotion Regulation

Emotion regulation is defined as "...how individuals influence which emotions they have, when they have them, and how they experience and express them" (Gross, 1998, p. 271). We are constantly regulating our own range of emotions and those of other people in daily life, often giving rise to new situations, which evoke further

emotional responses in an iterative process. In 1998, Gross described emotion regulation as an emerging field and in the early stages of this doctoral research, there was still very little evidence linking emotion regulation and mindfulness in the workplace (for an early example, see Hülshager, Alberts, Feinholdt and Lang, 2013). For this reason, a measure of emotion regulation was included in Study 2 in order to explore the effect MBSR might have on this variable. Scholars have also considered whether improvements in executive control, which could relate to the 'reperceiving' element of Shapiro et al.'s (2006) model, could also lead to improvements in emotion regulation (Teper, Segal & Inzlicht, 2013), and this possible mediation of mindfulness upon emotion regulation strategies, plus the further mediation of emotion regulation for well-being outcomes, will also be analysed in Study 2. It could be argued that effective regulation of emotions in the caring, patient-focused environment of the NHS could enhance both staff well-being and patient care. As such, evidence of the effects upon this regulatory process may allow for practical recommendations regarding mindfulness training within the NHS and beyond.

To begin this section of the literature review, the core elements of emotion regulation will be outlined in Section 3.4.1 below, and the Process Model of emotion regulation (Gross, 1998) will be reviewed as a framework within which to interpret the emotion regulation findings from Study 2. The review will then turn to domain-specific research into emotion regulation in the workplace, the neighbouring field of emotional labour, and the relationships these have with employee well-being. Finally, mindfulness, emotion regulation, and well-being will be explored using existing workplace theory and research, resulting in hypotheses as to the effect of MBSR training upon emotion regulation, and how emotion regulation might form part of a larger process by which mindfulness improves well-being at work.

3.4.1 Theoretical Emotion Regulation

As indicated in the above definition, the regulation of emotion is a dynamic and fluctuating process. Researchers have endeavoured to untangle this system, with one of the most notable examples being the process model of emotion regulation (Gross, 1998). The generally supported modal model (Barrett, Ochsner & Gross, 2007) of emotion generation is divided chronologically into situation, attention, appraisal, and response stages, and is the foundation upon which five temporal opportunities for emotion regulation are proposed in the process model, as illustrated in Figure 3.4 below. In brief, the five types of emotion regulation described in the process model are:

1. Situation selection: this is a precursor to the modal model of emotion, where an individual takes action to avoid or approach situations, which will lead to undesirable or desirable emotion experiences before they occur.
2. Situation modification: once in a situation, one can manipulate the external environment in order to change the impact it will have upon emotion experience.
3. Attentional deployment: by focusing on or avoiding specific elements of the situation an emotional reaction can be influenced.
4. Cognitive change: an individual can alter the way that they think about or make sense of a situation, or change their own assessment of their ability to cope with the challenges a situation brings.
5. Response modulation: when experiencing an emotion as the result of a situation, there is a late opportunity to temper the response and alter the expression of emotion.

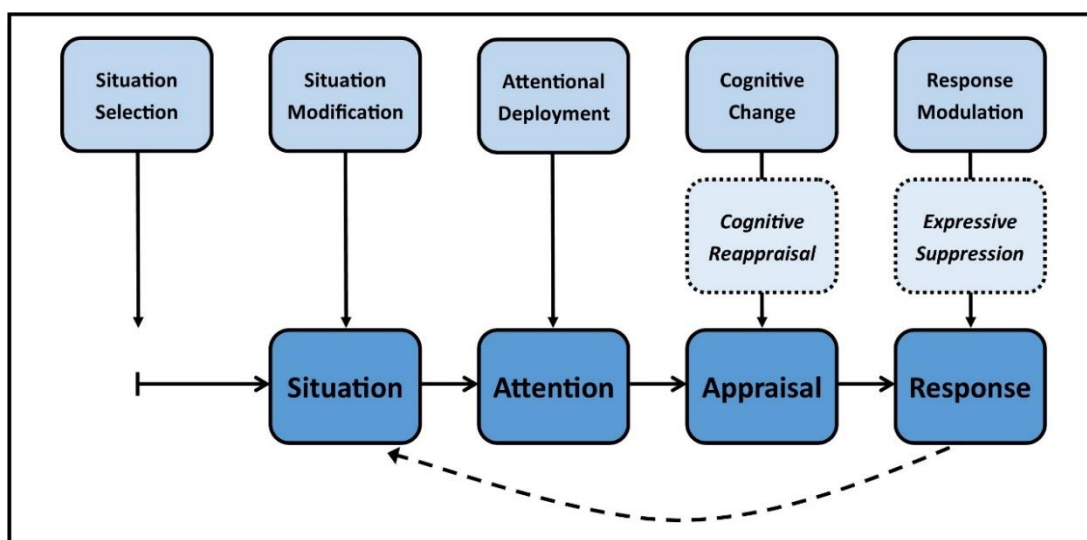


Figure 3.4. Diagram of the process model of emotion regulation including the two variables measured in Study 2 (adapted from Gross, 2014).

A detailed exploration of these five types of emotion regulation is beyond the scope of this research, however, using Gross and John's Emotion Regulation Questionnaire (ERQ; 2003), Study 2 will consider two emotion regulation strategies: cognitive reappraisal – a form of fourth-stage cognitive change; and expressive suppression – a fifth-stage form of behavioural response modulation. Gross (2014) describes these two strategies as the most well-researched in the field, and Gross and John (2003) highlight their relevance as well-defined and commonly used emotion regulation strategies; this should make them more salient for participants in Study 2, whilst also not being dependent on any specific context for emotion regulation, making them suitable for any population, including employees.

Cognitive reappraisal is a cognitive change strategy by which a person alters how they think about an emotion stimulus, takes a more objective perspective towards the stimulus, or alters how they think about the emotional response (Webb, Miles & Sheeran, 2012). In lab-based experiments, instructions to a participant may involve thinking of a different interpretation of a scenario (stimulus reappraisal; Hajcak & Nieuwenhuis, 2006), viewing a scenario as a detached outsider (perspective-taking reappraisal; Ochsner et al., 2004), or taking a more accepting, non-judging attitude towards the emotions that are being generated (emotion response reappraisal; Kuehner, Huffziger & Liebsch, 2009). In contrast, expressive suppression is a response modulation strategy whereby a person inhibits their expression of, or experience of, emotion, or suppresses thoughts about the stimulus that gave rise to the emotion, at the stage in the process when an emotion has already been generated. Examples of activities here may be to suppress reactions to a stimulus so that an observer could not discern any emotion (expressive suppression; Gross & Levenson, 1993), or instructions to suppress the feelings themselves in response to a stimulus (experiential suppression; Quartana & Burns, 2007).

A recent meta-analysis integrated emotion regulation strategies from each stage of the process model and evaluated the consequent effects upon emotion-related outcomes within 190 studies (Webb et al., 2012). Results indicated that, overall, cognitive reappraisal had the greatest effect on emotion response in the desired direction ($d=0.36$, 95% CI [0.27, 0.45], $k=99$), whereas suppression as a form of response modulation had a smaller effect size ($d=0.16$, 95% CI [0.09, 0.24], $k=102$). In addition, distraction or concentration strategies as a means of attentional deployment showed no effect overall ($d=0.00$, 95% CI [-0.07, 0.07], $k=215$). Of particular interest are reappraisal of the emotional stimulus, and suppression of emotional expression, as these are the specific regulatory strategies measured in the ERQ (Gross & John, 2003) which will be used in Study 2 to measure emotion regulation. Reappraisal of the situation shared a small-to-medium effect size similar to the overall cognitive reappraisal effect size ($d=0.36$, 95% CI [0.21, 0.51], $k=26$), whereas expression suppression was the most effective of the suppression strategies ($d=0.32$, 95% CI [0.27, 0.42], $k=56$). Although the studies included in this meta-analysis all involved a deliberate manipulation of the regulation strategies used by participants, rather than a natural selection and deployment of an individual's preferred method, they indicate that both methods are effective ways of altering the emotion-generating process, where success is defined as changing the resultant emotion (positive or negative) in the required direction (up- or down-regulating), as

opposed to changing emotion in a way that would be deemed successful for improving well-being.

This subsection has introduced Gross's (1998) process model of emotion regulation, including the five opportunities for emotion regulation over time. More detailed analyses of two commonly researched strategies; cognitive reappraisal and expressive suppression was conducted, as these are potential mediators within Study 2. In the subsection that follows, links will be made between this context-free theory of emotion regulation, and that of emotional labour – arguably the dominant research approach to emotion and well-being in the workplace.

3.4.2 Emotion Regulation and Well-Being at Work

Within the workplace, perhaps the most common manifestation of emotion research is that of emotional labour (Hochschild, 1983), which specifically relates to the effort to display emotions that are considered acceptable, or expected, when at work. Within this concept, surface acting denotes the regulation of emotion expression, and deep acting refers to the regulation of the emotion itself to make it more acceptable to the situation. The 'labour' element of emotional labour indicates a perspective that this modification of genuine emotion is effortful, and over time may have a negative correlation with well-being (Grandey, 2000). Grandey (2000) proposes that the process model of emotion regulation (Gross, 1998) discussed above should be used as a theoretical framework for the study of emotional labour at work, with deep acting representing a form of attentional deployment or cognitive appraisal, and surface acting representing a form of response modulation. In a recent review and revision of this proposal, Grandey and Melloy (2017) acknowledge that the mapping of emotional labour concepts onto the emotion regulation process model is not a perfect fit, and that a range of strategies from each of the five stages of the process model are available to employees, not just surface and deep acting. They furthermore recognise that the regulation of emotions is not only practised in customer-facing roles, which have previously been the focus of emotional labour research. As the practice and benefits of MBSR are proposed to produce generalised re-perceiving which will impact across a range of life domains, it was deemed preferable to maintain a broader, context-free perspective on the regulation of emotions, rather than take the focus of emotion labour as a domain-specific workplace concept, with an associated measure, the Emotional Labour Scale (ELS; Brotheridge & Lee, 2003) which gives emphasis to employee-customer interactions.

The impact of emotional labour specifically, and emotion regulation in general in the workplace is significant for well-being. Hülshager and Schewe (2011) conducted a meta-analysis of the correlations between emotion labour and a range of well-being indicators for working populations, finding strong positive relationships between surface acting (a form of expressive suppression) and psychological strain and facets of burnout, and a negative relationship with job satisfaction. These findings support Hochschild's (1983) original assertion that the effortful process of concealing one's true feelings at work, and attendant feelings of inauthenticity, have negative consequences for individual well-being. Moreover, the analyses indicated that deep acting; a more cognitive, antecedent-focused strategy was positively related to personal accomplishment, emotional performance and customer satisfaction (Hülshager & Schewe, 2011). Suppression has also been found to be more resource-depleting than alternative strategies (Alberts, Schneider & Martijn, 2012). These findings suggest that increases in antecedent-focused emotion regulation strategies such as cognitive appraisal are beneficial for worker well-being as they result in genuine displays of appropriate emotion, whereas response-focused strategies such as expressive suppression may be harmful for workers who need to mobilise more resources to fake emotions that are considered appropriate at work.

3.4.3 Mindfulness, Emotion Regulation and Well-Being at Work

The combination of mindfulness and emotion regulation for a working population has been studied to a limited extent in recent years. As previously stated, perhaps the earliest example of a high quality study of this relationship is Hülshager et al.'s (2013) RCT of a self-taught mindfulness intervention. This study supported the results of Hülshager and Schewe's (2011) meta-analysis, finding that reducing surface acting (a suppression strategy) mediated the effects of mindfulness training upon the emotional exhaustion component of burnout, whereby those who were more mindful faked fewer emotions and were less emotionally exhausted. Researchers have also theorised that enhanced mindfulness may pause habitual reactions, thus giving opportunity for the conscious selection of a response which may be more authentic and therefore less draining to display (Kang, Gruber & Gray, 2013). These findings indicate that mindfulness may facilitate a reduction in expressive suppression, which is generally negatively related to well-being outcomes. In an RCT evaluating the effect of a mindfulness intervention for a sample of 50 teachers, Jennings, Frank, Snowberg, Coccia & Greenberg (2013), used the ERQ (Gross & John, 2003) to assess changes in emotion regulation strategies and found a significant increase in cognitive reappraisal for the intervention group relative to the control group ($d = 0.80$,

$p = .002$). The reduction in expressive suppression compared to the control group was approaching statistical significance, and was medium-sized ($d = -.43$, $p = 0.076$). Jennings and colleagues (2013) also found relative improvement in physical health and some facets of mindfulness, but not in positive and negative affect or depression. They suggest that changes in these variables may need more time to develop, however the design did not include a follow-up to test this possibility. In addition, a systematic review amongst health care staff reached no clear conclusions regarding the effect of MBSR-based interventions upon empathy and emotional competencies (Lamothe et al., 2016). As such, more research is needed in order to understand the relationship between mindfulness and emotion regulation, which will be addressed in Study 2.

Existing research related to emotion regulation and emotional labour at work, and theoretical models of emotion regulation indicate the potential for mindfulness to improve emotion regulation abilities. Emotion regulation has in turn been positively related to well-being outcomes, and this has been shown in some early research in the workplace (e.g. Hülshager et al., 2013). The body of evidence concerning mindfulness and the regulation of emotion at work is not sufficiently developed to overtly support or reject these links, and therefore the following exploratory hypotheses are proposed for Study 2:

Hypothesis 4a) Participation in MBSR within the workplace will be related to an increase in emotion regulation using cognitive reappraisal, as measured by the ERQ (Gross & John, 2003), when compared to a control group, 4b) which is maintained at a six-month follow-up.

Hypothesis 5a) Participation in MBSR within the workplace will be related to a decrease in emotion regulation using expressive suppression, as measured by the ERQ (Gross & John, 2003), when compared to a control group, 5b) which is maintained at a six-month follow-up.

Hypothesis 6: The increase in workplace well-being as a result of participation in MBSR within the workplace will be mediated by changes in levels of mindfulness, resilience and emotion regulation (on both subscales) when compared to a control group.

The mediation model for Hypothesis 6 is visually presented in Chapter 6 (Figure 6.3, p. 122).

Conclusion

This chapter has discussed the four key variables within this thesis of work: mindfulness, well-being, resilience, and emotion regulation, in preparation for the following two studies investigating how they are influenced by MBSR training. Within the four subsections addressing these variables, the aims of Study 1, and the hypotheses of Study 2 have been offered based upon general and work-specific theory and upon empirical evidence with a focus upon high-quality workplace research where this is available.

Having established the aims of the systematic review and meta-analysis which form Study 1 – namely, to estimate the mean effect of MBSR upon mindfulness and well-being for studies which report findings from working populations using a randomised controlled design – the following two chapters present the methodology for Study 1 (Chapter Four) and the results of the systematic review and meta-analysis (Chapter Five) in pursuit of these aims, and in order to objectively quantify the findings which have been discussed narratively in this literature review.

4 Systematic Review – Methodology

This chapter will describe the process by which a systematic review was performed to assess across studies the efficacy of Mindfulness-Based Stress Reduction (MBSR) in improving well-being and mindfulness when provided for a working population. Although systematic reviews and meta-analyses are emerging in this field, this review extends current research by searching a wider selection of electronic databases than in previous reviews, and synthesising solely RCTs in the final analysis – which randomise participants into equivalent groups in order to reduce the risk of bias – to evaluate findings from this developing area using high quality research designs (see Section 4.1 for a detailed discussion of RCT design).

A systematic review's lofty goal is to draw together all the extant research conducted thus far on a specific topic, using a carefully designed research protocol that clearly states the inclusion and exclusion criteria each potential piece of evidence must pass in order to be selected. After following these strict and explicit eligibility tests, and making every effort to locate potential sources, the validity of the final data set is assessed for risk of bias, meta-analysed, and the final results of the review are presented and interpreted in a systematic manner (Higgins & Green, 2008). There are several benefits to this synthesis of data. Firstly, as replication of the same or similar research is common, it is more reliable to weigh the whole body of evidence than to consider single studies in isolation, furthermore, a lack of scientific accumulation can delay definitive changes in practice if individual findings or opinions are popularised despite wider empirical evidence being mixed (Borenstein, Hedges, Higgins & Rothstein, 2009). This can result in the acceptance of a hypothesis due to one popularised finding or opinion, despite multiple, perhaps smaller-scale findings to the contrary. In addition, systematic reviews can assess the overall resilience and strength of an effect across a range of samples and thus indicate how generalisable the findings are to a wider population (see de Vibe, 2012 for an example of this for the benefits of MBSR with a healthy adult population). There has now been sufficient replication of workplace mindfulness interventions to allow for this synthesis of findings and estimation of an overall effect across working populations.

Once the eligible findings have been gathered, one possible way of synthesising the findings of a systematic review is through meta-analysis. Meta-analysis replaces the subjective synthesis of the reviewer with statistical criteria with which the relative

weight of each finding is decided and considered within the scope of all of the findings. If the spread of effect sizes is consistent, then it may be appropriate to produce a summary effect size based upon all of the research included in the analysis. For example, Virgili (2015) reported a medium-sized effect of mindfulness interventions for working samples (Hedges' $g=0.68$). Borenstein and colleagues (2009) highlight that although meta-analysis is often considered in isolation as a research method, the validity of any outcome is heavily reliant on the quality of the initial search process. If the methodology is weak or biased, this will degrade the quality and applicability of the meta-analysis outcomes – for example, if the methodology is not based upon a clear protocol detailing the inclusion and exclusion criteria, a researcher may bias the findings by only including studies with large, positive effects in order to produce strong, publishable results. Therefore, the process of designing the systematic review and meta-analysis should be reciprocal in order for the research objectives to be aligned and eventually achieved.

In the sections that follow, this reciprocal design will be explained. Examples of existing mindfulness reviews – both with and without meta-analyses – will be examined, before the protocol for the search is presented. This protocol includes the search parameters and the restrictions implemented to access relevant search results, the process of extracting data from the included studies, and the assessment of risk of bias that was utilised. Finally, the procedure for synthesising the results statistically via meta-analysis will be presented including an explanation of the subgroup analyses.

4.1 The Intervention

Mindfulness-Based Stress Reduction is the intervention of interest to this systematic review. As previously discussed in Chapter 2, Section 2.2, MBSR is a group-based eight-week participatory intervention which develops the natural ability to be attentive and aware within the present moment, using mindful breathing meditations, mindful movement, body scans, and the practice of being more mindful of everyday, perhaps mundane or routine, experiences. These four elements are considered key to MBSR by de Vibe and colleagues (2012), as shown in Figure 4.1 below. In a standard MBSR course, sessions take place weekly for approximately two hours, during which time a group leader introduces and guides mindfulness meditations, followed by facilitated group discussions and reflection upon participant experiences. Participants are then

required to practice these mindfulness meditations and other homework tasks in the intervening time between sessions.

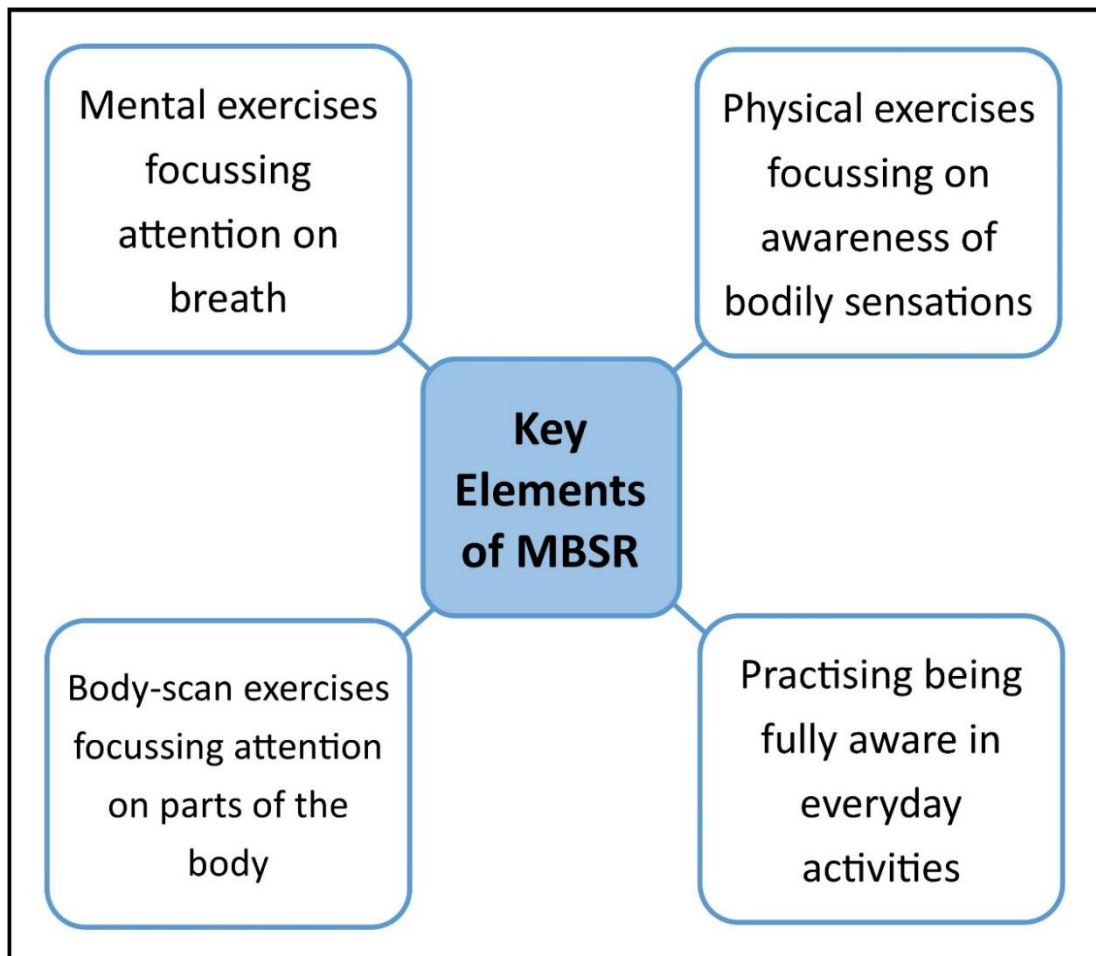


Figure 4.1. Diagram to show the key components of MBSR defined by de Vibe and colleagues (2010).

The variation in workplace MBIs is important to assess - this review pinpoints MBSR, yet some modifications of this well-known format are expected and are at times essential for mindfulness training to be successful in an organisational environment. Departures from the original, evidence-based model may include changes of convenience, requests of stakeholders, or concessions to time and budget constraints. Assessing this collection of MBSR variants, and their impact upon well-being outcomes is an important objective. Vitally, this review seeks to evaluate the possibility of what Margaret Chapman-Clarke terms “adaptation without dilution” (Chapman-Clarke, 2016, p.5); the ability to ethically tailor MBSR to specific working contexts, without sacrificing the quality and values of the original format. As such, changes to session length, total course duration, online or face-to-face delivery, and homework requirements will be accepted as prior analyses have thus far indicated that these do not impair outcomes (Virgili, 2015, Wolever et al., 2012). To test this

finding, the role of programme modification as a moderator of well-being outcomes will also be assessed in Study 1 in order to test whether this lack of difference holds true within the current RCT-only sample of studies.

The key inputs, processes and outputs recorded from the systematic review findings are summarised in Figure 4.2 below. In a work context, a common variation in the format of MBSR training is whether or not the course includes a day retreat, thus the inclusion/exclusion of this was recorded in readiness for subgroup analysis – whereby the subgroup of studies including a retreat day are compared to the subgroup of studies without a retreat day, and the difference in effect size is analysed to determine if it is statistically significant or due to chance – to assess whether this feature has an impact on well-being outcomes as I am not aware of research which has addressed the effect of this to date. There is also a potential for differential effects between occupational groups, and locations, and therefore these data were collected to help ascertain the generalisability of intervention findings to a global population. A detailed explanation of the procedure followed for subgroup analysis with moderators is reported in Section 4.5.2 below.

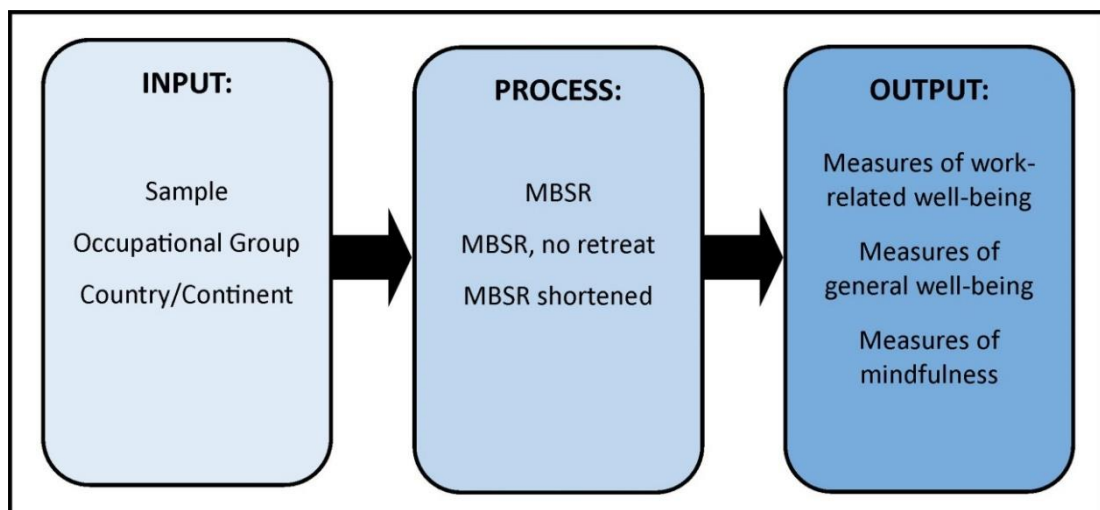


Figure 4.2. Diagram of the inputs, processes, and outputs of interest in the systematic review.

4.2 The Research Objective

This systematic review was conducted in order to gather the most rigorous extant research evaluating the effects of MBSR upon well-being for working populations and assess the extent to which mindfulness interventions impact upon well-being and mindfulness. The meta-analytic component of the review explores this relationship

statistically using studies reporting eligible quantitative findings. This quantitative analysis using effect sizes allows for the consideration of each individual study's findings within the context of the wider field of results that have met the selection criteria of the review. As a reminder, the aims of the systematic review, as outlined in Chapter 3, are listed again below:

Aim 1: To ascertain the mean effect of MBSR training upon the mindfulness skills of working populations, using meta-analysis.

Aim 2: To ascertain the mean effect of MBSR training upon the mindfulness skills of working populations at a follow-up measurement point beyond the end of the intervention, using meta-analysis.

Aim 3: To ascertain the effect upon mindfulness and well-being outcomes of a reduced programme of MBSR, when compared to studies which include the standard minimum of 16 hours contact time, using moderated meta-analysis.

Aim 4: To ascertain the effect upon mindfulness and well-being of MBSR programmes which include a retreat day, compared to those which omit this from the traditional MBSR format, using moderated meta-analysis.

Aim 5: To ascertain the mean effect of MBSR training upon the well-being of working populations, using meta-analysis.

Aim 6: To ascertain the mean effect of MBSR training upon the well-being of working populations at a follow-up measurement point beyond the end of the intervention, using meta-analysis.

In summary, the detailed aims of the systematic review are to estimate the mean effect of MBSR upon mindfulness and well-being at pre- and post-intervention measurement points, as well as pre-intervention to follow-up. Subgroup analyses will then be conducted to determine if the inclusion or exclusion of a retreat day, or the reduction of contact time during training to less than 16 hours, have any different effects upon the well-being and mindfulness outcomes. The relevance and value of exploring these aims will be discussed in the next subsection.

4.3 Why is it Important to do this Review?

4.3.1 Previous mindfulness reviews outside the workplace

Beyond the working context, there have been a number of systematic reviews and/or meta-analyses of the effects of mindfulness-based interventions (MBIs). For example, looking broadly at a range of contexts, populations and health problems (Grossman et al., 2004), stress in healthy populations (Chiesa & Serretti, 2009), depression and anxiety in clinical populations (Hofmann et al., 2010), and as an intervention for psychiatric disorders (Baer, 2003). The most comprehensive of these is a systematic review for The Campbell Collaboration by de Vibe and colleagues (2012; updated 2017), which found a medium-sized effect of MBSR upon the mental health of adult populations.

Following the trend of synthesis of findings from this rapidly developing field, by systematically reviewing the mindfulness literature for working populations and pooling the results, a clearer picture of the efficacy of workplace mindfulness can be formed. These findings may indicate the strengths of mindfulness interventions when applied at work, and any inherent challenges that may arise. In employment contexts, where high levels of stress and psychological strain are a risk to employees and to their fitness to perform their work, a detailed analysis of the utility of MBSR, including modifications to the original format, will inform practitioners, organisations and researchers of optimum course specifications for employees wishing to manage their stress. Workplace reviews furthermore indicate viable directions for future mindfulness research involving work-based populations by highlighting what is still unknown when the body of work is collected together.

4.3.2 Previous mindfulness reviews in the workplace

Whilst research conducted with work-based populations does exist, it is often difficult to locate; the employment status of the sample can be understated, assumed, or not of primary interest to researchers. One meta-analysis of the effects of MBIs for working adults identified only 19 studies of varying quality (Virgili, 2015). Virgili's meta-analysis is believed to be the first instance of synthesis of the effects of mindfulness training in an exclusively work-based population. The meta-analysis indicated medium-to-large effect sizes when assessing the impact of a range of mindfulness interventions upon the levels of psychological distress in working individuals. A subset of nine RCTs was identified in the search which concluded at the end of 2012, only half of which utilised MBSR. In the present review, three further years of exponential growth and on-going efforts to improve the methodological

quality and rigor of intervention studies has resulted in a larger sample of RCTs and consequently greater statistical power for an RCT-only meta-analysis. Growth in this field also provides the abundance needed for a detailed synthesis of findings and strengthened the need for a cut-off date for the current review at the end of 2015. This ensured the time was factored in for the lengthy process of selecting and synthesising the large number of search results, and keeping the review process manageable for a single researcher.

Whilst Study 1 was in preparation, two notable reviews of MBIs in the workplace have been published. Lomas and colleagues (2017b) provide a systematic narrative review of the impact of a range of MBIs upon both well-being and performance in the workplace, and Lamothe, Rondeau, Malboeuf-Hurtubise, Duval, and Sultan (2016) specifically address the emotion-related outcomes of MBSR for healthcare providers. In these systematic reviews, both studies conclude that MBIs are generally beneficial to working populations in terms of improvements on well-being outcomes, a decrease in mental health issues, and enhanced workplace performance. Results were mixed, however, for studies that measured changes in depression and burnout with no strong positive or negative effects found across the included studies (Lomas et al., 2017b), whilst improvements in healthcare providers' empathy were found by Lamothe et al. (2016). The benefits of workplace mindfulness interventions reported in these reviews are encouraging as they demonstrate a development of the field to encompass the effects of mindfulness upon workplace behaviours and skills as well as well-being.

These two reviews also make important recommendations about improving the quality of intervention study methodologies, particularly through the use of RCT designs. Lomas and colleagues (2017b) highlight the value of including full details of means, standard deviations and/or effect sizes in quantitative reports of interventions in order to streamline the process of meta-analysing findings. Similarly, Lamothe and colleagues (2016) recommend methodological improvements via the use of intervention guidelines such as CONSORT (Montgomery et al., 2013), which provides a set of clear reporting guidelines so that authors are able to facilitate future data extraction for inclusion in systematic reviews and meta-analyses, thus facilitating the process of data gathering, and reducing the number of studies that cannot be included due to incomplete reporting of primary results. This problem with incomplete reporting has ensured that the reporting of the intervention in Study 2 is as clear as possible, to enable inclusion in future meta-analyses.

Similarly, Jamieson and Tuckey's (2017) systematic review synthesised the findings of 40 articles describing workplace mindfulness interventions in order to identify areas of improvement in future research design and reporting. The authors highlight the tendency for occupational psychologists to focus on previous findings and literature from within the occupational psychology field, although much research in the workplace is conducted and published in the field in which a job role falls (for example, interventions with teachers are reported in education journals). As such, a thorough search needs to go further by utilising a range of academic databases across disciplines – particularly in order to capture the growing body of research with samples from healthcare and education. This is an observation I also made during the planning phases of the current review and which resulted in the use of broad and inclusive search terms across multiple databases to maximise search hits from all fields of mindfulness research.

4.3.3 The contribution of the present systematic review

The present systematic review extends Virgili's work by widening the scope of the search to additional electronic databases and the grey literature, and by implementing broader search terms encompassing studies from other disciplines as discussed above. For example, no search terms relating to 'work', 'workplace' or 'employee' were used in case the use of a working sample was not highlighted in titles or abstracts. This strategy resulted in more irrelevant search results, which then had to be filtered out by hand, but also reduced the likelihood of missing relevant papers at the broadest level of the search. The present research will also build upon Virgili's (2015) previous meta-analysis by: a) including only RCTs, b) restricting the intervention type to include only those which include a minimum three out of four of the key components of MBSR shown in Figure 4.1, and c) applying updated assessments of risk of bias as recommended in the Cochrane Handbook for Systematic Reviews of Interventions (Cochrane Handbook; Higgins & Green, 2011) in order to make assessments of potential bias more robust than in previous reviews. These three changes are discussed in more detail in Section 4.4.3 below.

The present systematic review differs from the reviews of Lomas and colleagues (2017b) and Lamothe and colleagues (2016) described above in several important respects which seek to build upon current knowledge. Firstly, the overall risk of bias is reduced by including only RCTs, as selection bias is reduced by allocating participants randomly to either the control group or the intervention group. Examples of potentially confounding variables may include sex, age, pay grade, working hours,

delay in signing up due to nature or volume of work. If participants are allocated randomly then it is more likely that these different characteristics will be dispersed evenly across the groups, and will therefore not skew the data. This reduction in bias is important in mindfulness interventions where interaction between the instructor and the trainees is necessary, and therefore neither can be blinded as per the protocol for a medical drug trial. Narrowing the criterion for study design to only RCTs risked a final pool of studies too small for meaningful evaluation, however, this was counterbalanced by an extended search of research sources using multiple electronic databases and the grey literature to obtain as many RCTs as possible. In another variation from the previous reviews, heterogeneity is reduced as a result of the focus upon one mindfulness intervention. Strict limitations on the study design and the specific use of MBSR allow any causal findings to be attributed more confidently to the intervention itself and not to other factors that may confound interaction effects when a range of different research designs and interventions are evaluated holistically. In addition, neither of the above reviews include a meta-analysis. The benefits of meta-analysis over narrative synthesis were discussed in the introduction to this chapter; namely that a meta-analysis allows for a more objective analysis of findings by assigning weights to each study depending on sample size as opposed to subjective judgements, and produces standardised summary effect sizes with which to evaluate with more precision the size and direction of a treatment effect.

In summary, there has been substantial progress towards a systematic synthesis of the workplace mindfulness intervention literature, however, in the present review, a more thorough search will allow for the quantification of findings in the meta-analysis and the synthesis of a broad field of knowledge, with which I am able to make a unique contribution to the field.

4.4 Systematic Review Procedure

In the design and implementation of this systematic review, it was important to gauge the standard required to complete a systematic and rigorous search; the existing review by de Vibe and colleagues (2012; updated 2017) was an invaluable benchmark as a gold-standard systematic review. The review considers the effect of MBSR upon well-being across all adult samples and is a Campbell Collaboration Systematic Review, which abides by the strict conduct and reporting standards of the Campbell Collaboration and has been subject to an expert peer-review process managed by a Campbell Collaboration Coordinating Group. By implementing key

strategies from de Vibe's review, along with the guidance of the Cochrane Handbook for Systematic Reviews of Interventions (Higgins & Green, 2011), a clear and robust search strategy was designed as shown in the subsections that follow. Studies which comprised an adult, working sample receiving at least three out of four of the core components of the original MBSR programme (see Figure 4.1 above for the four criteria), as part of a randomised controlled trial were included in the review. Only reports in the English language were included, with control groups that were active (received an alternative intervention), inactive (received no intervention), or on a waiting list for the intervention. In order for study findings to be included in the meta-analysis, the reported results of the study were required to include effect sizes for the mean change difference between the control and intervention group, or sufficient data for these to be calculated during the meta-analytic process for at least one validated measure of an aspect of well-being. For future reference, the criteria are listed below:

- a. Study design is a randomised controlled trial (RCT).
- b. Study paper is written in the English language.
- c. Sample for study is a working population.
- d. The Intervention contains at least three of the four elements of MBSR as defined by de Vibe et al. (2015) shown in Figure 4.1.
- e. Study reports quantitative results for at least one multi-item, validated well-being measure.
- f. Study reports data in a format that can be used to produce a standardised effect size from the mean change difference between the intervention and control groups.

4.4.1 Selection criteria

Study types.

Study design is limited to randomised controlled trials (RCTs). The traditional format of MBSR training in a face-to-face, instructor-facilitated environment makes blinding of participants and instructors impossible, and the experiential nature and substantial commitment of participant time required result in the need for self-selection of motivated individuals. Self-selection and the absence of blinding both increase the risk of bias; thus, including only RCTs limits the risk of further bias in group allocation. Within the RCT design, inactive, active, and wait-list control groups were considered acceptable.

There is some debate in the social sciences as to the suitability of RCTs in social settings compared to in the drug trials from which they originate. In the workplace specifically, it has been argued that the complexity of large-scale organisational interventions means that the ways they are implemented, the organisation's culture, and the behaviour of managers and employees during their application can all change the overall effectiveness of the intervention, but may not be captured in an RCT which does not consider these covariates and narrowly asks 'did the intervention work?' (Nielsen & Miraglia, 2017). That the purpose and value of RCT research is often misunderstood within social sciences research is another concern when the design is implemented outside of clinical settings, where researchers wrongly claim that all bias is removed by randomising participants (Deaton & Cartwright, 2018). However, as the mindfulness at work literature remains in a developmental phase, the replication of evaluation studies which indicate 'what works' in an RCT format can inform academics and practitioners about the efficacy of mindfulness interventions within different organisations, particularly when the same course is used in the case of MBSR, where instructors have received a standardised form of training, which keeps content homogenous. Once there is enough repetition and replication of the intervention, systematic reviews and meta-analyses of the kind reported here are made possible, and by synthesising these findings an estimated effect can be generalised across the wider working population. It is at this stage that attention may turn to how and why interventions may work, as is the case in the mediation analysis of Study 2.

Furthermore, as MBSR training is an individual-level intervention, which is usually experienced away from the everyday work environment and with an external trainer, any organisational culture and staff perceptions – whilst they may impact the initiation of a mindfulness-based scheme in the first place – are less likely to influence how the programme is implemented by the trainer, and how the individual participants receive the training. In contrast to the misgivings regarding RCTs in the workplace, there have been several calls for more, and even exclusively RCT research to be conducted evaluating mindfulness interventions both at work (e.g. Jamieson & Tuckey, 2017) and in general (de Vibe et al., 2012), and the Campbell Collaboration successfully publishes systematic reviews of the effectiveness of social interventions by combining the effects of RCTs via meta-analysis.

In addition, field research is vital to the testing of theories in occupational psychology, which at its core is concerned with creating actionable knowledge that can be applied

in work settings, and small, simple intervention studies which systematically vary an independent variable and observe the effect in a treatment and control group with randomisation of participants where possible are, I would agree, one of the strongest measures of causality (Eden, 2017). Randomisation of these controlled interventions increases the robustness of the design by establishing probable equivalence in the groups before the intervention has even begun, and in doing so controls for a range of known and unknown potential confounding variables giving the research strong internal validity, which is joined by high external validity as the intervention is taking place in the field and not under lab conditions (Bodner & Bliese, 2018), making the combination of randomisation and a controlled intervention an ideal combination in Study 1 in order to estimate the causal effect of MBSR upon well-being across a range of reported studies, using a design which is both realistic and appropriate to the high-level research aim of analysing and evaluating the reported effect of MBSR for working samples within the extant literature.

Participant types.

Participants were described as adults and part of a working population when receiving the intervention. Interventions which were being received as treatment for a medically diagnosed condition were excluded, and whilst there was an expectation that participants in included studies would be experiencing stress or stress-related issues, they were still attending work.

Intervention types.

All interventions were based largely or wholly on MBSR (Kabat-Zinn, 1990) and included at least three of the four key elements of MBSR, as defined by de Vibe and colleagues (2010) and illustrated in Figure 4.1 above. In brief, these are the inclusions of training in a) body scans, b) mindful movement and c) breath meditations, along with d) mindfulness in everyday activities.

As discussed in Section 4.1 above, adaptations to the traditional MBSR format are included in order to reflect the reality of the application of this type of stress-reduction for employees. Consequently, modifications to session length, course duration, inclusion of a retreat day, and homework are permitted, providing that a minimum of three of the above four elements are preserved.

Outcome types.

Well-being outcomes were of primary interest in the systematic review, therefore, studies which did not include a well-being outcome measure were excluded. Only

studies using standardised and validated quantitative scales to measure well-being outcomes were included in the review (single-item measures were excluded). In line with Warr's theoretical framework (Warr, 1990; Warr, 2007; Warr, Bindl, Parker & Inceoglu, 2014) discussed in Chapter 3, Section 3.2, a measure of well-being was included if it assessed elements of core affect as they are plotted around the circumplex in the affective model (see Figure 3.2). This criterion ensures the inclusion of affect that is pleasant or unpleasant, and high or low in activation representing the many elements of well-being. See Appendix A(i) for a full list of included measures).

As well-being is assessed in myriad forms and with multiple measurement tools, it was anticipated that there would be considerable variance in the assessments utilised by each research team. The outcome measures used are highlighted in the results in Chapter 5. This information is expected to benefit future research planning, as consistent measurement tools are desirable for ease of future aggregation of findings: where well-validated and reliable tools for measuring common outcomes arise, convergence on these measurements can lead to results that are more standardised and generalisable across samples.

The effect of the intervention upon levels of mindfulness was also of interest, although it did not form part of the selection criteria. The impact of a mindfulness-based intervention upon mindfulness skills is often assumed but less frequently checked. In their systematic review, de Vibe and colleagues (2012) identify only seven studies measuring mindfulness out of 31, rising to 33 out of 101 in the update of the review (2017) and recommend the inclusion of a mindfulness measure in future trials, as have other reviewers (e.g. Grossman et al., 2004). Furthermore, mindfulness as an outcome is not analysed in Virgili's (2015) meta-analysis of workplace interventions. The present search resulted in 10 workplace studies that included a measure of mindfulness out of the 15 data sets used. This indicates a gradual change in the design and reporting of intervention studies including mindfulness, allowing its inclusion as a secondary outcome of interest in the present meta-analysis. This increase in studies which measure mindfulness is also shown in the increase in mindfulness measures in the update of de Vibe and colleagues (2017) systematic review. This inclusion will facilitate exploration of the mechanisms by which well-being improves as a function of mindfulness training by determining if increased mindfulness is actually an outcome of MBSR training.

4.4.2 Search strategy

Search scope.

A wide range of relevant electronic research databases were searched, as well as the websites of key authors and research groups. The reference lists of the included papers were scanned and existing reviews and meta-analyses of similar workplace interventions were checked for relevant literature. Grey literature, including academic theses and dissertations were also searched. Results were restricted to the English language, and ranged from 1979, when Kabat-Zinn began to implement the first versions of MBSR, to the end of 2015. Repetition of early searches demonstrated that new results could appear for years that had been previously checked; presumably as databases are constantly being added to and updated retrospectively. For this reason, a final check with the original end date of 2015 was conducted in 2017. The 2015 end date was maintained, as resources were not available to integrate new findings beyond this cut-off date.

The following electronic databases were searched:

Web of Science
MEDLINE and PubMed
PsycINFO
Scopus
Cochrane Library
International Bibliography of Social Sciences
Dissertations and Theses A&I, UK & Ireland
Dissertation Abstracts International
ERIC
Social Services Abstracts
Sociological Abstracts
ProQuest
CINAHL
Business Source Premier

The implemented search terms.

The search terms below provide an example of the search implementation within the PubMed database (including MEDLINE). These terms were adapted to individual database search rules – search terms for all databases can be found in Appendix A(iii).

In a systematic search, the separate search terms are built up incrementally in the search history of the searcher, and then combined using Boolean operators 'AND' and 'OR'. As can be seen in the example below, the search terms are combined in searches 7, 9 and 12, and then these combinations are combined again in search 13

to create a single comprehensive search, which will not find any duplicates within the database as would be the case if all of the searches were run separately.

Search terms used in PubMed (including MEDLINE):

- 1 Meditation/
- 2 Meditation[MeSH Major Topic]
- 3 mbct*[Title/Abstract]
- 4 mbsr*[Title/Abstract]
- 5 mindful*[Title/Abstract]
- 6 meditat*[Title/Abstract]
- 7 1 OR 2 OR 3 OR 4 OR 5 OR 6
- 8 Humans/
- 9 7 AND 8
- 10 randomized controlled trial[Publication Type]
- 11 controlled clinical trial[Publication Type]
- 12 10 OR 11
- 13 9 AND 12

4.4.3 Data collection

Selection process.

Search results were narrowed through a four-stage exclusion process. After removing duplicates across the results from different databases, all titles were scanned in order to reject obviously unrelated results. Results that survived this process then had abstracts checked and again inappropriate studies were removed. Examples of such early rejections included research conducted in a medical context (e.g. interventions with cancer patients), or with non-adult samples (e.g. studies with samples of children and teenagers). In the third check, remaining papers were retrieved in full and assessed against the selection criteria. In order to improve reliability at the fourth stage, data and defining attributes from short-listed papers were extracted and coded separately by myself and another researcher in a similar field. Where conflicts arose regarding the inclusion or exclusion of a particular study, a third researcher with methodological expertise reviewed the paper and made the final decision to include or exclude the study.

Data extraction.

A data extraction form was designed for the purposes of final inclusion and data extraction, to be used by the two independent researchers to assess the studies identified in stage four as described above. The template was adapted from the Cochrane Handbook (Higgins & Green, 2011), and the data extraction form used by

De Vibe and colleagues (2012), and included the additional inclusion checks for the meta-analysis.

The data extraction form was developed during scoping searches, and piloted with an independent coder using three of the short-listed studies, an example of the form can be found in Appendix A(iii). The template includes criteria for study type and design, the content of the intervention, study population, and the use of standardised quantitative well-being scales. Once the final sample of included studies was agreed, the subset of studies that could be meta-analysed was prepared by gathering the means and standard deviations for the intervention and control groups, or other statistics if these were not available in order to calculate effect sizes. If effect sizes could not be calculated from the data reported, information was requested from the authors by email. If further information was not received, these studies could not be included in the meta-analysis, although they had met the criteria of the systematic review.

4.5 Meta-Analysis Procedure

This subsection is concerned with the statistical processes and procedures that take place within the meta-analysis after the eligible papers have been collected. Firstly, the processes for assessing risk of bias and publication bias are presented, followed by step-by-step statistical procedures for the calculation of standardised effect sizes for each study outcome (Hedges' g), the combining of these effect sizes in a random effects model to produce a summary effect size, and the adjustments made for outcomes that are from different instruments measuring well-being or mindfulness within the same study. Once these summary effect sizes have been calculated, the data are broken down further for subgroup analyses, and these are explained next, followed by a description of the process by which heterogeneity between the included studies is calculated.

4.5.1 Assessment of risk of bias

The method for assessing risk of bias was also in accordance with the Cochrane Handbook (Higgins & Green, 2011) using their recommended evaluation tool to assess the risk of bias in selection, performance, detection, attrition and reporting of the short-listed studies. Categorisation for each of these types of bias is either high risk, low risk, or unclear risk. The results of this assessment were entered into Review Manager (RevMan; version 5.3.5, The Cochrane Collaboration, 2014) to produce summary figures. The results of this assessment can be found in the Risk of Bias

Graph (Figure 5.2) and Risk of Bias Summary (Figure 5.3), and accompanying text in Chapter 5, Section 5.4. In order to facilitate the interpretation of results, the risk of bias results will be used to conduct subgroup analyses to show the effect that different perceived levels of risk of bias have upon the estimated mean effect size. All risk of bias results can be found in Chapter 5, Section 5.3).

4.5.2 Assessment of publication bias

Publication bias occurs when the available published studies that meet the eligibility criteria for a systematic review do not represent the distribution of results in all studies that have been conducted, whether published or unpublished. Publication bias is a threat to validity of all types of research, and can be quantified during meta-analysis where the aim is for the included papers to represent a field of research accurately (Rothstein, Sutton & Borenstein, 2005). Much publication bias is caused by selective publication, whereby studies that report significant findings are more likely to be published than those that do not, thus inflating the summary effect sizes as null findings (which would pull down the estimated mean effect) are not readily available in the published body of evidence.

To test for publication bias a funnel plot, as well as the trim and fill method (Duval & Tweedie, 2000) and Rosenthal's (1979) fail-safe N for the primary outcome of well-being will be utilised with the largest data set in the review; MBSR versus inactive control groups between T1 and T2 ($k = 12$). The funnel plot is produced as part of the analyses in CMA (See Chapter 5, Figure 5.4, p. 89), and is a scatterplot recording each study's standardised effect size (Hedges' g) against its standard error. As studies with larger samples have smaller standard errors and more statistical power to detect effects, they are more likely to appear close to the apex of the inverted funnel shown, whereas studies with smaller samples are less likely to have the power to detect significant effects. As small studies that do not report significant findings are less likely to be published, the lower left hand area of the inverted funnel will be sparse or empty if there is bias present, and this will make the funnel plot asymmetrical. Consequently, if the funnel plot is observed to be asymmetrical, this suggests the presence of bias in the results.

Two further checks for publication bias are included in Study 1. Firstly, within the funnel plot, Duval and Tweedie's (2000) trim and fill method identifies values to the right of the summary effect, which are not matched by a value on the opposite side of the funnel (trimming), and the summary effect size is re-estimated based upon the reduced data set, moving it over to the left. Based upon the new summary effect size,

the missing data on the left is then imputed to indicate how many unfound studies are missing in order to make the funnel plot symmetrical (filling). If very few or no studies are required to make the plot symmetrical, this suggests that the current data set is representative of the field, including unfound studies. Finally, Rosenthal's (1979) fail-safe N gives a calculation of the number of unfound studies with non-significant findings that would need to be discovered in order to render the summary effect found in the analysis non-significant.

When used in combination, these checks provide an estimation of the likelihood of publication bias, which if present would reduce the validity of the findings and impact on their interpretation and generalisability.

4.5.3 Measures of treatment effect

Standardised mean differences were calculated for each outcome in the form of Hedges' g (Hedges, 1981). The standardised format was required in order to reflect the nature of the composite well-being outcome, which has been assessed using various self-report measures across the included studies, as opposed to one single well-being measure. This is because a raw mean difference is not meaningful if a number of different measurement instruments have been used, each with a different scale. Hedges' g in particular is preferred over Cohen's d (Cohen, 1969), as although both are calculated by dividing a study's mean difference by its own standard deviation to give an index, Hedges' g also includes a correction which accounts for the tendency for Cohen's d to overestimate the standardised mean difference in small samples (Borenstein et al., 2009). Comprehensive Meta-Analysis (CMA; Version. 3.3.070, 2014) was used to calculate all effect sizes based on the different types of data available within each paper. In most cases, the mean, standard deviation, and sample size for the intervention group and the control group were extracted from the study reports and used to calculate a g -value by standardising gain scores using the pooled standard deviation of both groups at the post-intervention data collection point. Where these values could not be extracted, Hedges' g was instead calculated from the reported difference in scores between the independent groups, along with the p value (Cohen-Katz, 2005; Pipe, 2009), or using the reported F value for the difference in change between the two groups (Shapiro, 2005). Once a standardised effect size for each study outcome has been created in the form of Hedges' g , the data can be synthesised in CMA as discussed below.

4.5.4 Data synthesis

Using the calculated Hedges' g value for each outcome of each study, statistical meta-analysis is used to synthesise the results and estimate an overall mean effect. The current meta-analysis employs a random effects model, as the true effect of the intervention within each study is not expected to be identical, given that the studies take place in different countries and organisations, and by different researchers. In short, the studies should be similar in terms of the eligibility criteria, but there is no assumption that effect sizes will all be identical. The calculations used in a random effects model work to this assumption of non-identical effects, and view the included studies as a random sample of possible observed effect sizes, and a mean effect is estimated for this distribution.

In order for the estimated mean to be as precise as possible, a weight is assigned to each included study within the analyses, which is the inverse of the combined variance of the study and the variance across all studies. Each study then has a weighted mean effect, which is used to calculate the overall estimated mean effect across all of the included studies, which is the sum of all weighted means, divided by the sum of the weights.

In this meta-analysis, the construct of well-being (and mindfulness) is measured using different scales in different studies. All of these scales are still measuring the underlying constructs of well-being – defined as affect with high/low valence and activation from around the affective circumplex. In some cases, more than one measure of affect is used within the same study, for example an anxiety measure and a depression measure, in this case both measures can be included as they measure well-being, however the data are from the same set of participants. The data is therefore not independent and the error for each set will be correlated (Borenstein et al., 2009). This dependence needs to be factored into the meta-analytical procedure so that a mean effect size and its variance for scale data combined from the same group of participants can be calculated. In order to compute the variance of two or more correlated (dependent) sets of outcome data from the same participants, the correlation between the data from the measures to be combined is included in the calculation, which accounts for their dependency. For clarity, combining well-being measures is used as an example here, however, this process also applies to the mindfulness outcome where the five facets of mindfulness have been reported separately in a study, but then need to be combined prior to meta-analysis.

As well as calculating the estimated mean effect of MBSR upon well-being and mindfulness, a series of subgroup analyses were also conducted to break these results down further and address Aims 3 and 4, the procedure for these analyses will now be explained.

4.5.5 Subgroup analyses

In order to determine whether removal of the retreat day or a reduction in contact time during training changes the mean effect of MBSR upon mindfulness or well-being (Aims 3 and 4), subgroup analyses were conducted on the two data sets. As in single studies involving more than one group of participants, this involves the coding of studies to indicate which subgroup they belong to (e.g. 0 = No retreat day, 1 = retreat day), the estimated mean effect and standard error for each subgroup is then calculated, and a Z test is performed to see if the difference between the estimated mean effect for each group is significantly different from zero.

4.5.6 Dealing with missing data

As stated above, effect sizes were calculated using other test statistics where means and standard deviations were not reported. Two studies could not be meta-analysed: one due to missing standard deviations (Moody, 2013), and one due to reporting only combined means and standard deviations for both groups together (Duchemin, 2015). Study authors did not respond to requests for this data.

Three studies followed an intention-to-treat protocol (ITT; Aikens, 2014; Huang, 2015; van Berkel, 2014), with the remaining studies reporting on per-protocol outcomes. Intention-to-treat principles ensure that participants are analysed within the group to which they were originally randomised, regardless of which intervention they ended up receiving, and that participants are included at every time point – which can necessitate imputation of data if it is missing. As a result, subgroup analysis was carried out using the largest data set to assess the impact of including the ITT study data in the meta-analysis, compared to exclusion of these studies, as the approach to missing data may produce different results to non-ITT studies. The results of this analysis can be found in Chapter 5, Section 5.5.1.

4.5.7 Assessment of heterogeneity

Heterogeneity refers to the level of variation in effect sizes across the included studies. As each study takes place in a different sample, with different modifications of MBSR, delivered by different instructors, some heterogeneity is expected. There will also always be some random error in the observed effect sizes; heterogeneity

analyses seek to portion out the random error from the true variance to determine the true heterogeneity in the sample of studies. The studies have been included as they meet the same set of criteria regarding the use of MBSR at work, consequently, they are expected to be more homogenous, or similar, than could be due to random chance. If heterogeneity is high, it suggests some substantial differences between studies and indicates that their results should not be combined into an estimated effect as the differences themselves may be confounders in the analyses.

In order to evaluate the heterogeneity of the selected studies, two assessment methods were adopted. Firstly, a visual inspection of the level of overlap in the confidence intervals on the forest plots indicates the likelihood of statistical heterogeneity, where little overlap suggests large differences between studies. Secondly, to analyse statistical heterogeneity, Tau squared (T^2) and I squared (I^2) are calculated in CMA and reported in the results section. Tau squared is an estimate of the variance in the true effect size, and weighs each study's variance. If the weighted variance of a study is lower than the degrees of freedom in the meta-analysis Tau squared will be zero, indicating that the observed effect size is close to the estimate of the true effect size. I squared is a percentage value that indicates the proportion of the variation between studies due to heterogeneity, and not due to chance, any negative values are given as zero, and as with T^2 , if the heterogeneity statistic is lower than the degrees of freedom, a zero result will be recorded showing that variance across the studies is due to random chance (Higgins, Thompson, Deeks & Altman, 2003). As I^2 is a percentage, it gives a standalone representation of the variation in effect sizes that is impacting the true effect, rather than chance or error. Higgins et al. (2003) give rough guidelines to interpret I^2 with 25%, 50% and 75% values corresponding to low, moderate, and high heterogeneity respectively.

Conclusion

This chapter has described the process by which the systematic search was conducted, in order to meet the research objective of gathering existing research to evaluate the total effect of MBSR training upon employee well-being and mindfulness through a meta-analysis. In doing so, this systematic review adds to current knowledge of workplace mindfulness by searching for literature within and without the traditional occupational psychology journals. A clear and robust procedure for the systematic review has minimised the risk of bias during the review process, and allowed for subgroup evaluations of course modifications. The following chapter

begins with a broad overview of the included, excluded, and unclassified studies, risk of bias analyses, and the results of the meta-analysis of included studies.

5 Systematic Review – Results

This chapter will present the results of the systematic search and consequent meta-analysis. In the fourth-stage checks, 25 studies were examined for inclusion in the review and meta-analysis, with a final sample of 15 studies reported in 16 papers. Excluded studies from the final 25 papers are identified, as well as unclassified studies, which are awaiting responses from corresponding authors. This chapter is arranged and formatted in line with the guidelines for a Cochrane Collaboration systematic review (Higgins & Green, 2008) in order to meet common systematic review conventions. Firstly, a breakdown of the search results will be presented, including the flow of studies through each stage of the selection/exclusion process. Attention will then move exclusively to the included studies. Common characteristics of the included studies will be identified in order to provide a preliminary descriptive overview of this field of research, followed by the results of the meta-analyses of eligible studies. Assessments of risk of bias and publication bias will then be reported. As the primary outcome of interest, the results of the meta-analysis of intervention effects upon well-being versus an inactive control group will first be presented. The effects upon mindfulness skills will then be reported. Within each of these sections, the subgroup analyses that were performed will be included. For clarity, papers assessed in the systematic review will be identified using the first author's surname and year of publication. Finally, the studies which compare MBSR to an active control group will be analysed. In line with systematic review convention, the results are reported in this section, and then summarised and discussed within the discussion (see Chapter 9, Section 9.1).

5.1 Results of the Search

A search of eligible papers from January 1979 to the end of 2015 produced 2,997 results. By implementing the inclusion and exclusion criteria listed in Chapter 4, at the start of Section 4.4, 25 studies were followed-up for inclusion in the review. After detailed inspection and, in some cases, attempted contact with authors, 16 papers were included in meta-analysis, and six were rejected. In addition, three papers remain unclassified awaiting further information from the authors. The process of selection will now be described in more detail.

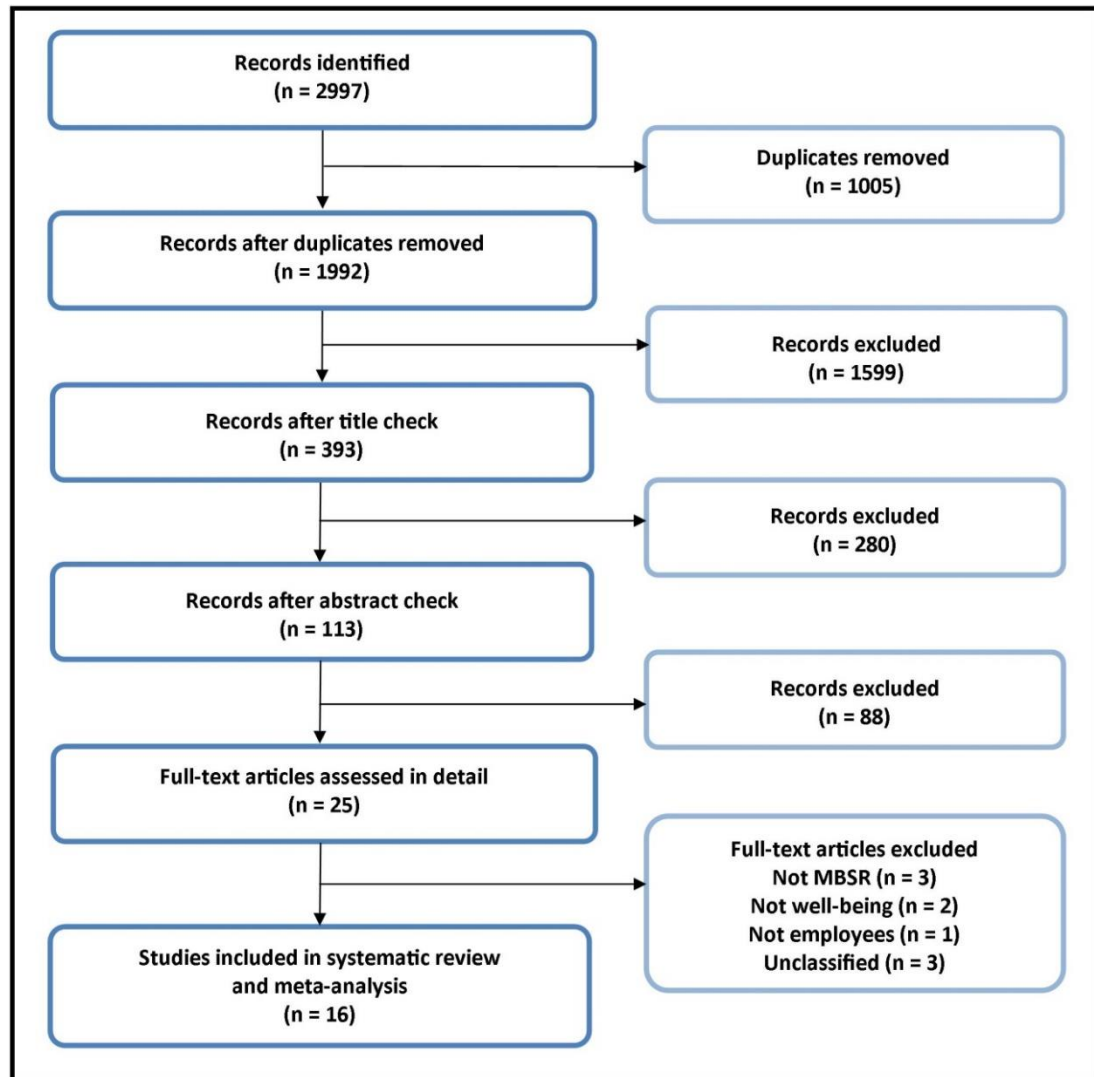


Figure 5.1. Flow diagram for inclusion of studies

A flow diagram of the process, which reduced the eligible papers from 2,997 to 16, is shown in Figure 5.1 above. Before beginning the screening process, the removal of duplicates revealed 1,992 unique search results. In the first stage of the exclusion process, examination of titles resulted in the further removal of 1,599 studies, which showed obvious grounds for exclusion. The abstracts of the remaining 393 papers were then examined and 280 further papers were excluded. For the remaining 113 papers, full text documents were obtained prior to the third check, where the contents of each paper were checked against all of the screening criteria. Following 88 exclusions at stage three, a short-list of 25 possible papers were submitted to closer inspection.

Of the 25 short-listed papers, those that could not be definitively included or excluded based upon the information they contained triggered searches for supplementary information, scrutiny of related papers from the same authors, and contact with

authors to ask for clarification, in order to retain the maximum number of eligible papers. These papers were assessed by both reviewers and accepted or rejected by consensus. These further investigations led to a final total of 16 included papers, the characteristics of which are discussed in Section 5.2.1 below, the exclusion of six papers, discussed in Section 5.2.2, and three papers awaiting classification, detailed in Section 5.2.3.

5.2 Description of Studies

5.2.1 Included studies

A table of characteristics of the 16 included papers can be found below (see Table 5.1; included studies are marked with an asterisk in the reference list). The samples under investigation fell into four broad occupational groups; eight papers involved health care professionals (HCPs; Amutio, 2015a; Amutio, 2015b; Asuero, 2014; Cohen-Katz, 2005; Mackenzie, 2006; Manotas, 2014; Pipe, 2009; Shapiro, 2005), two included teachers (Flook, 2013; Roeser, 2013), three involved workers within industrial settings (Aikens, 2014; Davidson, 2003; Huang, 2015), and three sampled university or research institute staff (Klatt, 2009; Malarkey, 2013; Van Berkel, 2014). The majority of sample sizes for the intervention and control groups were small and approximately equal, (within group sample Range = 10-129, Mdn = 22; total sample Range = 18-253, Mdn = 42). For the primary analysis of pre-post change in well-being, the data set included the randomisation of 718 individuals. One study was reported across two publications (Amutio, 2015a, Amutio 2015b) and the data for this single sample were combined for the purposes of this meta-analysis; referred to as 'Amutio, 2015' throughout the analyses.

Of the 15 studies, nine implemented the traditional MBSR format, with six reducing the programme. All studies described interventions that contained all of the four key elements of MBSR defined in Figure 4.1. Only five of the included studies retained the day-long retreat, which is a standard part of MBSR training.

Table 5.1 Characteristics of included studies

Study Name	Country	Occupational Group	Control Group	Well-being Outcomes	Mindfulness Outcomes	MBSR Reduced	Retreat Day	F-Up Mths	N
Aikens, 2014	USA	Chemical Company	W.list	PSS, SVS -CL, SVS -EE, SVS -PS	OBS, DES, AWA, NOJ, NOR	Yes	No	-	89
Amutio, 2015a	Spain	HC – Physicians	W.list	MBI DE, MBI EE, MBI PA,	OBS, DES, AWA, NOJ, NOR	No	Yes	-	42
Amutio, 2015b	Spain	HC – Physicians	W.list	SRSI-BR	OBS, DES, AWA, NOJ, NOR	No	Yes	-	42
Asuero, 2014	Spain	HC – Primary Health	W.list	MBI DE, MBI EE, MBI PA, POMS	OBS, DES, AWA, NOJ, NOR	No	Yes	-	68
Cohen-Katz, 2005	USA	HC – Nurses	W.list	MBI DE, MBI EE, MBI PA	MAAS	No	No	-	25
Davidson, 2003	USA	Biotech Industry	W.list	STAI-T	-	No	Yes	-	41
Flook, 2013	USA	Teachers	W.list	MBI DE, MBI EE, MBI PA, SC 90-R	OBS, DES, AWA, NOJ, NOR	No	Yes	-	18
Huang, 2015	Taiwan	Industry - Factory	W.list	CHQ-12, CIS, PSS-10	-	No	No	1, 2*	144
Klatt, 2009	USA	University Staff	W.list	PSS-10	MAAS	Yes	No	-	42
Mackenzie, 2006	Canada	HC – Nurses	W.list	IJS, MBI DE, MBI EE, MBI PA, SRDI, SWLS	-	Yes	No	-	30
Malarkey, 2013	USA	University Staff	Active	CES-D, PSS-10	TMS	No	Yes	6*, 12	184
Manotas, 2014	Colombia	HC – Various	W.list	BSI-18 GSI, PSS	OBS, DES, AWA, NOJ, NOR	Yes	No	-	78
Pipe, 2009	USA	HC - Nurse Leaders	Active	GSI	-	Yes	No	-	32
Roeser, 2013	Canada, USA	Teachers	W.list	BDI, MBI, OST, STAI-S	FFMQ	No	No	3*	113
Shapiro, 2005	USA	HC – Various	W.list	BSI-53, MBI, PSS, SWLS	-	No	No	-	28
van Berkel, 2014	The Netherlands	Research Institutes	W.list	RAND-MH, UWES	MAAS	Yes	No	3*	253

Note: HC=Health care, W.list=Wait-list control group, only follow-ups with a control group are included. *Follow-ups of similar length included in T1-T3 analysis. For list of outcome measure abbreviations, see Appendix A(i).

Although eight study designs included a follow-up measurement point after the pre- and post-intervention points, most studies offered waiting-list control participants the intervention before this measurement point and therefore could not be included in the follow-up analysis as they did not include a control group. The control group was only maintained at follow-up in four studies (Huang, 2015; Malarkey, 2013; Roeser, 2013; Van Berkel, 2014). In the case of Van Berkel (2014), the first measurement post-intervention was more than two months after the end of the MBI, and for this reason, was included solely as a follow-up study.

Within the included studies, eight measured mindfulness as a dependent variable, measured with a validated mindfulness scale. As five studies reported results for each of the five facets of mindfulness as defined by the FFMQ (Baer et al., 2006), the mean estimated effect for each of the facets was also calculated as a post hoc analysis to identify any differences in the effect of the intervention on the facets of Observing, Describing, Acting with awareness, Non-judging of inner experience, and Non-reactivity to inner experience.

Two included studies compared the intervention to an active control group only (with no inactive or wait-list control group). Malarkey and colleagues (2013) compared their MBI to a lifestyle education group, which received the same group contact time and homework requirements as the intervention group, and Pipe and colleagues (2009) offered leadership training to their control group. In line with recommendation in the Cochrane Handbook (Higgins & Green, 2011), these studies were not included in the main analyses as their design is substantially different to studies involving a wait-list or inactive control group, who did not receive any form of intervention. The two studies with active control groups are considered separately in Sections 5.5.4 and 5.5.5.

5.2.2 Excluded studies

From the 25 short-listed papers, six papers were excluded from the review (excluded studies are marked with a cross in the reference list). The main reason for exclusion at this stage was an intervention that did not include at least three of the four core components of MBSR shown in Figure 4.1, which was the case for three results (Anderson, 1999; Boe, 2015; Bostock, 2015). This suggests that the interventions were substantially different to the traditional MBSR format, and therefore were not eligible for this analysis. Two studies were excluded due to the outcome measures used: a study by Hülshager and colleagues (2013) contained outcomes measured using single-items as part of a diary study as opposed to a multi-item, validated well-

being scale, and a second study using the same intervention did not include a well-being outcome measure that met the review criteria (Hülshager, 2015). A further study was excluded as it reported the combined outcome data of both teachers and carers of children with special needs, which could not be separated for analysis (Benn, 2012).

5.2.3 Studies awaiting classification

Three studies await classification (Duchemin, 2015; Moody, 2013; Wolever, 2012; indicated with a question mark in the reference list). The published results for the study by Duchemin and colleagues (2015) only reported means and standard deviations for the intervention and control groups combined, and Moody and colleagues (2013) did not report standard deviations with their outcome means, and effect sizes could not be calculated for either study. To date, the corresponding authors have not responded to requests for further information.

One study could not be included/excluded based upon the content of the paper (Wolever, 2012). At the time of submission, the authors have not responded to requests for further information regarding the content of the intervention in order to determine if it meets the criteria of the review. These studies remain unclassified, and may be integrated into updates of this review if future information from authors allows for inclusion.

5.3 Risk of Bias in Included Studies

As described in Chapter 4, Section 4.4.3, the risk of bias was judged using the Cochrane Collaboration's risk of bias tool (Higgins & Green, 2008). For the six criteria, a judgement was made as to the presence of bias, with a rating of low or high risk, or uncertain risk where the study does not report the information needed to make a judgement. Lack of reporting meant that in most studies, at least half of the criteria were judged to be uncertain risk; this can be seen clearly by the large amount of yellow data in the Risk of Bias Graph in Figure 5.2 below.

To give an overall risk of bias judgement to each study, a high or unclear risk item was coded as '1', whilst low risk items were coded as zero. The values across the six criteria were then summed, and the composite risk of bias value was used in the subgroup analyses to determine the effect that potential bias within the studies would have upon outcomes. The distribution of the composite risk of bias scores and the subgroup analysis is shown in Table 5.2 below. The maximum score is six, with a

high score indicating high risk of bias. Judgements for each of the six criteria for each study can be seen in the Risk of Bias Quality Summary in Figure 5.3 below, with a median composite risk of bias score of 3, which is in the middle of the range of possible scores.

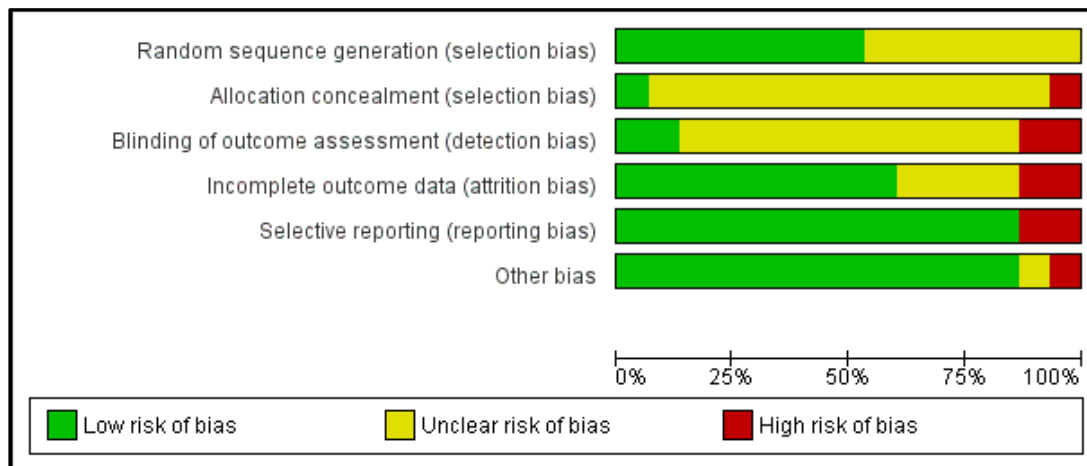


Figure 5.2. Risk of Bias Graph

As the results show, there were only a small number of criteria where studies were judged to be at an overtly high risk of bias, however as details were missing from the reporting of most studies, it can only be conservatively assumed that there is the potential for high risk of bias within the included studies.

Table 5.2 Overall risk of bias scores for included studies

Risk of Bias Score (high score indicates high risk)	Number of Studies (k = 15)	Hedges' g (95% CI)	Hedges' g Number of Studies (k = 12)
0	0	N/A	0
1	1	N/A	0
2	6	0.49 (0.28, 0.71)	5
3	3	0.56 (0.19, 0.96)	2
4	3	0.57 (0.30, 0.84)	3
5	2	0.68 (0.18, 1.17)	2
6	0	N/A	0

Note: Subgroup analysis of effect size for each value of Risk of Bias calculated for well-being versus inactive control group, T1-T2.

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
Aikens, 2014	+	?	?	+	+	+
Amutio, 2015	+	?	?	+	+	+
Asuero, 2014	+	?	?	?	+	+
Cohen-Katz, 2005	?	?	?	-	+	?
Davidson, 2003	?	?	?	?	-	+
Flook, 2013	?	?	+	+	+	+
Huang, 2015	+	?	?	+	+	+
Klatt, 2009	+	?	-	+	+	+
Mackenzie, 2006	?	-	?	+	+	+
Malarkey, 2013	+	+	+	+	-	+
Manotas, 2014	?	?	?	?	+	+
Pipe, 2009	+	?	?	+	+	-
Roeser, 2013	?	?	?	-	+	+
Shapiro, 2005	?	?	-	?	+	+
Van Berkel, 2014	+	?	?	+	+	+

Figure 5.3. Risk of Bias Summary

In particular, there was a high risk of bias relating to allocation concealment and blinding – this is not surprising, as the nature of MBSR, which is usually conducted face-to-face in a group setting means that participants and instructors are fully aware of whether groups are receiving the intervention or not and cannot be blinded to this. It is possible to blind researchers conducting the statistical analysis to the identity of each group, and its participants, however this was only reported to have been done

in a small number of cases (Flook, 2013; Huang, 2015; Malarkey, 2013). For the random sequence generation, although all studies stated that participants were randomised, over half of study reports did not describe the randomisation method, however, full reporting of outcomes was found in most studies, and incomplete outcome data where participants had dropped out of the study, were accounted for in more than half of the included studies.

Risk of bias scores were dummy coded as categorical variables and the estimated mean effect size was calculated for each value in a subgroup analysis of the largest dataset (MBSR versus inactive control groups, T1-T2, $k = 12$). As shown in Table 5.2 above, the results indicate that for studies with a lower risk of bias, the estimated effect size is also smaller, and this increases with every one-point increase in risk of bias. This positive relationship between risk of bias and effect size may suggest that effect sizes are inflated in studies where there is a high risk of bias, and that bias may therefore be impacting upon the results. It was not possible to conduct further analysis of this difference as the small sample of studies was lacking in degrees of freedom and therefore could not detect variance within and between the groups, therefore this is only an observation and cannot be tested more rigorously in the present sample.

5.4 Publication Bias of Included Studies

As described in Chapter 4, Section 4.5.2, the possibility of publication bias was tested using a funnel plot, as well as the trim and fill method (Duval & Tweedie, 2000) and Rosenthal's (1979) fail-safe N for the primary outcome of well-being for MBSR vs inactive control groups between T1 and T2 ($k = 12$). The funnel plot is shown in Figure 5.4 below, and along with the results of the trim and fill, suggests a symmetrical plot which does not require any trimming and filling. The adjusted centre of the effect is therefore the same as the estimated mean effect reported in Section 5.5.1 ($g=0.54$, 95% CI [0.39, 0.69], $k=12$), as shown by the black and white diamonds at the bottom of the funnel plot, which are in the same position.

Rosenthal's fail-safe N indicates that 142 unpublished studies which fell on the left-hand side of the funnel plot would need to be found in order to reduce the observed effect size to below a p value of 0.05. As it is unlikely that so many studies remain unfound, compared to the small number of currently included studies, these analyses all suggest that the effect sizes observed within the meta-analyses are robust and are not overestimated due to missing studies with small effect sizes. Publication bias

analyses are particularly suited to detecting small study bias; instances were smaller studies, with smaller effect sizes (due to reduced power) are less likely to be published and therefore are not represented around the bottom, left-hand side of the funnel plot when considering the true effect of an intervention. One reason for the observed symmetry in the current included studies could be the presence of a high number of small studies already within this sample, due to the tendency for MBSR interventions to be conducted in groups of less than 20 participants. In summary, these analyses do not suggest the presence of publication bias within the systematic review, with studies found which are evenly distributed around the observed effect size.

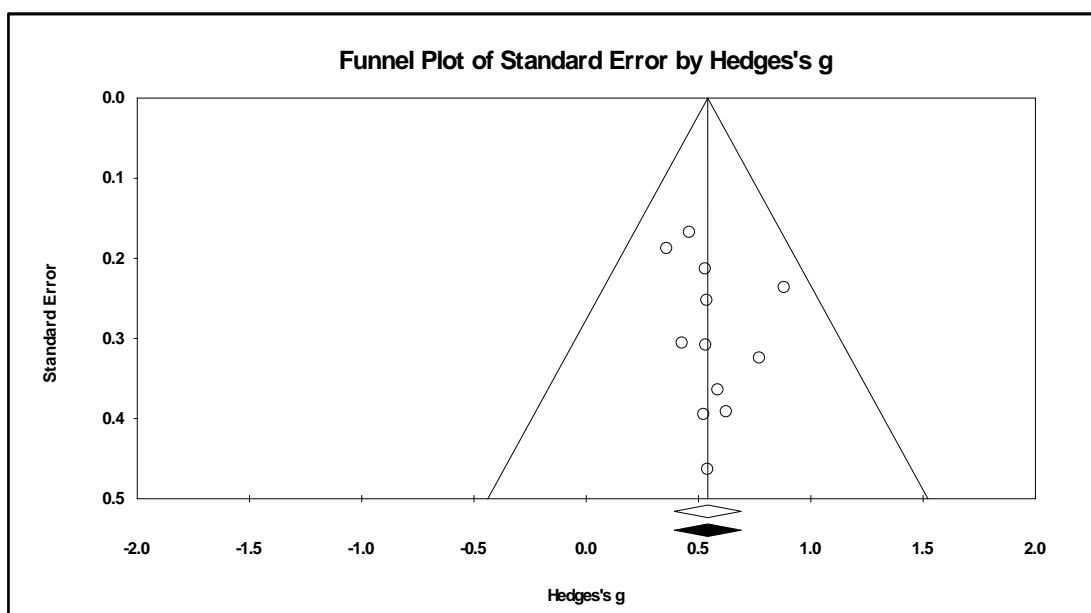


Figure 5.4. Funnel plot of MBSR studies with inactive controls

5.5 Effects of Interventions

Within the meta-analyses, Hedges' g effect sizes have been calculated (Hedges, 1985). In line with Cohen's (1969) parameters, an effect size of 0.2-0.5 is considered small, 0.5-0.8 is a medium-sized effect, and 0.8+ is considered a large effect. Effect sizes have been adjusted, so that a positive g value always favours the intervention over the control group and shows a beneficial effect for the outcome measure. Random-effect weighting has been employed for all analyses.

5.5.1 MBSR versus inactive control group: Well-being

Comparison of pre-post group means (T1-T2).

As stated above, 14 studies included measures of well-being collected at baseline and immediately after the intervention, with 12 of these including an inactive control group. Table 5.3 below identifies the studies included in this analysis, the measures of well-being used, and the results of the T1-T2 well-being meta-analysis. As shown in Table 5.3, the estimated mean effect for well-being was medium-sized ($g=0.54$, 95% CI [0.39, 0.69], $k=12$). The calculation of this mean effect size included 18 scales and/or subscales of well-being variables, with the effect sizes pooled within studies to produce one combined effect size per study. Heterogeneity in this sample was very low ($\tau^2 = 0$, $I^2 = 0$), indicating that the observed effect size is close to the estimate of the true effect size and that variance across the studies is due to random chance and not large difference in effect sizes.

Table 5.3 MBSR versus inactive control – well-being outcomes (T1-T2)

Studies Included	Outcome Measures	Int n	Con n	Hedges' g	95% CI	Heterogeneity
Aikens, 2014; Amutio, 2015; Asuero, 2014; Cohen-Katz, 2005; Davidson, 2003; Flook, 2013; Huang, 2015; Klatt, 2009; Mackenzie, 2006; Manotas, 2014; Roeser, 2013; Shapiro, 2005	BDI, BSI-18- GSI, BSI-53, CHQ-12, CIS, IJS, MBI, MBI-DE, MBI-EE, MBI- PA, OST, POMS, PSS, PSS-10, SC90-R, SRDI, SRSI-BR, STAI-S, STAI- T, SVS-CL, SVS-EE, SVS- PS, SWLS	365	353	0.54	0.39- 0.69	$\tau^2=0.00$ $I^2=0.00$

Note: For list of outcome measure abbreviations, see Appendix A(i).

A forest plot for the effect on well-being is shown in Figure 5.5 below, which puts this summary effect into the context of the sample of studies. Each study's effect size is represented by a black square, the size of which is relative to the study's weight within the analysis. Each study's effect size is also bounded by a horizontal line representing the 95% confidence interval, with a shorter line indicating a more precise calculation of the effect for the study.

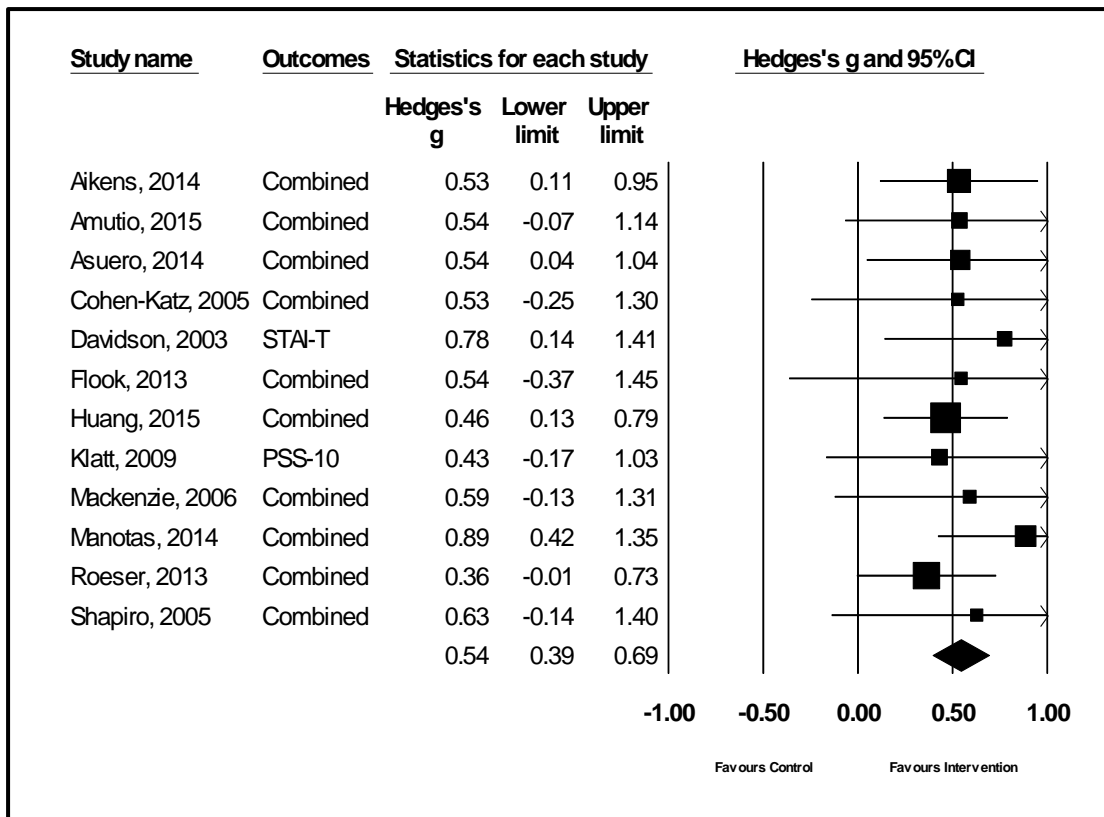


Figure 5.5. Forest plot MBSR Vs inactive control group: well-being

The estimated summary effect for the combined data set is represented by a diamond at the bottom row of the forest plot, where the width of the diamond is itself a representation of the 95% confidence interval between which the true effect is predicted to lay. As can be seen in Figure 5.5 and Table 5.3, the confidence interval for the estimated summary effect size does not include zero demonstrating the presence of a medium-sized, beneficial effect of mindfulness training on intervention group well-being compared to control group well-being. As described in Chapter 4, Section 4.5.7, a subgroup analysis was performed on this data set to determine whether different summary effects were found for studies which employed Intention-To-Treat (ITT) analysis and those that did not. As shown in Table 5.4 below, the difference in effect size for each group was not statistically significant, and therefore ITT and non-ITT studies are combined for all future analyses. This finding indicates that MBSR has a statistically significant effect upon well-being when compared to a control group who have received no training.

Subgroup analysis – standard vs reduced MBSR training time.

Sub-group analyses were used to determine the effect of the moderators upon well-being for the included studies. The first moderator considered the effect when the course content was reduced from the standard MBSR training contact time or was not reduced as a dichotomous categorical variable. The reduced training varied between two and eight hours, compared to the traditional minimum training time of 16 hours.

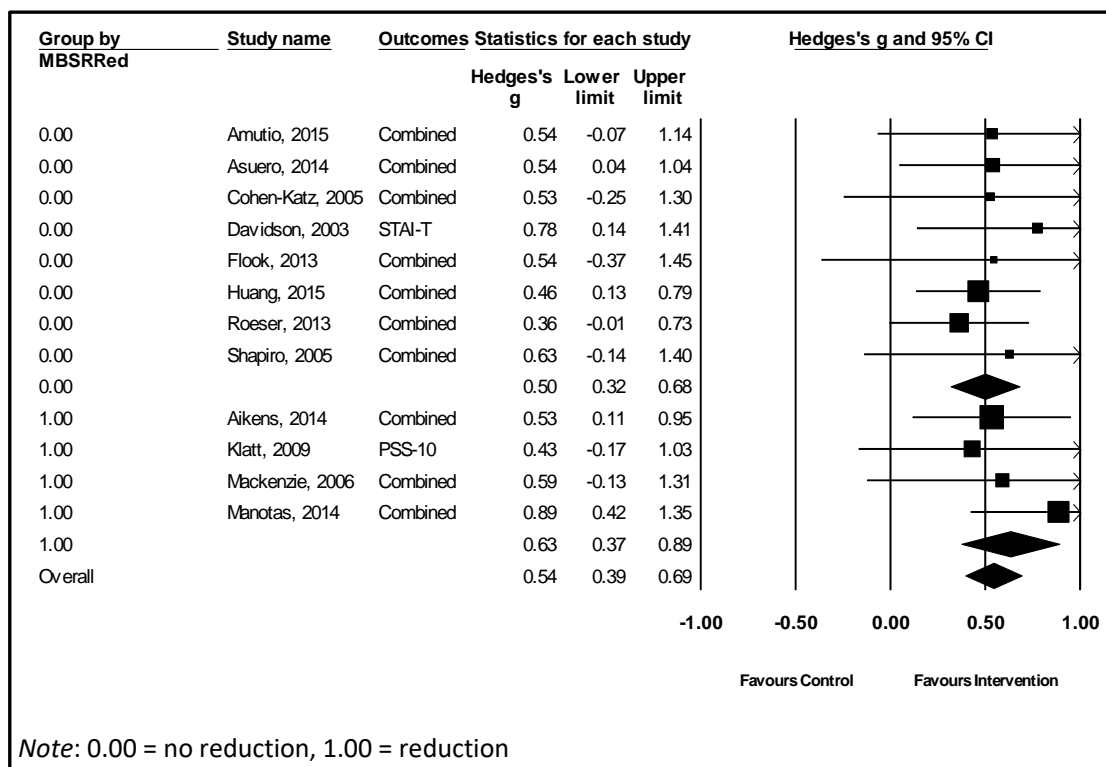


Figure 5.6. Forest plot MBSR Vs inactive control, MBSR reduced Vs standard: well-being

As shown in Figure 5.6 above, the estimated mean effect for studies which used the traditional MBSR format was medium-sized and significant ($g=0.50$, 95% CI [0.32, 0.68], $k=8$), and with a larger effect found for those studies where the time commitment of MBSR was reduced, which also had a significant, medium-sized effect ($g=0.63$, 95% CI [0.37, 0.89], $k=4$).

Table 5.4 Subgroup analysis results

Comparisons	Number of Studies	Effect size difference, Z score difference, p-value
Well-being		
Standard vs reduced MBSR training time	12	0.13, 0.82, $p = 0.41$
No retreat day vs retreat day	12	0.07, 0.39, $p = 0.70$
ITT analysis not included vs included	12	-0.08, -0.46, $p = 0.64$
Mindfulness		
Standard vs reduced MBSR training time	8	-0.14, -0.72, $p = 0.47$
No retreat day vs retreat day	8	-0.004, -0.02, $p = 0.99$

As shown in Table 5.4, this difference between subgroups was not found to be significantly different from zero ($g_{Diff} = 0.13$, $Z_{Diff} = 0.82$, $p = 0.41$). This finding suggests that shortened interventions have similar effects on employee well-being to those that follow the standard MBSR protocol.

Subgroup analysis – exclusion vs inclusion of a retreat day.

In order to explore the potential effects of the inclusion or exclusion of the day-long retreat that is a part of a traditional MBSR course; all papers were assessed for their inclusion of a retreat day and analysed as subgroups.

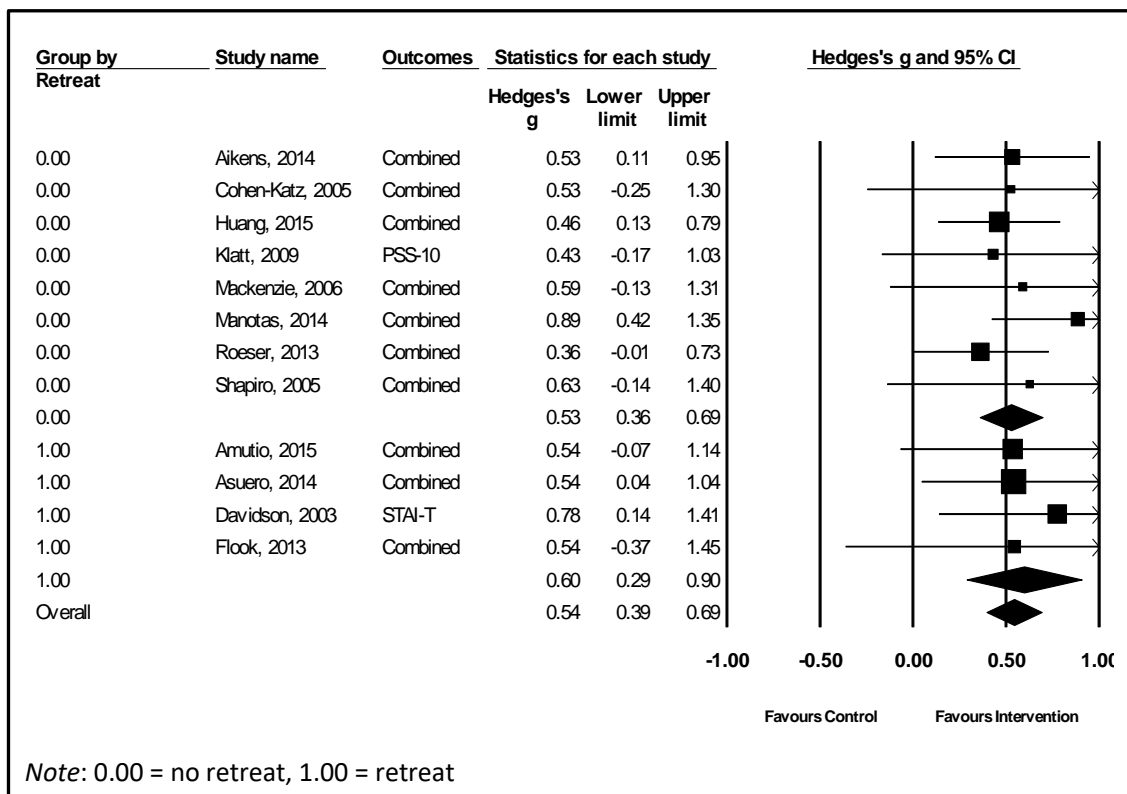


Figure 5.7. Forest plot MBSR Vs inactive control, inclusion Vs exclusion of retreat day: well-being

The forest plot in Figure 5.7 above shows that the estimated mean effect for both groups was medium-sized and significant, and was slightly lower in interventions without a retreat day ($g=0.53$, 95% CI [0.36, 0.70], $k=8$) than those retaining the retreat day ($g=0.60$, 95% CI [0.29, 0.91], $k=4$). As shown in Table 5.4, this difference is not statistically significant when a Z score is created ($g_{Diff} = 0.07$, $Z_{diff} = 0.39$, $p = 0.70$). This finding suggests that the effect of interventions that include a retreat day on employee well-being is not substantially different to those that follow the traditional MBSR protocol.

Comparison of baseline to follow-up group means (T1-T3).

As stated in Section 5.2.1, three studies reported follow-up results on a well-being outcome for the intervention group and an inactive control group (Huang, 2015; Roeser, 2013; Van Berkel, 2014) the analyses in this section consider differences between measures of well-being collected at baseline and those collected at a follow-up. This will assess whether there are any long-term benefits of training. Table 5.5 below identifies the studies included in this analysis and the measures of well-being used, followed by the results of the T1-T3 well-being meta-analysis. It is important to note that as there are only three studies in this analysis, the results should be interpreted with caution and may not be representative of a wider working population. As shown in Table 5.5, the estimated mean effect from baseline to follow-up for well-being was small ($g=0.31$, 95% CI [0.04, 0.59], $k=3$). The calculation of this mean effect size included nine combined scales and/or subscales of well-being outcomes. Heterogeneity for the combined measure was high ($\tau^2 = 0.03$, $I^2 = 57.47\%$), the moderate I^2 value indicates that variance across the studies is due to differences in effect sizes.

Table 5.5 MBSR versus inactive control – well-being and mindfulness outcomes (T1-T3)

Outcome and Studies Included	Outcome Measures	Int n	Con n	Hedges' g	95% CI	Heterogeneity
Well-being						
Huang, 2015; Roeser, 2013; Van Berkel, 2014	BDI, CHQ-12, CIS, MBI, OST, PSS-10, RAND-MH, STAI-S, UWES	255	258	0.31	0.04- 0.59	$\tau^2=0.03$ $I^2=57.47\%$
Mindfulness						
Roeser, 2013; Van Berkel, 2014	FFMQ, MAAS	180	186	0.26	-0.29- 0.81	$\tau^2 = 0.13$ $I^2 = 83.51\%$

Note: For list of outcome measure abbreviations, see Appendix A(i)

A forest plot for the effect on well-being at follow-up is shown in Figure 5.8 below depicting the make-up of the estimated mean effect from the included studies. As shown in Figure 5.8 and Table 5.5, the confidence interval for the well-being estimated summary effect size does not include zero demonstrating the presence of a small, beneficial effect of mindfulness training on intervention group well-being

compared to a control group. This finding is in line with hypotheses for the intervention study reported in Chapter 7, and indicates that there continues to be a beneficial effect after a follow-up ranging from 2-3 months in duration, which is important when assessing the effectiveness of MBSR as a well-being intervention compared to other available programmes.

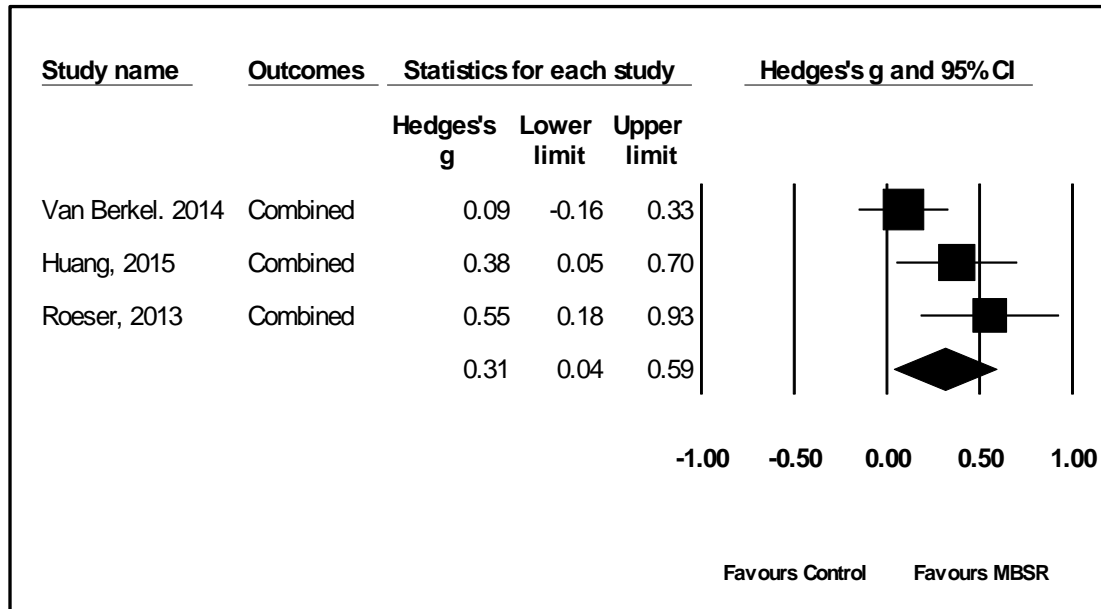


Figure 5.8. Forest plot MBSR Vs inactive control: well-being follow-up

5.5.2 MBSR versus inactive control group: Mindfulness

Comparison of pre-post group means (T1-T2).

When considering the secondary outcome of interest, ten studies included a quantitative measure of mindfulness skills, nine of which used an inactive control group, and eight of which measured mindfulness at baseline and immediately after the intervention. As such, eight studies are included in the main analysis of mindfulness between T1 and T2. Five studies included the Five Facet Mindfulness Questionnaire (FFMQ, Baer et al., 2006; used by Aikens, 2014; Amutio, 2015; Asuero, 2014; Flook, 2013; Manotas, 2014), and reported all five facets separately, one study reported a composite score across the five facets of the FFMQ (Roeser, 2013), and three studies utilised the Mindful Attention Awareness Scale (MAAS, Brown & Ryan, 2003; used by Klatt, 2009; Cohen-Katz, 2005; Van Berkel, 2014).

Table 5.6 below identifies the estimated mean effect upon mindfulness when all measures of mindfulness are integrated, which studies are included, and the scales used to measure mindfulness. The effect is medium-sized and favours the

intervention over the control group ($g=0.50$, 95% CI [0.32, 0.68], $k=8$). Heterogeneity was again very low ($\tau^2 = 0$, $I^2 = 0$).

Table 5.6 MBSR versus inactive control – mindfulness outcomes (T1-T2)

Studies Included	Outcome Measures	Int n	Con n	Hedges' g	95% CI	Heterogeneity
Aikens, 2014; Amutio, 2015; Asuero, 2014; Cohen-Katz, 2005; Flook, 2013; Klatt, 2009; Manotas, 2014; Roeser, 2013;	FFMQ (OBS, DES, AWA, NOJ, NOR), MAAS	244	233	0.50	0.32- 0.68	Tau ² =0.00 I ² =0.00

Note: For list of outcome measure abbreviations, see Appendix A(i)

Figure 5.9 below depicts a forest plot of each study's individual estimated effect size and precision and their contribution to the overall mean estimated effect size.

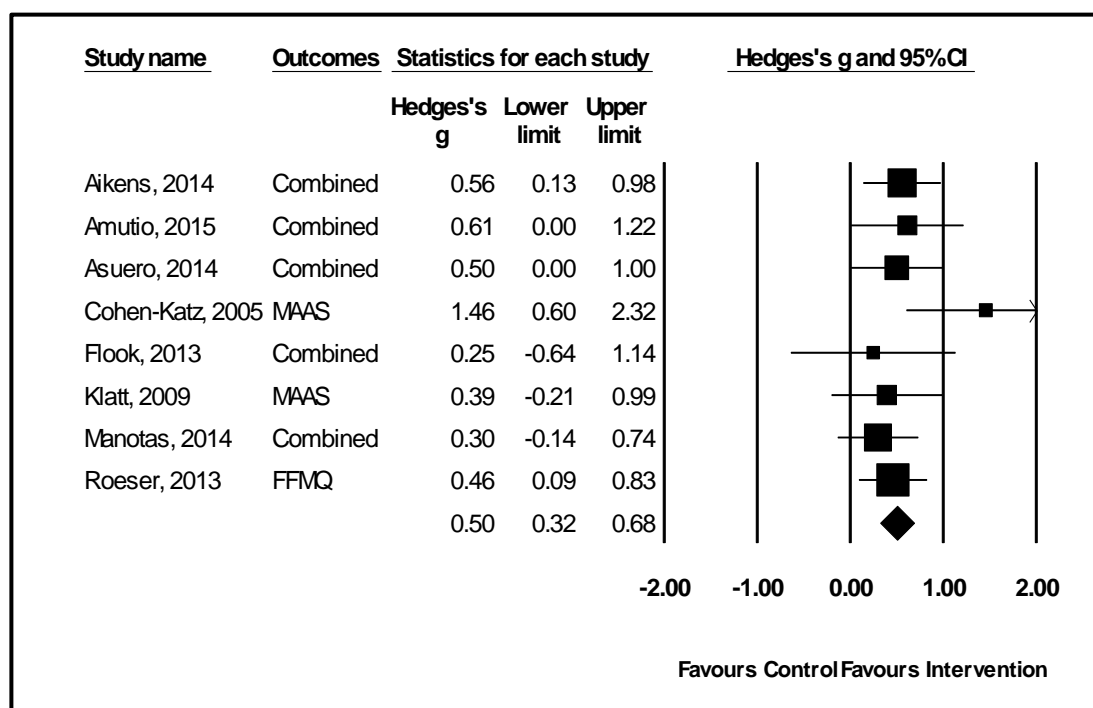


Figure 5.9. Forest plot MBSR Vs inactive control group: mindfulness

The confidence interval for the mindfulness outcome does not include zero and therefore indicates a 95% likelihood that the true effect falls between these intervals, which are indicative of a significant beneficial effect of MBSR interventions upon the mindfulness of this working population between T1 and T2 compared to a control group who received no intervention. This corresponds with existing research, and

with Hypothesis 1a for Study 2; namely that there will be an increase in mindfulness following the MBSR intervention, compared to the control group.

Subgroup analysis –standard vs reduced MBSR training time.

Potential moderators of the effect upon mindfulness were analysed using subgroup analysis, the first analysis compared studies where the course content was reduced from the standard MBSR training contact time to those where it was not. Reduced programmes varied from a total of six to eight hours, compared to the minimum standard MBSR training time of 16 hours. As shown in Figure 5.10 below, the estimated mean effect for studies which used the traditional MBSR format was medium-sized and significant ($g=0.56$, 95% CI [0.31, 0.81], $k=5$), and was greater than for those studies where the time commitment of MBSR was reduced, which had a significant, small-to-medium effect ($g=0.42$, 95% CI [0.15, 0.70], $k=3$).

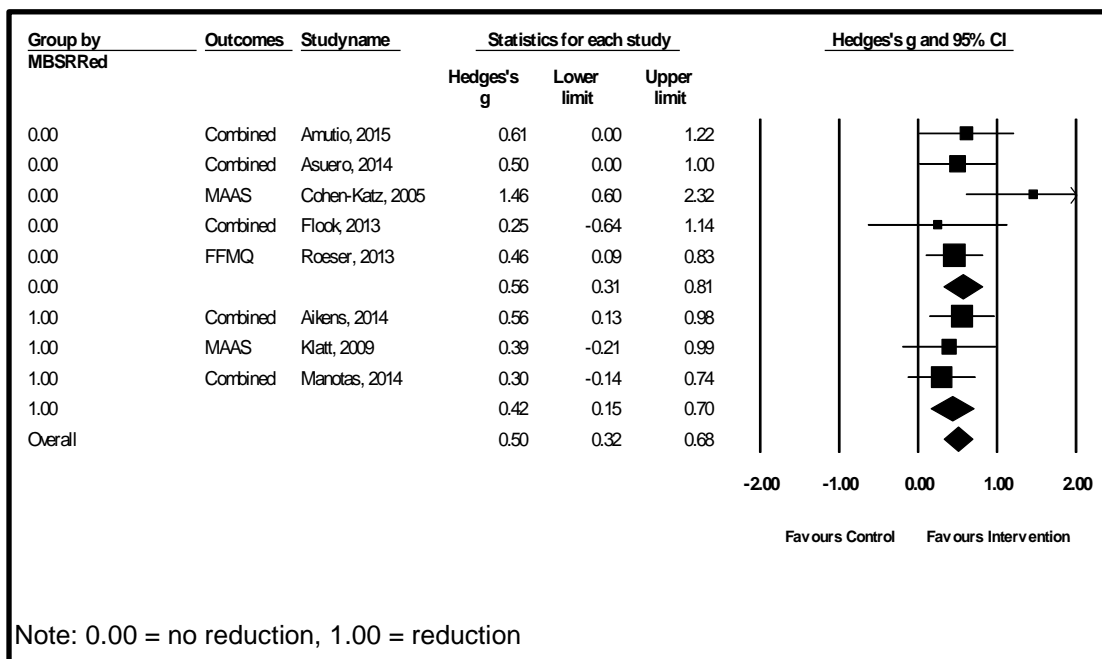


Figure 5.10. Forest plot mindfulness inactive control MBSR reduced Vs standard

As shown in Table 5.4, this difference was not found to be significantly different from zero ($g_{Diff} = -0.14$, $Z_{Diff} = -0.72$, $p = 0.47$). When comparing this moderation analysis to the same analysis for the well-being outcome, reducing MBSR training time was associated with a slight improvement in well-being, whilst it was associated with a slight reduction in effects on mindfulness, although neither of these differences was statistically significant. This finding suggests that shortened interventions do not have different effects on the mindfulness levels of staff to those that follow the standard MBSR protocol.

Subgroup analysis – inclusion vs exclusion of a retreat day.

Subgroup analysis was also conducted to investigate the effect upon mindfulness of the inclusion of the day-long retreat. The forest plot in Figure 5.11 shows that the estimated mean effect was medium-sized and significant for interventions which retained the retreat day ($g=0.50$, 95% CI [0.14, 0.86], $k=3$) and for those studies without a retreat day ($g=0.50$, 95% CI [0.28, 0.72], $k=5$). As shown in Table 5.4, this difference is not statistically significant when a Z score is calculated ($g_{Diff} = -0.004$, $Z_{diff} = -0.02$, $p = 0.99$). When comparing the two analyses moderated by retreat day inclusion, taking away the retreat day was associated with a slight increase in well-being, but was not related to any different effects on mindfulness, although the degree of change was insignificant in both cases. This suggests that the inclusion or exclusion of the retreat day did not have an impact on the beneficial effect of the MBSR intervention.

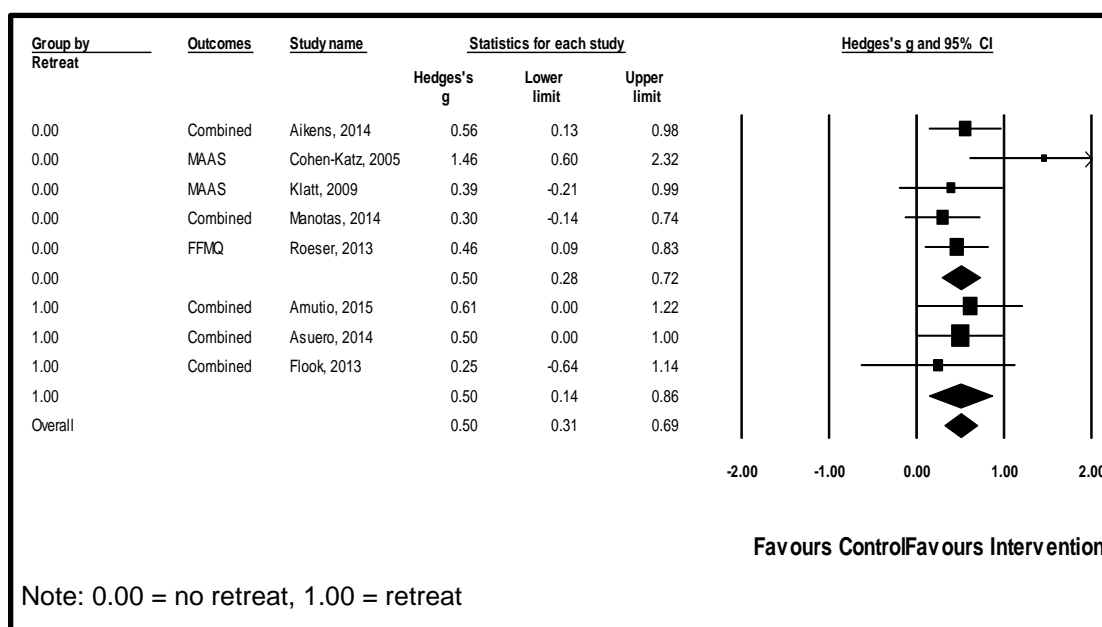


Figure 5.11. Forest plot mindfulness inactive control: inclusion Vs exclusion of retreat day

Comparison of baseline to follow-up group means (T1-T3).

Of the three studies that reported follow-up results for both the intervention and an inactive control group, two reported results on a mindfulness outcome (Roeser, 2013; Van Berkel, 2014). Table 5.5 above identifies the studies included in this analysis and the mindfulness measures used, followed by the results of the T1-T3 meta-analysis. It is important to note that due to the very small number of studies, the results should be interpreted with caution and may not be representative of a wider working population. The estimated mean effect from baseline to follow-up for mindfulness was small, with a confidence interval spanning zero suggesting a non-

significant effect ($g=0.26$, 95% CI [-0.29, 0.81], $k=2$). Heterogeneity in this case was very high ($\tau^2 = 0.13$, $I^2 = 83.51\%$). The high I^2 value indicates that variance across the studies is due to differences in effect sizes and not due to random chance, therefore this sample is unlikely to be representative of a larger and more homogenous sample.

A forest plot for the effect on mindfulness estimated from these two studies is shown in Figure 5.12 below depicting the make-up of the estimated mean effect from the included studies. As shown in Figure 5.12 and Table 5.5, the confidence interval for the estimated summary effect size includes zero demonstrating a lack of confidence in the precision of the estimate, and the possibility that the true effect size is not significantly different to zero. As such, the results do not suggest a significant beneficial effect of the MBSR upon mindfulness after a follow-up. This finding is unexpected based on other previous research, and is contrary to the hypothesis proposed for the intervention study reported in Chapter 7 (Hypothesis 1b), namely that there will be a maintenance of mindfulness at follow-up from the MBSR intervention, compared to the control group.

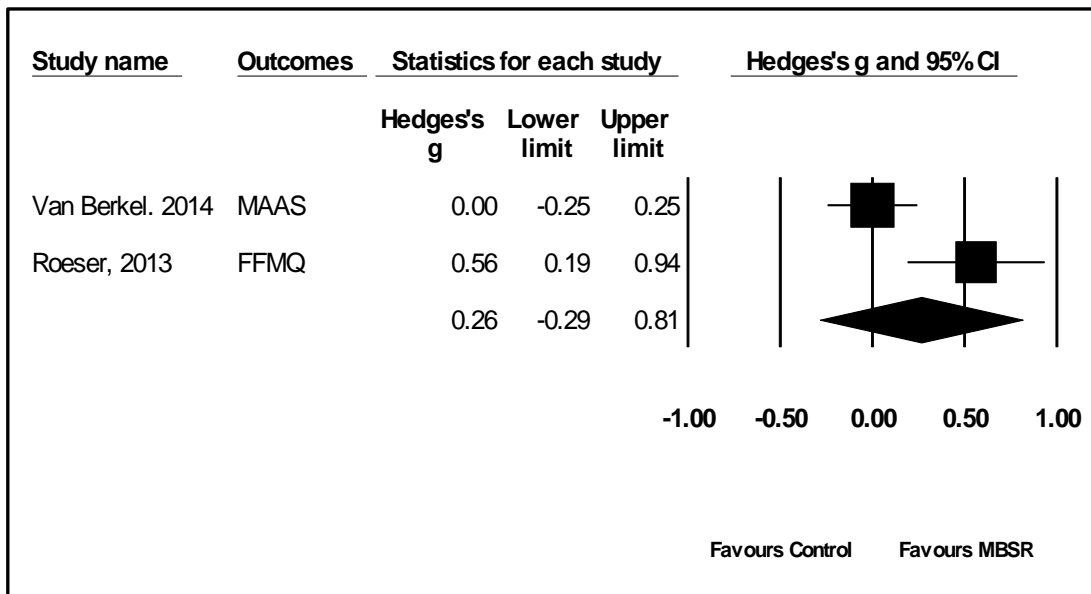


Figure 5.12. Forest plot MBSR Vs inactive control: mindfulness follow-up

5.5.3 MBSR versus inactive control group: Mindfulness, five facets of FFMQ

Comparison of pre-post group means (T1-T2).

As five studies reported results for each of the five facets of mindfulness in the FFMQ, it was possible to explore the effects upon these specific outcomes in addition to the overall composite measure of mindfulness. This was not a planned outcome of the systematic review, and has been conducted post hoc as an exploratory analysis given

the data available from the included studies. As only five studies were included in these analyses, subgroup analyses of course reductions and retreat day inclusion would not have been meaningful and therefore were not conducted.

As shown in Table 5.7 below, where mindfulness outcomes were reported for the five facets measured in the FFMQ ($k=5$), the average effect size for Observing was the largest (OBS; $g=0.85$, 95% CI [0.61, 1.08]), with small average effect sizes for the remaining facets of Non-Reactivity to Inner Experience (NOR; $g=0.44$, 95% CI [0.21, 0.67]), Non-Judging of Inner Experience (NOJ; $g=0.37$, 95% CI [0.15, 0.60]), Acting with awareness (AWA; $g=0.37$, 95% CI [0.14, 0.60]), and Describing (DES; $g=0.27$, 95% CI [0.04, 0.49]). Heterogeneity for all of the analyses was very low ($\tau^2=0$, $I^2=0$). In all five cases, the confidence intervals do not span zero and therefore demonstrate robust estimations of statistically significant small but beneficial effects of the intervention upon Non-reactivity to inner experience, Non-judging of inner experience, Acting with awareness, and Describing, and a large beneficial effect upon Observing. There were no eligible studies with active control groups that measured mindfulness using the FFMQ, therefore this is the only analysis of the FFMQ that is possible. In summary, this post hoc analysis indicates that MBSR has a statistically significant effect upon all five facets of mindfulness, however, it has a much larger effect upon Observing than the others, suggesting that this may be a key part of the process of becoming more mindful during MBSR training.

Table 5.7 MBSR versus inactive control – mindfulness facet estimated mean effect sizes (T1-T2)

Facet of the FFMQ	Hedges' g	95% CI	K	Heterogeneity
Observing	0.85	0.61-1.08	5	$\tau^2=0$, $I^2=0$
Non-Reactivity	0.44	0.21-0.67	5	$\tau^2=0$, $I^2=0$
Non-Judging	0.37	0.15-0.60	5	$\tau^2=0$, $I^2=0$
Acting with Awareness	0.37	0.14-0.60	5	$\tau^2=0$, $I^2=0$
Describing	0.27	0.04-0.49	5	$\tau^2=0$, $I^2=0$

5.5.4 MBSR versus active control group: Well-being

Comparison of pre-post group means (T1-T2).

As described in Section 5.2.1, two studies included measures of well-being collected at baseline and immediately after the intervention involving an active control group.

Table 5.8 below identifies the studies included in this analysis and the measures of well-being used, followed by the results of the T1-T2 well-being meta-analysis. The results of this small sample of studies should be interpreted cautiously. The estimated mean effect for well-being as a composite outcome was small and not significant ($g=0.15$, 95% CI [-0.11, 0.42], $k=2$). The calculation of this mean effect size included three different measures of well-being, with the effect sizes pooled within studies to produce one combined effect size per study. Heterogeneity for the combined measure was very low ($\tau^2 = 0$, $I^2 = 0$).

Table 5.8 MBSR versus active control – well-being and mindfulness outcomes (T1-T2)

Outcome and Studies Included	Outcome Measures	Int n	Con n	Hedges' g	95% CI	Heterogeneity
Well-being						
Malarkey, 2013; Pipe, 2009	CES-D, GSI, PSS-10	108	108	0.15	-0.11, 0.42	Tau ² =0.00 I ² =0.00
Mindfulness						
Malarkey, 2013	TMS	86	89	0.18	-0.12, 0.48	Tau ² =0.00 I ² =0.00

Note: For list of outcome measure abbreviations, see Appendix A(i)

A forest plot for the effect on well-being is shown in Figure 5.13 below. The confidence interval for the estimated summary effect size includes zero, and shows that for Pipe et al (2009) in particular, the confidence interval is wide and imprecise. As such, for these two studies, there is no significant difference in the effect of a mindfulness intervention or an alternative workplace intervention. This is in contrast to the findings in Section 5.4.1 for the studies with inactive control groups, where the estimated mean effect size was confidently reported as medium-sized and beneficial compared to receiving no form of intervention in the control group ($g=0.54$, 95% CI [0.39, 0.69], $k=12$). These findings suggest that MBSR, has no additional benefit beyond those of alternative interventions that do not include mindfulness.

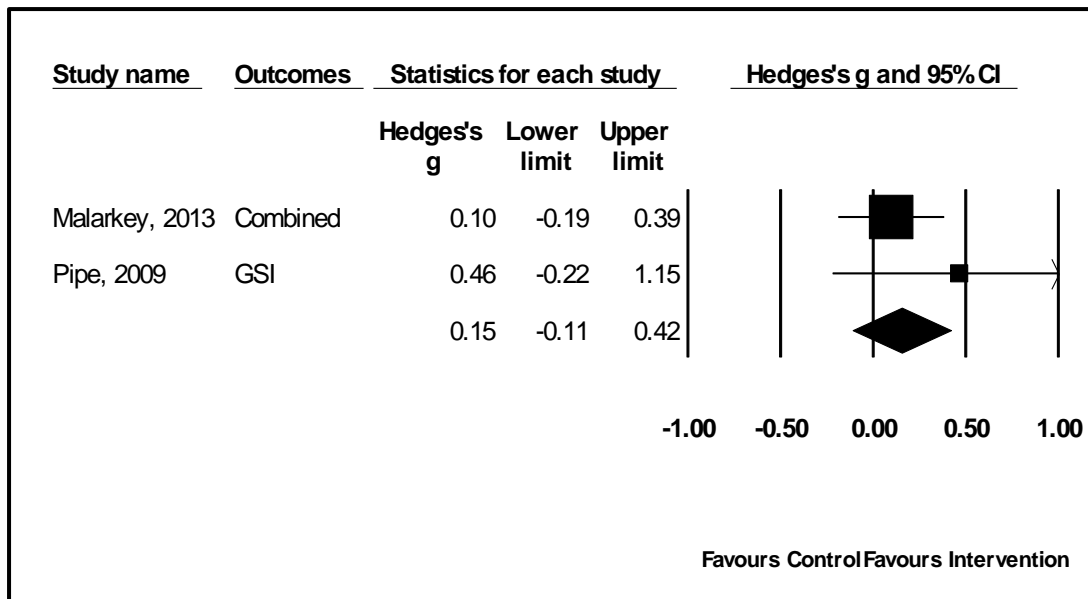


Figure 5.13. Forest plot MBSR Vs active control group: well-being

Subgroup analysis – reduced vs standard MBSR training time.

Of the two studies that included active control groups, one study had reduced the MBSR training contact time (Pipe, 2009) and one had not (Malarkey, 2013). As these single studies cannot be meta-analysed, their individual effect sizes are compared with each other in a narrative form.

Malarkey and colleagues (2013) did not reduce the standard MBSR contact time, and as can be seen in the previous forest plot (Figure 5.7) there was a small and insignificant mean effect size favouring the mindfulness intervention ($g = 0.10$, 95% CI [-0.19, 0.37]) with a confidence interval including zero. This study included a large sample of research staff. The contact time in the mindfulness intervention was reduced for Pipe and colleagues' (2009) study, in a population of nurse leaders, and resulted in an effect size which was estimated to be small-to-medium, but which lacked the precision to be certain that the true effect size would be significantly different to zero ($g = 0.46$, 95% CI [-0.22, 1.15], shown in Figure 5.7 above). In addition, this study had a small sample ($n = 32$) and may have had insufficient statistical power to precisely detect an effect. These findings are inconclusive as to whether reducing the contact time in the mindfulness intervention is harmful to the effect of the intervention upon well-being when compared to traditional MBSR, and more eligible studies that utilise an active control group are needed in order to revisit this question in the future.

Subgroup analysis – inclusion vs exclusion of a retreat day.

As in the previous subgroup analysis, one study included a retreat day (Malarkey, 2013) and one did not (Pipe, 2009). As previously shown, neither study finds a significant difference in the effect of the mindfulness intervention or an alternative control group intervention, regardless of whether the retreat day is included or not. The lack of studies prohibits further exploration of this moderator, or the use of subgroup analysis.

Comparison of baseline to follow-up group means (T1-T3).

Only Malarkey and colleagues (2013) gathered data at a follow-up time point with an active control group and as such, meta-analysis between subgroups was not possible. When comparing baseline to follow-up in this study, the effect size was found to be small and not significantly different from zero ($g=0.16$, 95% CI [-0.13, 0.45]). This finding is not surprising as a similarly small and non-significant effect was found immediately after the intervention for this study. Suggesting that there was no effect of the intervention, and this did not change over time to a follow-up four months after the end of the intervention.

5.5.5 MBSR versus active control group: Mindfulness***Comparison of pre-post group means (T1-T2).***

Of the two studies which utilised an active control group, only one measured mindfulness as a dependent variable (Malarkey, 2013), and as such, meta-analysis cannot be performed to assess the overall effect of mindfulness, nor to compare subgroups. Malarkey and colleagues measured mindfulness using the Toronto Mindfulness Scale (Lau et al. 2006), included a retreat day, and did not reduce the contact time. They found a small, insignificant effect of the intervention upon mindfulness when compared to an active control group ($g=0.18$, 95% CI [-0.12, 0.48]). As the confidence interval includes zero, there is no confidence that the true effect would be significantly different to zero. This observation suggests that whilst MBSR is effective for improving mindfulness when compared to a control group who are receiving no intervention (inactive control group), it is not any more effective than alternative interventions that do not include mindfulness training (active control group; in this case, a lifestyle intervention and a leadership intervention).

Subgroup analysis – reduced vs standard MBSR training time.

Subgroup analysis could not be conducted, as there was only one eligible study as described in the previous section.

Subgroup analysis – inclusion vs exclusion of a retreat day.

Subgroup analysis could not be conducted, as there was only one eligible study as described above.

Comparison of baseline to follow-up group means (T1-T3).

The study by Malarkey and colleagues (2013) reports mindfulness outcome data at a four-month follow-up. When comparing baseline to follow-up in this study, the effect size was found to be small and not significantly different from zero ($g = 0.29$, 95% CI [-0.005, 0.59]), with a confidence interval that begins with zero. As with the well-being outcome, this finding is not surprising as a similarly small and no significant effect was found immediately after the intervention for this study. Suggesting that there was no effect of the intervention, and this did not change over time to a follow-up four months after the end of the intervention, when compared to an active control group who received a lifestyle intervention. Although there was a larger positive effect at follow-up than at T2, which is nearing significance, suggesting that there was further improvement during the follow-up, but not enough to be significantly different to the control group.

Conclusion

To conclude this chapter, a summary of the findings relating to the aims of Study 1 will now be given. A more detailed summary of results can be found at the start of the discussion chapter in Section 9.1.1 in line with systematic review reporting conventions, along with a summary table (Table 9.1).

A statistically significant medium-sized effect of MBSR upon both mindfulness and well-being between T1-T2 was found when trainees were compared to an inactive control group. Subgroup analyses confirmed that reducing the number of contact hours with the teacher or excluding the retreat day did not make a significant difference to the positive effects upon both well-being and mindfulness. However, the effects upon well-being and mindfulness were not significant amongst studies that compared MBSR to an alternative intervention. Thus, immediately after training, MBSR leads to a greater increase in well-being and mindfulness than if no training is received, but is not shown to have any added benefits compared to different interventions.

When considering the effects between T1 and T3, there was a significant effect of MBSR upon well-being, but not mindfulness, when compared to an inactive control

group, and no significant effects on either outcome when compared to active control groups. As such, there was a lasting beneficial effect of MBSR upon well-being 2-3 months after the training but only compared to receiving no training at all. However, only four studies included a controlled follow-up, and heterogeneity between these was high, suggesting that the results should not be generalised to a wider population.

Before these results are discussed in Chapter 9, the following three chapters will turn to Study 2 – Chapter 6 outlines the methodology employed for the intervention study comparing the effects of MBSR to an inactive control group of NHS employees, Chapters 7 reports the results of the study in terms of the direct effects of MBSR upon mindfulness, well-being, resilience, and emotion regulation using multi-level modelling, and Chapter 8 reports the indirect effects of MBSR upon well-being using mediation analyses.

6 Intervention Study – Methodology

This chapter will discuss the process by which the intervention study within the NHS was designed, approved, implemented, and analysed. Firstly, the overarching epistemological assumptions will be explained in order to frame the research design. Next, the research will be placed within the context of the NHS Community Trust in which it was conducted, with details of the environment and the working population both in general and in terms of the study participants, followed by a detailed description of the Mindfulness-Based Stress Reduction (MBSR) course which was evaluated. The chapter will then move on to discuss the dependent variables to be explored within the study, and the measures with which these will be assessed including their reliability. The procedures for recruitment and the flow of participants, the collection of data, and the consequent statistical analyses will then be described.

6.1 Epistemological Assumptions

This research adopted a critical realist approach, whereby the social world is believed to be constructed based upon a range of underlying mechanisms which can be studied and altered to affect the social world (Patomaki & Wight, 2000). Critical realists purport that “There is a distinction between the objects that are the focus of their enquiries and the terms they use to describe, account for, and understand them” (Bryman & Bell, 2011, p.17). As such, this approach is viewed to be more appropriate to the social sciences, where direct observations of phenomena are not always possible or necessary, and perceptions of and reflections on behaviour are the closest alternative. Considering mindfulness and its Buddhist origins, this is in line with the concept of an underlying reality that is viewed through the lens of personal conditions and human suffering and is only seen clearly by those who attain enlightenment after substantial mental training.

This research has primarily taken a deductive approach whereby theory has been identified and explored via hypothesis-testing of quantitative data. This is important as testing of mindfulness theories is sparse in the literature (see Chapter 3, Section 3.1.1). Being able to make inferences about causality is important in this study, and as discussed in Chapter 4 Section 4.4.1, simple and small-scale field experiments are an excellent way to test if the manipulation of an independent variable brings about change in dependent variables of interest (Eden, 2017). Although Section 4.4.1

highlights the value and preference for an RCT design, Section 6.3 below details how this was not possible in Study 2. As such, a quasi-experiment in the field was conducted in order to allow for some consideration of causality using the most rigorous means available given the circumstances. Participants in the intervention are hypothesised to go through cognitive and perceptual change which will have an impact upon the way that the social world is described, accounted for, and understood (Bryman & Bell, 2011). As such, by comparing their self-reports to those of a control group of their peers, and checking for potential covariates (which would normally be accounted for in randomisation) in the analyses, any difference in self-reports of the intervention group from those of the control group can be more confidently attributed to the intervention as the key difference between the groups.

6.2 The Organisation

The organisation was a Community Healthcare NHS Trust in the north of England providing a range of healthcare options within the community, including community nursing, physiotherapy, and mental health services, with some staff situated at local prison services to provide offender healthcare. Gaining access to this population was facilitated by the Head of Organisational Development at the Trust who had recently secured funding for staff mindfulness training courses. The aim was to pilot and evaluate a series of mindfulness courses, the results of which would determine the provision of further courses, including the allocation of funding to this type of staff intervention in the future.

Austerity measures placed upon the Trust had led to increased job demands, reduced job resources, and a strain on the support systems to which employees currently had access. At the beginning of data collection in early 2015, the Trust employed approximately 2,900 staff. Anecdotal reports of low morale, high levels of stress, and funding constraints were considered to be representative of NHS Trusts and Clinical Commissioning Groups (CCGs) nationally. Furthermore, data from the 2014 Staff Survey suggested that the responses from this Trust regarding job satisfaction were distributed in a similar pattern to those of the entire survey sample (NHS, 2015). As the NHS continues to experience similar challenges in funding and staff morale in 2019, the study's findings remain relevant to current staff. As one of the largest employers in the UK, this was a valuable opportunity to gain insight into the success of a mindfulness intervention in a large organisation; in the NHS, mindfulness courses were already being offered to patients as a means to improve mental health, and

mindfulness course provision for employees is steadily becoming more popular. As such, the study results may be more readily generalisable to the wider working population.

6.3 Experimental Design and Rationale

After negotiation with the local NHS Research and Development team, a quasi-experimental controlled design was approved and implemented, using a non-equivalent control group. The sample comprised employees from across the Community Healthcare NHS Trust who had expressed interest in an MBSR training course as a means to improve their own well-being. Following numerous calls in the extant literature for quality improvement of future studies (see Jamieson & Tuckey, 2017 for an example), the original study design was planned as a randomised controlled trial (RCT). Consenting participants would have been randomly allocated to either a course in January 2015, or a wait-list control group to receive the training after the study's conclusion in October 2015. Although this design received ethical approval through the peer-reviewed University of Sheffield Ethical Application System, the local NHS Research and Development team did not approve a randomised design, or the exclusion from the two January courses of employees who did not wish to take part in the research until the next available course in March. As an alternative, the research was approved in a quasi-experimental form whereby potential participants were approached after the Trust had allocated places on the next MBSR course. For a discussion of the challenging nature of RCT research in organisational settings, see Chapter 4, Section 4.4.1.

Eden (2017, p. 98) states, "If the true experiment is the gold standard, the quasi-experiment is the silver." In a quasi-experimental situation without randomisation groups may not be equivalent prior to the intervention. As such, the researcher must attempt to test for and control or minimise known confounding variables (e.g. age or sex). By assessing and then controlling for as many confounding factors as possible, the longitudinal quasi-experiment is a strong alternative to an RCT design, and goes further than observational studies or cross-sectional uncontrolled designs in the attempt to pinpoint the cause of effects in Study 2. To bolster the internal validity of the quasi-experiment, sensitivity analyses will also be conducted where there is a question as to the effect of a variable other than the independent variable upon the outcomes of interest. . In doing so, the findings of Study 2 create actionable

knowledge about the effects and possible mechanisms of mindfulness-based interventions for the benefit of researchers and practitioners.

In addition, there are benefits to the use of a quasi-experiment when research is being conducted in the field and the strict criteria of a clinical trial are difficult or impossible to apply. The applied setting of this intervention research is a true representation of the circumstances in which mindfulness training in the workplace can occur – with participants who have considerable constraints to their time and their ability to commit to regular attendance and practice. These are important factors for organisations and practitioners to consider when attempting to train a diverse workforce over a specific time period.

Quantitative self-report data was collected at three time points from both groups – prior to the training (T1), eight weeks later immediately after the training (T2), and at a follow-up six months after the intervention's conclusion (T3). This research design allowed for a quantified measure of perceived changes in mindfulness skills, psychological resilience, emotion regulation, and workplace well-being over time utilising standardised and valid measures, and comparing data for those who received the intervention with those who did not. A period of six months between the course end and the follow-up measurement was chosen, as there is a paucity of follow-up measurement exceeding 2-3 months in the literature; a six month follow-up showed the differences in effects over a slightly longer period, whilst still being feasible within the timeframe of a PhD. The data were then used to explore the mechanisms by which mindfulness training impacts upon well-being, and whether psychological resilience and emotion regulation mediated this link.

6.4 Participants and Sample Size

In order to determine a minimum sample size for this research design, a power calculation was conducted using GLIMMPSE (2012, version 2.0.0) indicating that a sample size of 40 (20 per group) would have sufficient (80%) power to detect a medium-sized effect of MBSR when comparing pre- and post-intervention scores for the intervention and control group (Cohen's $d=0.6$, power=0.8). In this case, a moderate effect size is likely, based upon the medium-sized effects found in meta-analyses of similar MBSR interventions to improve well-being both in the workplace (Hedge's $g=0.68$; Virgili, 2015) in a healthy general population (Hedge's $g=0.62$; de Vibe et al., 2012), and in the general population including those with diagnosed health conditions (Hedge's $g = 0.54$, de Vibe et al., 2017).

A power calculation was particularly important in this case, as the sample size was already restricted due to the tendency for MBSR courses to be conducted with small groups; in this case a maximum of 16 delegates per course. In order to maximise the chance of retaining a minimum of 40 participants at the end of the eight-month study duration, participants were recruited in three phases, corresponding with the commencement of three consecutive pairs of courses during 2015 at the NHS Trust.

The final sample comprised 61 employees of the NHS Trust who had expressed an interest in attending an MBSR course following internal advertisements. Participants who had already been allocated a place on the next course were invited to take part in the intervention group (n=26), whilst those who remained on the waiting list for future courses were invited to take part in the control group (n=35). A total of 55 females (90%) and six males participated, with 24 females in the intervention group (92%) and 35 females in the control group (89%). Participants who completed the survey at fewer than two time points were excluded (n = 5). For a detailed analysis of demographic characteristics of the sample, see Chapter 7, Section 7.1.

6.5 The Mindfulness Intervention

The mindfulness intervention was provided by an external mindfulness trainer who was not an NHS employee, and I was not involved in the design, conduct or debriefing of the intervention. A reputable course-provider was commissioned by the Trust, and all courses were taught by the same experienced mindfulness practitioner with over 20 years of mindfulness practice, operating in accordance with the UK Mindfulness-Based Teacher Trainer Network “Good Practice Guidance for Teachers” (2011). The course followed the traditional eight-week MBSR format designed by John Kabat-Zinn (1982) which was discussed previously in Section 2.2, which incorporates mindfulness techniques such as sitting meditation, body scans, hatha yoga, and mindfulness in everyday activities. These techniques are introduced during the sessions and are then practised at home, and discussion time during the sessions allows for exploration of these experiences through a process of sharing with the group and guided enquiry by the teacher.

As with the traditional MBSR format, the course involved weekly two-hour sessions for eight weeks, with a one-week break when the course coincided with a school holiday. The timetable for the course is shown in Table 6.1 below. In a change from the original MBSR format, the NHS course did not include a full-day retreat toward the end of the course; however, all course graduates are eligible to attend follow-up

retreat days with the course provider at their own expense. Delegates were provided with a course handbook, and were required to practice at home six days per week for approximately 45 minutes facilitated by audio recordings of the guided meditations recorded by the teacher. Course participation was dependent upon consenting to comply with the terms and conditions laid out by the course provider, which included expectations regarding attendance, home practice and communication with the teacher. Participants also agreed a set of ground rules and a pact of confidentiality within the group during the first session, so that regardless of grade or hierarchy in the workplace, all participants were able to speak freely and in confidence during the reflective elements of the course.

Table 6.1 MBSR intervention weekly course content

MBSR Content	
Week 1	
Training session	Introduction to course, 3-minute breathing space, raisin-eating meditation, body scan mediation
Homework	Daily practice of body scan, short meditation, and mindful eating, read Week 1 of workbook
Week 2	
Training session	The nature mindfulness: attention, intention and attitude, mountain meditation
Homework	Daily practice of either body scan or mountain meditation, and short meditation, mindful eating or other daily activity, read Week 2 of workbook
Week 3	
Training session	Mindful movement, body scan meditation II
Homework	Rotate learnt meditations, mindfulness in more daily activities, record pleasant experiences in workbook
Week 4	
Training session	Discussion of stress, sitting meditation
Homework	Rotate learnt meditations, mindfulness in more daily activities, record unpleasant experiences in workbook
Week 5	
Training session	Mindful listening, dealing with difficulty
Homework	Rotate learnt meditations, mindfulness in more daily activities, record pleasant/unpleasant experiences in workbook, read Week 5 of workbook
Week 6	
Training session	Mindfulness in relationships, loving-kindness meditation
Homework	Rotate learnt meditations, mindfulness in more daily activities, record pleasant/unpleasant experiences in workbook, consider own stress profile, read Week 6 of workbook
Week 7	

Training session	Thai Chi movements, meditation practice planning, stress toolbox
Homework	Use practices learnt so far to develop a personal practice plan and stress toolbox
Week 8	
Training session	Course conclusion, group meditation, finalise plans to continue mindfulness practice
Homework	Use meditations and resources from the course to continue to develop mindfulness

As shown in Table 6.1 The course begins with the setting of ground rules, introductory guidance on starting a mindfulness journal, recommendations for supportive meditation postures, and suggestions to help set up a positive intention for the course which embodies commitment, curiosity, and receptivity to the new practices and experiences which will be encountered. These intentions are then applied to some foundation-level mindfulness exercises, which are practised at home until the next session.

In week two, the building of a strong foundation of mindfulness practice continues; participants learn more about attitudes, intentions, and the nature of awareness, and ways in which these elements of mindfulness can be adapted and applied in their own mindfulness practice. The third week begins a process of immersion within the mindfulness meditations as the mindful movement practices are taught and a second body scan meditation is introduced. At this stage, participants can alternate between several meditations in their home practice, as well as bringing mindful attention to every-day activities. Weeks four, five, and six are considered essential by the course teacher; by this time, participants are building their practice and beginning to have insights into the ways in which mindfulness can be applied most effectively in their own lives. The fourth and fifth weeks focus upon stress, mindful listening, and dealing with difficulty, which is extended and applied to relationships in week six. As the course draws to a close, week seven introduces more mindful movement in the form of Tai chi positions, and encourages participants to formulate a plan to help incorporate mindfulness into their daily routine, recognise rises and falls in stress levels, and create longer-term plans and aspirations. Finally, in week eight, plans and future intentions are emphasised and the course is summarised and concluded.

Participants were required to attend at least six out of eight sessions, and to inform the teacher in advance if they would not be able to attend a session. Those who had

missed a session had the opportunity to arrive 30 minutes earlier the following week to receive a recap of the missed content from the teacher.

6.6 Materials

At T1, participants in both groups were asked to provide demographic information, so that any necessary baseline control variables could be added to the analyses. Participants were asked to provide their age, gender, job title and NHS band (indicating their level of pay and responsibility), see Appendix B(i) for an example of the survey. Furthermore, participants were asked for details of any prior experience of mindfulness or meditative practices, including their nature and duration.

At T2 and T3, the control group were asked again if they had engaged in any mindfulness or meditative practices since the previous questionnaire, and the intervention group were asked if they had completed the mindfulness course, how many sessions they had attended, how often they had used the mindfulness techniques learnt during the course since the last questionnaire, how much benefit they felt they had gained from taking part in the course, and whether they would recommend the course to a colleague. After these preliminary questions, all participants received the same self-report questionnaire pack at each time point.

The self-report questionnaire pack included the following measures which will be discussed in detail below:

- Mindfulness Skills – Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006). See Appendix C(i)
- Workplace Well-Being –MultiAffect Indicator (Warr et al., 2014)). See Appendix C(ii)
- Psychological Resilience - The Connor-Davidson Resilience Scale (CD-RISC; Connor & Davidson, 2003). See Appendix C(iii)
- Emotion Regulation – The Emotion Regulation Questionnaire (Gross & John, 2003) See Appendix C(iv)

6.6.1 Five Facet Mindfulness Questionnaire (FFMQ)

The FFMQ (Baer et al., 2006) is a 39-item measure looking at five components of mindfulness skills; Observing, Describing, Acting with awareness, Non-judging of inner experience and Non-reactivity to inner experience. The Observing facet has

eight items, for example, “I pay attention to sensations, such as the wind in my hair or sun on my face.” Eight items address the Describing facet, including “I’m good at finding the words to describe my feelings.” The Acting with awareness facet includes eight items, such as, “I find myself doing things without paying attention” (reverse scored). Eight items are concerned with Non-judging of inner experience, for example, “I disapprove of myself when I have irrational ideas” (reverse scored), and the Non-reactivity to inner experience facet has seven items, including “I watch my feelings without getting lost in them.”

The items are scored on a unipolar Likert-type scale from one (never or very rarely true) to five (very often or always true). The authors report very good internal consistency for each of the subscales, with alpha coefficients between .75 and .91 (Baer et al., 2006). This measure is derived from the factor analysis of several established and well-validated measures of mindfulness, incorporating the seven/eight items which had the highest loadings onto each of the five emergent facets. After reverse coding negatively-worded items, a mean score is given for each subscale. As an overall measure of mindfulness in the mediation analyses, the 39-items are combined to give an overall average score.

The FFMQ and the Mindful Attention Awareness Scale (MAAS, Brown & Ryan, 2003) are arguably the two most-used mindfulness measures, and both are used to measure mindfulness by different studies included in Study 1. The MAAS is one of the scales which were included in the factor analysis which was used to develop the FFMQ, and as such, many of the items on the MAAS are represented in the Acting with awareness facet of the FFMQ. As such, the benefit of the FFMQ is its comprehensive exploration of five different elements of mindfulness, which can be analysed separately and in combination, and can provide more insight into the effects of MBSR beyond Acting with awareness, which is only one part of what defines mindfulness.

Reliability analyses.

In the present study, the FFMQ subscales demonstrated high levels of reliability across the three time points. The eight-item Observing subscale was found to be highly reliable at each time point (T1 $\alpha=.82$, T2 $\alpha=.88$, T3 $\alpha=.91$), as was the case with the Describing facet, which also has eight items (T1 $\alpha=.93$, T2 $\alpha=.93$, T3 $\alpha=.91$). The Acting with awareness facet which has eight items was also found to be highly reliable (T1 $\alpha=.91$, T2 $\alpha=.91$, T3 $\alpha=.90$). Reliability was strong for the eight-item Non-Judgement of Inner Experience facet (T1 $\alpha=.90$, T2 $\alpha=.93$, T3 $\alpha=.94$), whereas the

reliability was slightly lower, but still good for the seven-item Non-Reactivity to Inner Experience facet (T1 $\alpha=.81$, T2 $\alpha=.82$, T3 $\alpha=.82$). For the composite scale used in the mediation analysis in Chapter 8, which is the mean score for all 39 items on the FFMQ, there is also strong reliability (T1 $\alpha=.95$, T2 $\alpha=.96$, T3 $\alpha=.95$).

6.6.2 The Multi-Affect Indicator (MAI)

The MAI (Warr et al., 2014) is a comprehensive measure of job-related psychological well-being which covers four core areas within an affective circumplex; a detailed discussion of the core affect circumplex can be found in Sections 3.2.1 and 3.2.2. The measure covers four quadrants of affect upon the continua of low-to-high activation, and unpleasant-to-pleasant affect, which “offers greater specificity of analysis and precision of prediction” (Warr et al., 2014, p.344) when compared to other commonly used affective measures such as the Positive and Negative Affect Schedule (Watson, Clark & Tellegen, 1988) which focus exclusively upon high-activation positive and negative affect and do not address the low-activation quadrants.

The measure asks the question “For the past week, how often have you felt the following while you were working in your job?” and then presents items such as “tense” for high-activation unpleasant affect, “depressed” for low-activation unpleasant affect, “joyful” for high-activation pleasant affect, and “calm” for low-activation pleasant affect. The items are rated using a seven-point Likert scale, from one (never) to seven (always), and all unpleasant affect items are reverse scored, so that a high score always indicates high well-being. Item scores are averaged to give a mean score for each quadrant. Quadrant results can be examined separately or in combination; for example, all negative, or positive affect can be analysed together, or – as is of interest in Study 2 - the diagonal axes through the quadrants which give a scale from high-activation unpleasant to low-activation pleasant (Anxiety-Comfort axis), and low-activation unpleasant to high-activation pleasant (Depression-Enthusiasm axis) can be assessed. The four quadrant scales were found to be highly reliable during scale development, with alpha coefficients between 0.75 and 0.90, using combined exploratory data from six studies (Warr et al., 2014).

Reliability analyses.

In the present study, reliability was strong for the total 16-item MAI (T1 $\alpha=.89$, T2 $\alpha=.92$, T3 $\alpha=.90$). Furthermore, for the diagonal axes, both of which contain eight items, the Anxiety-Comfort axis and the Depression-Enthusiasm axis both

demonstrated good reliability at each time point (T1 $\alpha=.88$, T2 $\alpha=.87$, T3 $\alpha=.84$, and T1 $\alpha=.85$, T2 $\alpha=.89$, T3 $\alpha=.86$, respectively).

6.6.3 The Connor-Davidson Resilience Scale (CD-RISC)

The CD-RISC (Connor & Davidson, 2003) is a 25-item measure of psychological resilience over the last month, which includes items such as “When things look hopeless, I don’t give up” rated on a five-point Likert scale from zero (not true at all) to 4 (true nearly all of the time). The authors report high internal consistency with an alpha coefficient of .89 and test-retest reliability of .87. All items are positively framed and the responses are summed to give a scale score ranging from 0-100. The CD-RISC is a commercially available scale, and has benchmarking data for various populations within the user manual. As much of the wider literature on resilience is conducted with samples of children, the CD-RISC was chosen as a validated measure of psychological resilience appropriate to adults.

Reliability analyses.

Reliability analyses of the CD-RISC for the current data revealed high levels of reliability at every time point (T1 $\alpha=.88$, T2 $\alpha=.92$, T3 $\alpha=.90$).

6.6.4 The Emotion Regulation Questionnaire (ERQ)

The ERQ (Gross & John, 2003) is a 10-item measure with two separate subscales measuring cognitive reappraisal and expressive suppression as two distinct forms of emotion regulation. The reappraisal subscale includes items such as: “I control my emotions by changing the way I think about the situation I’m in,” and the suppression subscale includes: “I control my emotions by not expressing them”. Reliability of the measure as reported by Gross and John (2003) is good at .79 for reappraisal and .73 for suppression, with good test-retest reliability of 0.69 for each of the subscales. The ERQ is a popular and validated scale, meaning that the results of Study 2 can be compared to other research using the same scale in order to judge how MBSR relates to other interventions aimed at improving emotion regulation.

Reliability analyses.

For the current NHS Trust sample, the six-item Reappraisal subscale, and the four-item Suppression subscale, both demonstrated good levels of reliability (T1 $\alpha=.82$, T2 $\alpha=.88$, T3 $\alpha=.87$, and T1 $\alpha=.79$, T2 $\alpha=.89$, T3 $\alpha=.85$, respectively).

6.7 Procedure

The potential participants were those who had a confirmed place on the next mindfulness course (for the intervention group), and those on the waiting list for future courses (for the control group). These individuals were sent an email, including an information sheet introducing the research and detailing the research requirements, and an invitation to take part in the research by completing an accompanying consent form. The information sheet included my contact details and those of the first PhD supervisor so that questions could be answered prior to participants deciding whether to take part in the research. This email was initially sent by the Local Collaborator from the Organisational Development department of the Trust, in accordance with NHS ethical procedures which state that the invitation must come from within the Trust. Potential participants interested in taking part in the study, then returned the signed consent form to the local collaborator. The names and email addresses of the people who had consented to take part in the research were then forwarded to me by the Trust in a secure file.

This initial recruitment method proved to be slow and inefficient, particularly as the local collaborator had other demands and was sometimes absent from work leading to unavoidable breakdowns in communication. Therefore, for the final phase of the research, I applied for and received an NHS Research Passport. This change allowed me to contact potential participants directly prior to consent being given, and made the recruitment process more streamlined as consent forms and queries were received instantly by the relevant person, and management of this task and the resultant data was no longer a shared responsibility.

Both the intervention group and the control group completed baseline questionnaires before the start of the course at T1, the content of which was described in Section 6.6 above. The participants in both groups were invited to fill in the main questionnaires again after the end of the course at T2, and at a six-month follow-up at T3. At each time point, participants who had yet to complete the questionnaire were sent a personalised reminder. The flow of participants is shown in Figure 7.1 below, and is discussed in Chapter 7, Section 7.1.

Originally, it was hoped that enough participants would be recruited from both the waiting list and the pair of intervention courses beginning in January 2015 (Phase 1), however the required sample size was not achieved during this phase. As a result, two further phases of recruitment and data collection ensued around courses

beginning in May (Phase 2) and September 2015 (Phase 3). The three phases ended with the six-month follow-up at Time 3 in October 2015, January 2016, and May 2016, respectively.

The surveys were completed online using the survey platform Qualtrics, although one participant at Time 1 requested a paper copy of the questionnaire and their data were added manually to the data set. Data was anonymised by Qualtrics and then exported into Microsoft Excel for cleaning and organisation before being exported to SPSS or Mplus for analysis.

6.8 Ethical Considerations

This research complied with the Ethical Code of the Institute of Work Psychology within the Management School of the University of Sheffield, and also satisfies the Ethical Code of the Division of Occupational Psychology of the British Psychological Society. These Codes require consideration of consent, potential harm to participants, and provisions for data confidentiality and safe data storage.

In addition to ethical approval from the University of Sheffield, ethical approval was also granted by the NHS, which is essential for all research conducted therein. In this case, as the research involved staff and not patients, and because the ethical process at the University is peer-reviewed, only local NHS Research and Development approval was required from the Trust, and was confirmed in early January 2015.

As this is a non-invasive research method, the likelihood of physical or psychological distress was low. The participants were giving up their time to complete the questionnaires, which may have been a small inconvenience, but this was voluntary. A common reason for the use of mindfulness training is to reduce stress, and as such, the questionnaire may have highlighted problems with stress for the participant. The questionnaires contained advice to contact one's General Practitioner or workplace Occupational Health team if they wished to speak to someone regarding this. In addition, participants were informed that they were free to withdraw from the study at any time if they did not feel comfortable with the questions asked. The final report to the organisation has also been made available to participants so that they may review the outcomes of the research. In addition, the mindfulness trainer was an experienced practitioner, and able to effectively support and signpost participants if

there was any concern for their health as a result of taking part in the training, or if their workload was causing excessive stress.

With regards to data confidentiality, the questionnaires did not contain any identifying information, instead utilising a unique ID number for each participant, which was retained for all of the repeated measures.

To ensure that data was safely stored, paper questionnaires were kept in a locked storage facility and shredded as soon as the information was entered into an electronic record. All electronic files were password-protected and stored on the University's secure server.

6.9 Analytical Procedure

6.9.1 The mixed model

The aggregated participant data were imported into SPSS to investigate changes in the dependent variables over time within and between experimental groups. Preliminary descriptive statistics were produced, and the data were checked for violation of the assumptions of parametric analysis. Independent samples t-tests and Chi-square analyses were also conducted to check for any significant T1 differences between the two experimental groups which would require the addition of control variables to future analyses. In the initial phases of statistical analysis, repeated measures ANOVAs with a 2x3 design were utilised, with two experimental groups as the between-subjects factor and three time points as the within-subjects factor for each measure. When all data were collected however, participant attrition at T3 resulted in considerable list-wise deletion of participants – particularly in the control group – thus unbalancing the groups, reducing statistical power, and excluding a large portion of available data from the analyses. For this reason, the data set was reorganised, and mixed model analyses were instead conducted within SPSS using the MIXED procedure with maximum likelihood estimation for each scale or subscale. This procedure allows the analysis of longitudinal data with a hierarchical structure – in this case, nesting time within individuals (the level 1 model), and individuals within experimental groups (the level 2 model), as shown in Figure 6.1 below, whilst retaining and including data for participants who did not complete every questionnaire. Furthermore, this analysis is well suited to longitudinal designs where observations are not completely independent (Shek & Ma, 2011) as is the case here where observations from the same participant over time are likely to be correlated.

A non-linear trend is proposed by Hypotheses 1-5, whereby participants taking part in mindfulness training are expected to improve between T1 and T2 whilst the intervention is taking place (part a of the hypotheses), and then maintain this improved level between T2 and T3 (part b of the hypotheses) rather than continuing to improve in a linear fashion. It was not possible to model this non-linear pattern of change using only three time points and a small sample, which resulted in convergence failures when the model was run in SPSS.

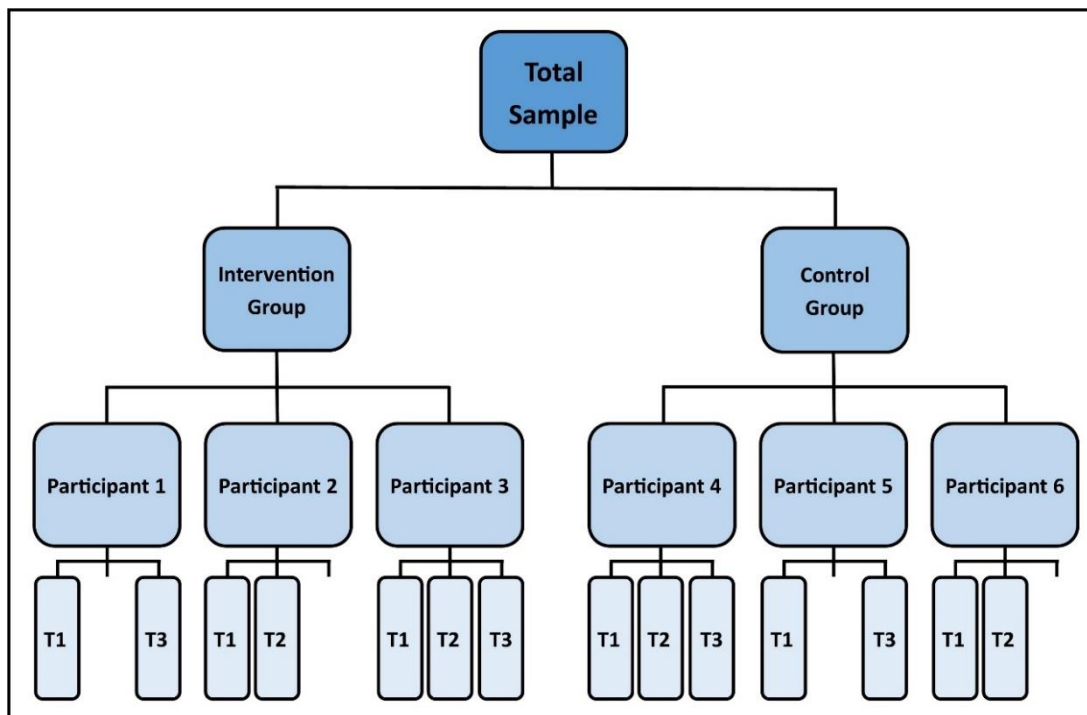


Figure 6.1. Diagram of the nested hierarchical mixed model, including the possibility of missing data at one time point per participant.

As the lack of convergence was an issue with sample size, running the analyses using a different statistical package would have had the same result. For this reason, the analyses were conducted as a two-step change process, meaning that the two time periods of interest – during the intervention, and during the follow-up – were assessed in a non-linear format to reflect the change occurring in a non-parametric way over time. The time variable was transformed into two dummy variables - Change1 and Change2. Using Change1, the model analysed how much variance in the outcome variable was attributable to the intervention by comparing mean outcome scores for each group at baseline (T1) with the mean outcome scores after the intervention (T2 and T3). In order to analyse any change in mean scores during the follow up, Change2 compared mean outcome scores prior to the follow-up period (T1 and T2) with outcome scores after the six-month follow-up (T3). These two dummy variables allowed each period of change to be measured independently, yet within the same

model, which gives flexibility to the analysis in order to explore all of the proposed hypotheses. The coding of the two dummy variables is shown in Figure 6.1 below. The results of these analyses are presented in Chapter 7.

Time	Change 1	Change 2
T1	0	0
T2	1	0
T3	1	1

Figure 6.2. Coding of the dummy variables Change1 and Change2 from the variable Time for the Mixed Model.

6.9.2 The mediation model

In order to explore the mechanisms of change which operate when one receives mindfulness training, and to investigate the serial and parallel relationships between the outcome variables, mediation analysis was conducted. Using multiple mediators in a serial and parallel format, a mediation model was built to determine successional changes in outcome variables over time as a result of the intervention. In a simple mediation model, the effect of an independent variable (X) upon a dependent variable (Y) is predicted to proceed via a mediator (M) in a causal chain. In the case of multiple mediators, the causal chain is more complex and can proceed from variable X via mediators that either occur in a specific sequence (serial mediation), or concurrently during the process (parallel mediation). Intervention studies are an ideal forum for the exploration of mediating mechanisms, as the longitudinal nature of the data allows for causal inferences.

As with the previous analysis, the small sample resulted in the need for a somewhat simplified model focussing on direct and indirect pathways which are proposed after reviewing the literature. The sample size restriction also meant that structural

equation modelling was not possible due to lack of power (Bartholomew, Steele, Moustaki & Galbraith, 2008).

Mindfulness, resilience, and emotion regulation were placed in mediating roles between the intervention and well-being. As shown in Figure 6.3 below, it was hypothesised that the intervention would lead to improvements in mindfulness skills, which would in turn enhance both resilience and emotion regulation, and that these in turn would improve workplace well-being.

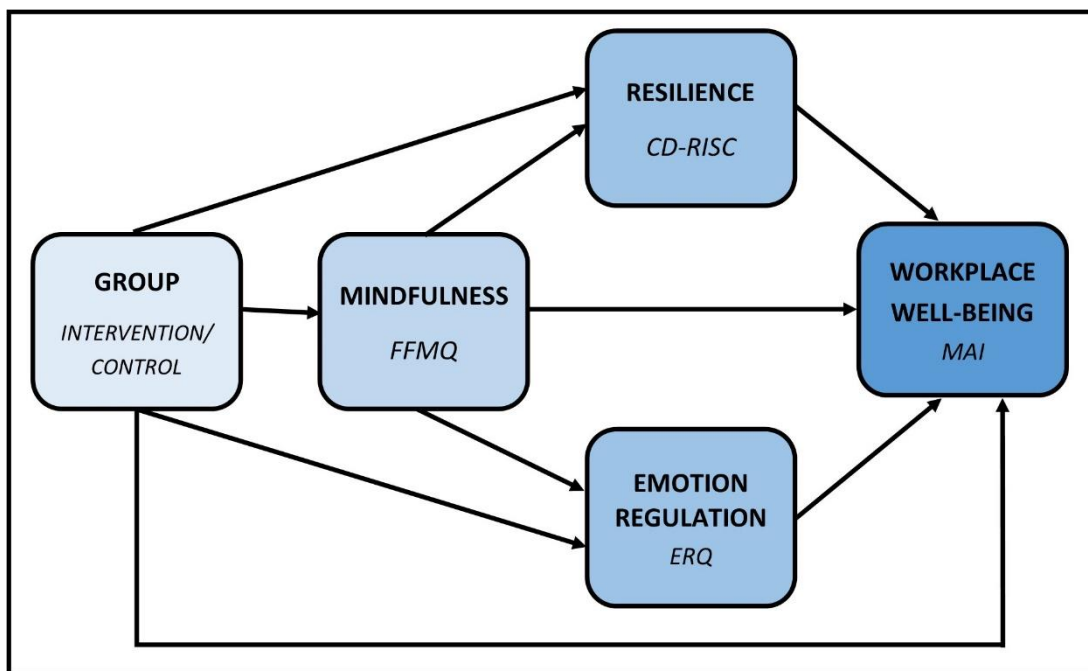


Figure 6.3. Diagram of the mediation model.

To test this mediation model, data were imported to Mplus in order to conduct path analyses. Entering all of the outcome variables in this way has the advantage of taking into account shared variance and how this is divided between the model components so that outcome changes can be assessed as an interactive and dynamic process, rather than several discrete routes (Mackinnon, Coxe & Baraldi, 2012). Furthermore, the use of mediation analyses in Mplus means that the indirect effects of mediating variables can be analysed using non-parametric bootstrapping; bootstrapping is more appropriate than a Sobel test for the nested (i.e. non-independent) pathways in this multi-level model (Kenney, 2018) and gives an estimated confidence interval as well as the p value for each of the indirect paths and the total indirect path which is shown to be non-trivial (i.e. statistically significant) if the interval does not include zero. Bootstrapping in this case was based upon 10,000 iterations of possible samples derived from the original data. Mplus is specifically a

path analysis statistical program, which gives several advantages over the use of the *MEDIATE* or *PROCESS* macros within SPSS. In particular, Mplus is able to incorporate both categorical and continuous latent variables, and allows all indirect pathways to be incorporated into a single statistical model as opposed to conducting the analysis of each possible indirect pathway separately (Geiser, 2012). As recommended by Hayes (2013) and by Preacher and Kelley (2011), the terms 'full' and 'partial' mediation will not be used to categorise the role of mediation pathways, as there are myriad ways and degrees to which mediators can influence relationships between independent and dependent variables. Pathway strength will instead be specified using unstandardized coefficients and their confidence intervals. The results of the mediation analysis are presented in Chapter 8.

Conclusion

This chapter has presented and discussed the methodological approach used in Study 2. The critical realist epistemology has been described as it relates to mindfulness, and how the use of a quasi-experimental field design facilitates the pursuit of actionable knowledge within this frame of reference. The organisation, the participants, and the intervention are then described in detail, followed by description and rationale for using the chosen measures to record change in the dependent variables.

The latter half of the chapter then outlined the experimental procedure used, and the flow of participants through this procedure, as well as the ethical considerations of the study, and the procedure by which the data will be statistically analysed.

The following chapter will report the direct effects of MBSR upon the outcomes of mindfulness, well-being, resilience, and emotion regulation using multi-level modelling.

7 Intervention Study – Results: Direct Effects

The current chapter presents the analyses of data gathered from Study 2, which evaluated the effect of MBSR upon trainees compared to a control group in an NHS Community Trust. Data were analysed to test Hypotheses 1-5 presented in Chapter 3 with a focus upon the effects of the intervention for the mindfulness training group in comparison with a control group, on the key outcome variables of mindfulness, well-being, resilience, and emotion regulation, and whether these effects are maintained at follow-up. The chapter begins with a report of participant characteristics and checks that the data meet assumptions of parametric data. Each variable is then considered in turn presenting the results of descriptive statistics and of the multi-level model that has been built for each one. A short summary of the results within each variable is given at the end of each section. As a reminder, the hypotheses relating to direct effects tested in this chapter are listed below:

Hypothesis 1a) Participation in MBSR within the workplace will be related to an increase in mindfulness skills, as measured by the FFMQ (Baer et al., 2006) when compared to a control group, 1b) which is maintained at a six-month follow-up.

Hypothesis 2a) Participation in MBSR within the workplace will be related to an increase in well-being at work, as measured by Warr et al.'s (2014) MultiAffect Indicator, when compared to a control group, 2b) which is maintained at a six-month follow-up.

Hypothesis 3a) Participation in MBSR within the workplace will be related to an increase in personal resilience, as measured by the CD-RISC (Connor & Davidson, 2003), when compared to a control group, 3b) which is maintained at a six-month follow-up.

Hypothesis 4a) Participation in a Mindfulness Based Intervention within the workplace will be related to an increase in emotion regulation using cognitive reappraisal, as measured by the ERQ (Gross & John, 2003), when compared to a control group, 4b) which is maintained at a six-month follow-up.

Hypothesis 5a) Participation in a Mindfulness Based Intervention within the workplace will be related to a decrease in emotion regulation using expressive suppression, as

measured by the ERQ (Gross & John, 2003), when compared to a control group, 5b) which is maintained at a six-month follow-up.

7.1 Participant Characteristics and Attrition

As shown in the flow diagram in Figure 7.1, of the 71 individuals who consented to take part in the research, 62 went on to complete at least two surveys; 26 from the intervention group and 36 from the control group. Of the remaining nine individuals, four consented but did not complete any questionnaires and five were excluded from the research as they completed only one survey and therefore their data could not be used to test change over time as required by the research hypotheses - of those excluded, two were in the intervention group and three were in the control group.

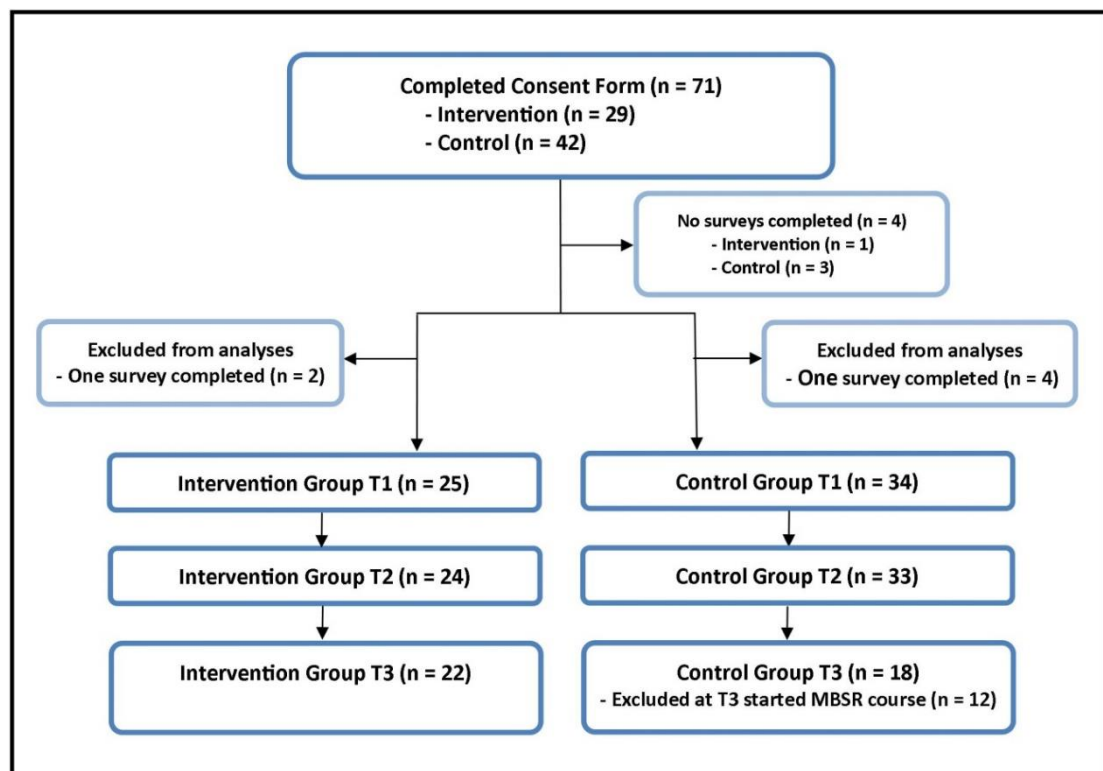


Figure 7.1. Flow diagram of participant responses and exclusions

In the control group, 12 sets of T3 data were removed from the analysis, as the participants had taken part in a mindfulness training course between T2 and T3, and no longer met the requirements of this group. One of these control group participants was then excluded from the study as they only had remaining data from a single time point. These exclusions resulted in a final useable data set from 61 participants; 35 in the control group, and 26 in the intervention group. Across time points, this gave 58 responses at T1, 56 responses at T2, and 39 responses at T3. The original statistical analysis plan involved 2x3 repeated measures ANOVAs to evaluate change

over time, however, in SPSS this necessitates the list-wise deletion of all participants without complete data sets for all three time points. This would have resulted in an inadequate total sample of 34; 15 in the control group, and 19 in the intervention group – which would have been underpowered according to the power calculation discussed in Section 6.4. For this reason, statistical methods which did not require list-wise deletion of incomplete data were sought, and a multi-level model approach was taken which enabled participants with only two time points of data to be included in the analysis, as explained previously in Section 6.9.1.

Descriptive statistics for the demographic variables are shown in Table 7.1 below. Chi-square analysis using Fisher's exact test found no significant difference in gender between the two groups ($\chi^2(1) = 0.24, p = 0.49$). In addition, no significant difference was found using a Mann-Whitney test for job band between the control group (Mdn = 5.5) and the intervention group (Mdn = 7; $U = 525.5, z = 1.57, p = 0.12$). Medians for each of the phases were inspected for large discrepancies but none were found. Consequently, gender and job band were not included as control variables in the analyses.

An independent-samples t-test confirmed that there was no significant difference between the groups in terms of age ($t_{57} = -0.04, p = 0.97$). Therefore, age was not included as a control variable in any of the analyses.

Table 7.1 Demographic variables for the sample, divided by Group.

Variable	N		Mean		SD		Median		Range	
	C	I	C	I	C	I	C	I	C	I
Age (Yrs)	34	25	47	47	10	6	49	46	23-61	33-59
Job Band	34	25	5.5	7	1.7	2.2	5.5	7	3-8B	2-9

Note: N = number of participants, SD = standard deviation of mean, C = Control, I = Intervention.

7.2 Assumptions of Parametric Data

As described in Section 6.9.1, the multilevel model used to test Hypotheses 1-5 involved hierarchical data nested within two levels; level one is the repeated measure over time, level two nests these repeated measures within participants. Whether the intervention impacted upon outcome measures was determined by adding group

status as a covariate. By looking at the individual growth curves of participants, and then adding the contextual variable of being in the experimental or control group, the analyses identify the proportion of variance in growth trajectories which can be explained by the intervention. The hierarchical, longitudinal nature of the data results in a violation of the usual assumptions regarding the independence of observations, and that of the associated error terms – in this case, we would expect the residuals within participants and within groups to be correlated, not independent. For this reason, the intraclass correlation (ICC) will be calculated as a measure of the estimated dependency between data points, as a ratio of the variance between each participant's response, to the variance within each participant's responses at each time point; this makes it possible to state the proportion of the variance attributable to each variable in a model (Field, 2005) as the model is built up by adding contextual variables.

Prior to beginning to build the mixed models, all outcome variables were checked for normality, outliers, missing data, skewness and kurtosis, and multi-collinearity. Unless otherwise stated below, these were all within acceptable ranges and data were not transformed (see Appendix D(i) and Appendix D(ii) for the results of these analyses). Means and standard deviations for all of the outcome variables sorted by group and time point are shown in Table 7.2 below, and are described in more detail in the Descriptive Statistics section for each variable.

Standardised mean differences are calculated in this analysis, and are expressed as Hedges' g (Hedges, 1981). Hedges' g is calculated by first subtracting the mean of one group from the mean of the other group to give a mean difference, and dividing this by the pooled within-group standard deviation to produce Cohen's d (Cohen, 1969), and then applying the correction factor J to this result. Hedge's g adjusts d in this way as d has been found to overestimate the effect size in studies with small samples which is accounted for by the correction (Borenstein et al., 2009). The inclusion of standardised effect sizes expressed as Hedges' g has several benefits; this metric allows the comparison of effects from outcomes with different measurement scales in a standardised form; it gives an unbiased effect size estimate when sample sizes are small as is the case in this study; and the clear reporting of means, standard deviations and effect sizes provides future researchers with the data required to include these findings in future meta-analyses without needing to contact the author, which was noted in Study 1 as a serious flaw in the reporting of many

studies in this field. Importantly, it allows for the direct comparison of the results of Study 1 and Study 2 in the discussion (Chapter 9, Section 9.3).

The data relating to the direct effects of MBSR upon the dependent variables is divided in two ways in this chapter. Means, standard deviations, and effect sizes are reported in Table 7.2 for the data divided into time points – showing the effect between T1 and T2, and between T2 and T3, which is the data most comparable to other longitudinal evaluations and which would be required in future meta-analyses. Within the MLM analysis, as outlined in Chapter 6, Section 6.9.1, time points are combined to form the variables Change1 and Change2, which have different means and standard deviations as they each combine data at two time points, and are two dummy variables used together to represent Time. It is therefore not appropriate to create effect sizes for these variables separately as they both include the data from T2, and do not accurately portray the effects unless they are placed into a model together (where the analysis with one variable controls for the other variable). Consequently, the effect sizes between time points (T1-T2 and T2-T3) are reported within this chapter and when the results are discussed in Chapter 9, Section 9.2 and Table 9.2. To aid the discussion, effect sizes between T1 and T3 are also shown in Chapter 9 in order to indicate overall change from baseline to the end of the study.

7.3 Building a Multi-Level Model

In order to test Hypotheses 1-5, a model was incrementally built to indicate the direction and rate of change, and the impact of covariates. The analysis of the multi-level model's fit to the data was achieved through the comparison of minus twice the log-likelihood (-2LL) at each step of the model build which indicates the difference from the overall fit of the chi-square likelihood ratio – with a smaller value indicating better fit to the data. The model was built in a bottom-up procedure (Singer & Willett, 2003) as described below.

In the first model (Model 1), the outcome variable data for all participants at all time points was included in a model without specifying any predictors, and with random and fixed intercepts. This model is the equivalent of a one-way ANOVA and indicates the between-participants difference in the outcome variable that can therefore be used to ascertain generally whether there is enough difference between-participants – as shown via the ICC value – to use multi-level modelling rather than more standard Repeated Measures ANOVA. An ICC greater than 0.25 suggests the need for a multi-level model (Shek & Ma, 2011). Model 1 is known as the unconditional model.

In the second model (Model 2), the dummy variables representing time (Change1 and Change2) were added to the model. This model looks at the difference between- *and* within-participants for the outcome variable using the whole sample. This is known as the unconditional linear growth curve model. The -2LL value was recorded here and compared to the final model value.

In the final model (Model 3), the Group variable was added to the analyses as a covariate, in order to ascertain the fixed effect of receiving or not receiving the mindfulness intervention. Interaction effects are also introduced at this point to determine whether change over time is different for the intervention and control group participants. The -2LL is reported, and if the value decreases in the final model, this indicates improved fit to the data. The final model is reported using the F values, degrees of freedom, and p values in the same way as a repeated measures ANOVA.

Table 7.2 Means and standard deviations for all outcome variables within groups at all time points, with effect sizes

SCALE	SUBSCALE	Time 1		Time 2		T1-T2 <i>g</i> (95% CI)	Time 3		T2-T3 <i>g</i> (95% CI)						
		Control Mean	Intervention SD	Control Mean	Intervention SD		Control Mean	Intervention SD							
FFMQ	Composite Scale	3.02	0.55	2.70	0.39	3.01	0.53	3.47	0.51	1.48* (0.89, 2.07)	3.35	0.54	3.35	0.48	-0.90* (-1.55, -0.26)
	Observing	3.06	0.69	2.69	0.45	3.02	0.63	3.64	0.70	1.48* (0.89, 2.08)	3.36	0.73	3.26	0.76	-0.94* (-1.59, -0.29)
	Describing	3.22	0.76	2.98	0.70	3.18	0.71	3.69	0.64	1.08* (0.52, 1.64)	3.46	0.78	3.61	0.67	-0.49 (-1.11, 0.14)
	Acting with Awareness	2.84	0.70	2.41	0.53	2.83	0.63	2.99	0.70	0.90* (0.35, 1.46)	3.22	0.62	3.04	0.54	-0.59 (-1.22, 0.04)
	Non-Judging	3.19	0.74	2.90	0.75	3.20	0.77	3.74	0.74	1.08* (0.52, 1.64)	3.63	0.81	3.67	0.71	-0.65* (-1.28, -0.01)
	Non-Reactivity	2.78	0.61	2.54	0.37	2.79	0.51	3.27	0.47	1.44* (0.85, 2.03)	3.07	0.61	3.14	0.46	-0.75* (-1.39, -0.11)
MAI	Composite Scale	3.57	0.73	3.45	0.71	3.56	0.77	4.05	0.80	0.77* (0.23, 1.31)	3.53	0.80	4.10	0.67	0.10 (-0.51, 0.71)
	Anxiety-Comfort	3.43	0.84	3.18	0.86	3.50	0.85	3.94	0.87	0.80* (0.26, 1.33)	3.58	0.86	3.91	0.80	-0.12 (-0.73, 0.49)
	Depression-Enthusiasm	3.70	0.80	3.72	0.82	3.62	0.82	4.17	0.96	0.59* (0.06, 1.12)	3.49	0.84	4.28	0.72	0.31 (-0.30, 0.93)
CD-RISC		61.85	11.33	59.28	10.78	59.58	11.81	69.25	11.09	1.05* (0.50, 1.60)	61.50	10.47	68.73	11.22	-0.22 (-0.83, 0.39)
ERQ	Cognitive Reappraisal	4.44	1.00	4.17	1.00	4.57	0.90	5.17	0.92	0.96* (0.41, 1.50)	4.83	1.20	5.23	0.64	-0.22 (-0.83, 0.40)
	Expressive Suppression	3.51	1.16	3.43	1.46	3.34	1.43	2.86	1.35	0.28 (-0.24, 0.80)	3.42	1.39	3.13	1.26	-0.14 (-0.75, 0.48)

Note. *g* = Hedges' *g*. FFMQ Composite Score only used in mediation models in Chapter 8. Time 1: Intervention *n* = 25 except on MAI when *n* = 24, Control *n* = 33. Time 2: Intervention *n* = 24 except on FFMQ when *n* = 23, Control *n* = 33. Time 3: Intervention *n* = 22 except on FFMQ when *n* = 21, Intervention *n* = 18. *effect size with 95% confidence intervals that do not span zero.

7.4 Mindfulness Results

7.4.1 Observing

Descriptive statistics.

As shown in Appendix D(i) and Appendix D(ii), the data were normally distributed and did not violate any of the assumptions for parametric analysis referred to in Section 7.2 above, therefore the data were analysed without transformation, or limitations to the interpretation. As shown in Figure 7.2 below and in Table 7.2 above, the mean score on the five-point scale increased for the Intervention group from T1 to T2 when the intervention took place, whilst staying relatively static for the control group. There was then a decline during the six-month follow-up for the intervention group, whilst the control group rated their Observing skills more highly during this time-period.

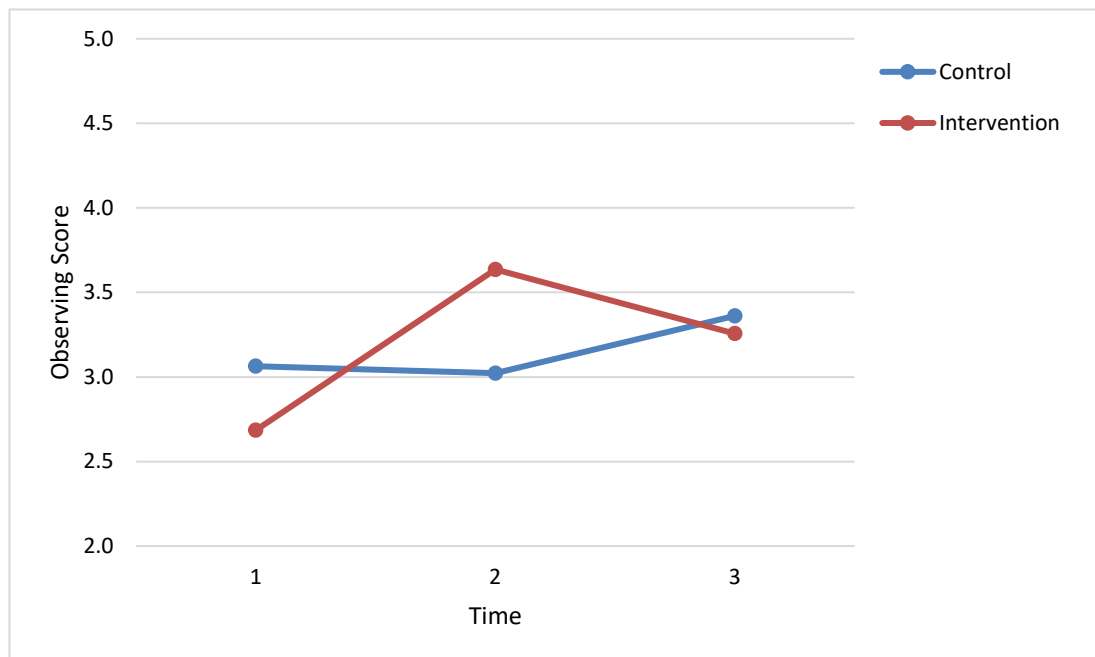


Figure 7.2. Graph of mean scores for each group at each time point for the FFMQ Observing facet.

Multi-level model.

Hypothesis 1a and 1b predicted that participation in a MBSR within the workplace would be related to an increase in mindfulness, when compared to a control group, which would be maintained at follow-up. For the unconditional model (Model 1) with the Observing subscale of the FFMQ entered as the dependent variable, the ICC was 0.48, indicating that approximately 48% of the variance in Observing was due to differences between participants. This high value confirmed the need for multi-level modelling.

In the unconditional linear growth model (Model 2), the time variables Change1 and Change2 were added to the model as fixed effects and the -2LL value for this model was 278.01 with five parameters, which will be compared with the final model.

In Model 3, the full model, Group was entered as a fixed-effect covariate, with two interactions - the interaction between group and change between T1 and T2, (Change1*Group) and between group and change between T2 and T3 (Change2*Group). The -2LL value decreased to 236.42 with eight parameters – a difference of 41.59 and three parameters, showing an improved fit of the chi-square likelihood ratio that is highly significant ($p < 0.001$).

In the full model, the fixed effect of time between T1 and T2 did not significantly predict Observing (Change1: $F_{1, 93.13} = 0.01$, $p = 0.93$), however, time between T2 and T3 did significantly predict Observing (Change2: $F_{1, 98.59} = 4.57$, $p = 0.04$). The fixed effect of Group was also a significant predictor ($F_{1, 90.97} = 5.91$, $p = 0.02$). For the interaction fixed effects, Group was found to be a highly significant predictor of self-reported Observing skills between T1 and T2 (Change1*Group: $F_{1, 93.70} = 51.52$, $p < 0.001$), and between T2 and T3 (Change2*Group: $F_{1, 96.55} = 14.90$, $p < 0.001$). Specifically, the mean score on the Observing subscale of the FFMQ after the intervention was higher for those in the intervention group ($M = 3.46$, $SD = 0.75$) than for those in the control group ($M = 3.14$, $SD = 0.68$), and at follow-up this decreases for the intervention group ($M = 3.26$, $SD = 0.76$) but increases for the control group ($M = 3.36$, $SD = 0.73$).

The magnitude of the interaction effects can be assessed by inspecting the beta weights: between T1 and T2, the estimated increase over time was one whole point on a five-point Likert scale on the FFMQ for the intervention group ($\beta = 1.00$, $SE = 0.14$, $p < 0.001$, 95% CI [0.10, 0.17]); but between T2 and T3 there was an estimated decrease of 0.6 of a point ($\beta = -.62$, $SE = 0.16$, $p = < 0.001$, 95% CI [0.19, 0.44]). Group was found to account for approximately 7% of variance within-participants.

7.4.2 Describing

Descriptive statistics.

As shown in Appendix D(i) and Appendix D(ii), the data were normally distributed and did not violate any of the assumptions for parametric analysis, therefore the data were analysed without transformation, or limitations to the interpretation. As shown in Figure 7.3 below and in Table 7.2 above, the intervention group showed an improvement in Describing relative to the control group between T1 and T2. There

was then both a slight decrease in the mean score for the intervention group and an increase for the control group during the six-month follow-up.

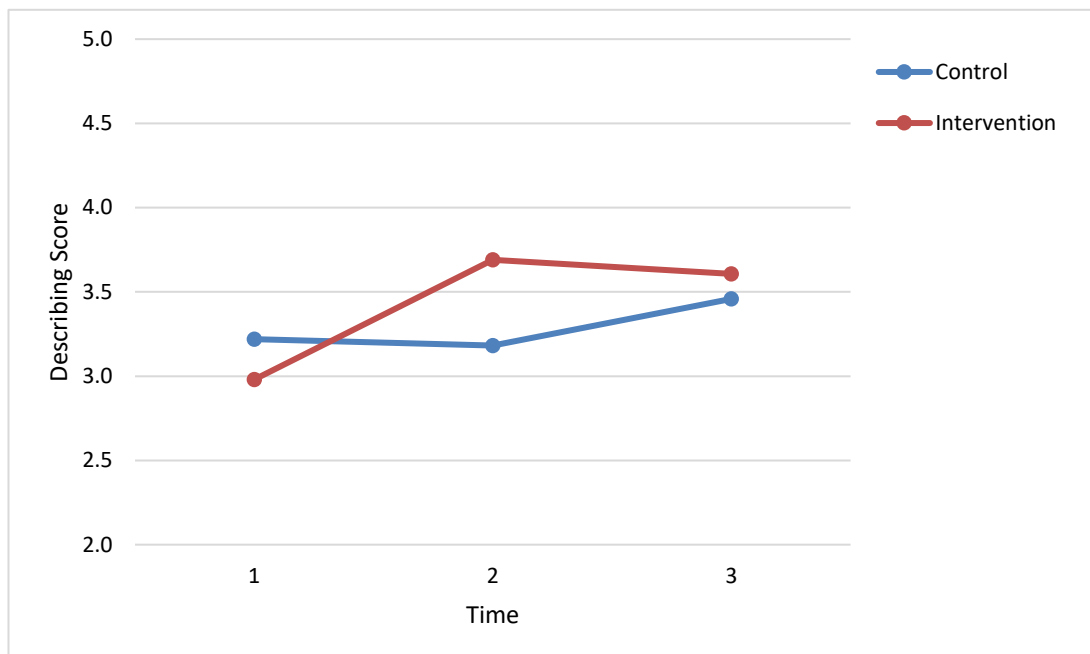


Figure 7.3. Graph of mean scores for each group at each time point for the FFMQ Describing facet.

Multi-level model.

In further testing of hypotheses 1a and 1b, for the unconditional model (Model 1) with the Describing subscale of the FFMQ entered as the dependent variable, the ICC was 0.65, indicating that approximately 65% of the variance in Describing was due to differences between participants which should be explored further.

For the unconditional linear growth model (Model 2), the -2LL value was 266.92 with five parameters. In Model 3, including the interaction between group and change between T1 and T2, and between group and change between T2 and T3, the -2LL value decreased to 246.98 with eight parameters – a difference of 19.95 and three parameters, showing an improved fit of the chi-square likelihood ratio that is highly significant ($p < 0.001$).

In the full model, the fixed effect of time between T1 and T2 did not significantly predict Describing (Change1: $F_{1, 92.37} = 0.26$, $p = 0.61$), or between T2 and T3 (Change2: $F_{1, 96.81} = 0.50$, $p = 0.48$). Group was also not a significant predictor ($F_{1, 84.64} = 1.53$, $p = 0.22$). For the interactions, Group was found to be a highly significant predictor of change between T1 and T2 (Change1*Group: $F_{1, 92.86} = 19.60$, $p < 0.001$), but not between T2 and T3 (Change2*Group: $F_{1, 95.16} = 0.56$, $p = 0.46$). Specifically, the mean score on the Describing subscale of the FFMQ after the intervention was higher for

those in the intervention group ($M = 3.65$, $SD = 0.65$) than for those in the control group ($M = 3.28$, $SD = 0.74$), and at follow-up this is maintained for the intervention group ($M = 3.61$, $SD = 0.68$) but increases slightly for the control group ($M = 3.46$, $SD = 0.78$).

Inspecting the beta weights, the estimated increase over time was 0.6 on a five-point Likert scale on the FFMQ for the intervention group ($\beta = 0.61$, $SE = 0.14$, $p < 0.001$, 95% CI [0.34, 0.89]); but between T2 and T3 there was a slight estimated decrease ($\beta = -.12$, $SE = 0.16$, $p = 0.46$, 95% CI [-0.43, 0.20]). Group was found to account for approximately 3% of variance within-participants.

7.4.3 Acting with awareness

Descriptive statistics.

As shown in Appendix D(i) and Appendix D(ii), the data were normally distributed and did not violate any of the assumptions for parametric analysis. As shown in Figure 7.4 below and in Table 7.2 above, the mean scores for both groups are somewhat lower on this facet than on most of the five facets. The mean score on the five-point scale increased for the Intervention group from T1 to T2 when the intervention took place, whilst staying relatively static for the control group. This increase was maintained during the six-month follow-up for the intervention group, whilst the control group rated their Observing skills more highly than the intervention group during this time-period.

Multi-level model.

Hypothesis 1a and 1b predicted that participation in a Mindfulness Based Intervention within the workplace would be related to an increase in mindfulness, when compared to a control group, and would be maintained at follow-up. For the unconditional model (Model 1) with the Acting with awareness dependent variable, the ICC was 0.54; approximately 54% of the variance was due to differences between participants.

For Model 2, the -2LL value was 253.89 with five parameters. In Model 3, the -2LL value decreased to 237.69 with eight parameters – a difference of 16.2 and three additional parameters, showing an improved fit of the chi-square likelihood ratio that is very significant ($p < 0.005$).

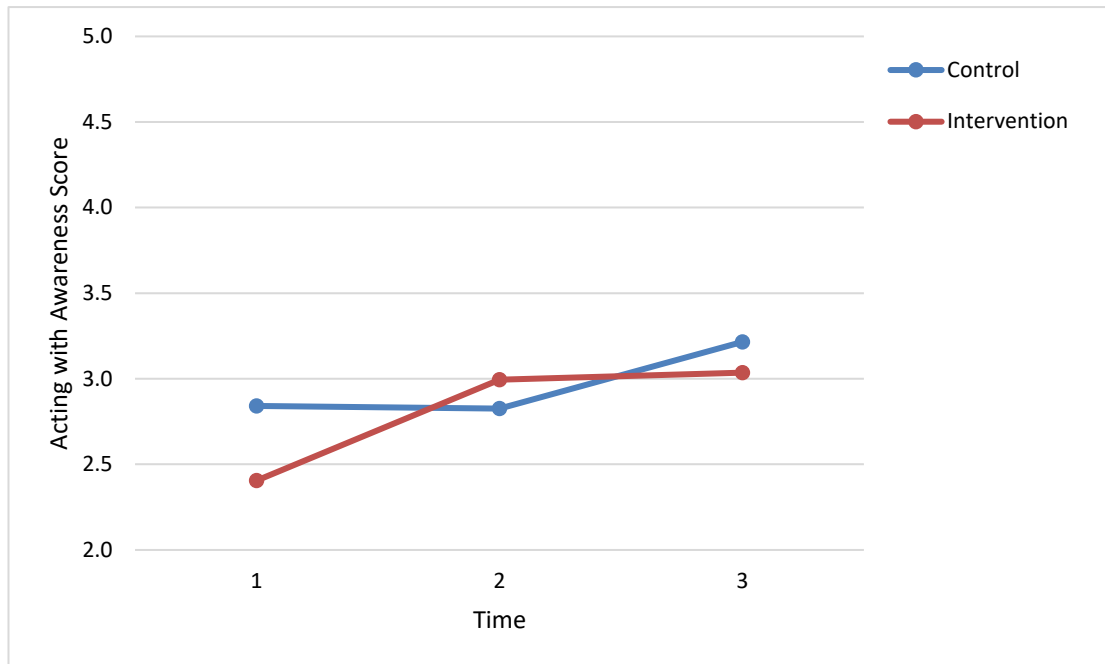


Figure 7.4. Graph of mean scores for each group at each time point for the FFMQ Acting with awareness facet.

In the full model, between T1 and T2, time did not significantly predict Acting with awareness (Change1: $F_{1, 91.23} = 0.20$, $p = 0.66$), but did between T2 and T3 (Change2: $F_{1, 97.48} = 4.17$, $p = 0.04$). Group was a significant predictor of Acting with awareness ($F_{1, 92.79} = 7.28$, $p = 0.01$). For the interaction fixed effects, Group was found to be a highly significant predictor of change between T1 and T2 (Change1*Group: $F_{1, 91.86} = 16.22$, $p < 0.001$), but not between T2 and T3 (Change2*Group: $F_{1, 95.14} = 2.15$, $p = 0.15$). Specifically, the mean score on the Acting with awareness subscale of the FFMQ after the intervention was higher for those in the intervention group ($M = 3.01$, $SD = 0.63$) than for those in the control group ($M = 2.96$, $SD = 0.65$), and at follow-up this changes very little for the intervention group ($M = 3.04$, $SD = 0.54$) or the control group ($M = 3.22$, $SD = 0.62$).

Inspecting the beta weights, the estimated increase over time was 0.6 on a five-point Likert scale on the FFMQ for the intervention group ($\beta = 0.58$, $SE = 0.14$, $p < 0.001$, 95% CI [0.29, 0.86]); but between T2 and T3 there was a slight estimated decrease ($\beta = -.24$, $SE = 0.17$, $p = 0.15$, 95% CI [-0.57, 0.09]). Group was found to account for approximately 2% of variance within-participants.

7.4.4 Non-judging of inner experience

Descriptive statistics.

As shown in Appendix D(i) and Appendix D(ii), the data were normally distributed and did not violate any of the assumptions for parametric analysis referred to in Section

7.2 above, therefore the data were analysed without transformation, or limitations to the interpretation. As shown in Figure 7.5 below and in Table 7.2 above, the mean score on the five-point scale remained static for the control group, but increased for the intervention group from T1 to T2 during the intervention. There was then a slight decline during the six-month follow-up for the intervention group, whilst the control group rated their Non-judging skills more highly during this time-period, to the degree that both groups showed similar mean levels of Non-judging of inner experience at follow-up.

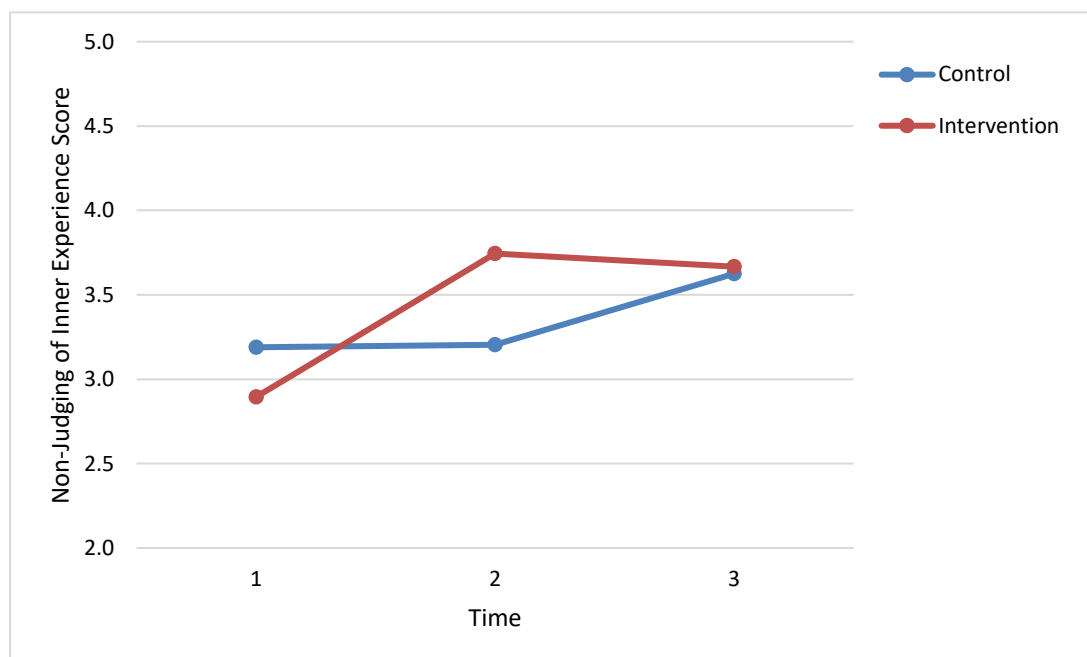


Figure 7.5. Graph of mean scores for each group at each time point for the FFMQ Non-Judging of Inner Experience facet.

Multi-level model.

Continuing with the analysis of Hypothesis 1a and 1b, in Model 1 with the Non-judging of Inner Experience dependent variable, the ICC indicated that approximately 48% of the variance in non-judging was due to differences between participants.

For Model 2, the -2LL value was 315.75 with five parameters. In Model 3, the -2LL value decreased to 297.38 with eight parameters – a difference of 18.37 and three additional parameters, showing an improved fit of the chi-square likelihood ratio that is highly significant ($p < 0.001$).

In the full model, between T1 and T2, time did not significantly predict Non-judging of inner experience (Change1: $F_{1, 92.77} = 0.16$, $p = 0.69$), or between T2 and T3 (Change2: $F_{1, 100.11} = 3.55$, $p = 0.06$). Group was not a significant predictor of Non-judging of inner experience ($F_{1, 100.33} = 2.17$, $p = 0.14$). For the interaction fixed effects,

Group was found to be a highly significant predictor of scores between T1 and T2 (Change1*Group: $F_{1, 93.47} = 19.75, p < 0.001$), but not between T2 and T3 (Change2*Group: $F_{1, 97.35} = 3.64, p = 0.06$). Specifically, the mean score on the Non-judging of inner experience subscale of the FFMQ after the intervention was higher for those in the intervention group ($M = 3.71, SD = 0.72$) than for those in the control group ($M = 3.35, SD = 0.80$), and at follow-up this changes very little for the intervention group ($M = 3.67, SD = 0.71$) and increases slightly for the control group ($M = 3.63, SD = 0.81$).

Inspecting the beta weights, the estimated increase over time was 0.8 on a five-point Likert scale on the FFMQ for the intervention group ($\beta = 0.80, SE = 0.18, p < 0.001, 95\% CI [0.44, 1.16]$); but between T2 and T3 there was an estimated decrease ($\beta = -.40, SE = 0.21, p = 0.06, 95\% CI [-0.81, 0.02]$). Group was found to account for approximately 5% of variance within-participants.

7.4.5 Non-reactivity to inner experience

Descriptive statistics.

As shown in Appendix D(i) and Appendix D(ii), the data were normally distributed and did not violate any of the assumptions for parametric analysis referred to in Section 7.2 above, therefore the data were analysed without transformation, or limitations to the interpretation. As shown in Figure 7.6 below and in Table 7.2 above, the results form a similar pattern to the non-judging facet results shown in the section above, although with lower means on the five-point scale. The intervention group increased their ratings of their Non-reactivity to inner experience relative to the control group after the mindfulness training, and maintain this at follow-up, whilst the control group show an increase in non-reactivity during the follow-up period which makes the two groups almost equal.

Multi-level model.

Hypothesis 1a and 1b predicted that participation in a Mindfulness Based Intervention within the workplace would be related to an increase in mindfulness, when compared to a control group, which is maintained at follow-up. For the unconditional model (Model 1), the ICC indicated that approximately 37% of the variance in Non-reactivity to inner experience was due to differences between participants.

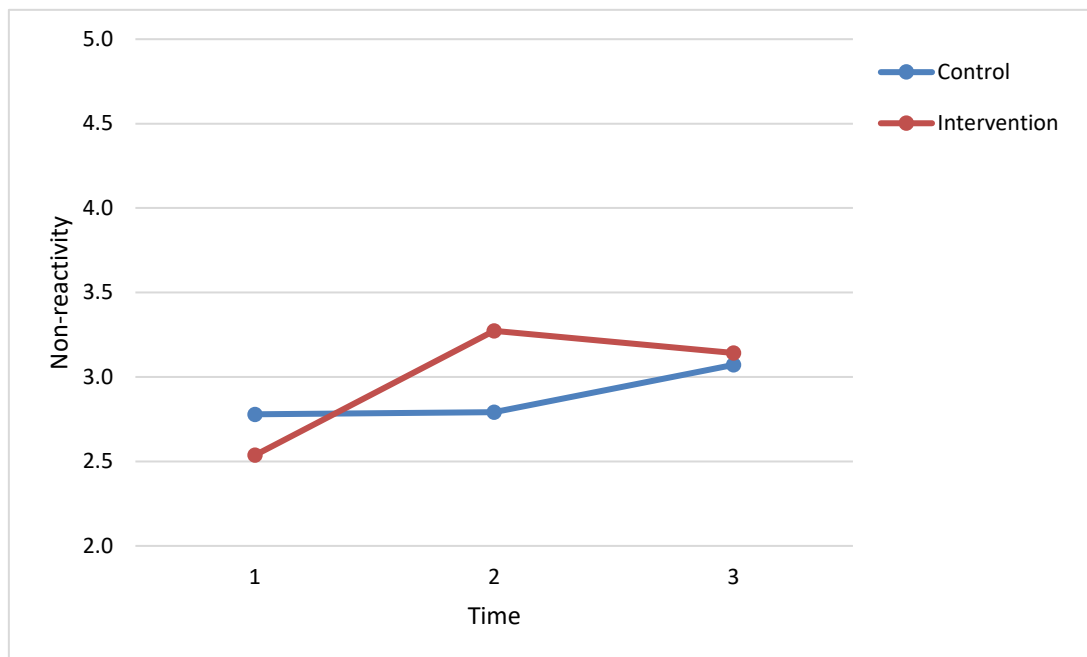


Figure 7.6. Graph of mean scores for each group at each time point for the FFMQ Non-reactivity to Inner Experience facet.

For Model 2, the -2LL value was 218.008 with five parameters. In Model 3, the -2LL value decreased to 192.26 with eight parameters – a difference of 25.74 and three additional parameters, showing an improved fit of the chi-square likelihood ratio that is highly significant ($p < 0.001$).

In the full model, between T1 and T2, time did not significantly predict Non-reactivity to inner experience (Change1: $F_{1, 93.24} = 0.13$, $p = 0.72$), or between T2 and T3 (Change2: $F_{1, 102.26} = 2.92$, $p = 0.09$). Group was also not a significant predictor of Non-reactivity to inner experience ($F_{1, 109.32} = 3.54$, $p = 0.06$). For the interaction fixed effects, Group was found to be a highly significant predictor of change between T1 and T2 (Change1*Group: $F_{1, 94.03} = 28.62$, $p < 0.001$), and between T2 and T3 (Change2*Group: $F_{1, 98.85} = 5.70$, $p = 0.02$). Specifically, the mean score on the Non-reactivity to inner experience subscale of the FFMQ after the intervention was higher for those in the intervention group ($M = 3.21$, $SD = 0.47$) than for those in the control group ($M = 2.89$, $SD = 0.56$), and at follow-up this changes very little for the intervention group ($M = 3.14$, $SD = 0.46$) and increases for the control group ($M = 3.07$, $SD = 0.61$).

The beta weights show that the estimated increase over time was 0.7 on a five-point Likert scale on the FFMQ for the intervention group ($\beta = 0.72$, $SE = 0.13$, $p < 0.001$,

95% CI [0.45, 0.98]); but between T2 and T3 there was an estimated decrease ($\beta = -.37$, SE = 0.15, $p = 0.02$, 95% CI [-0.67, -0.06]). Group was found to account for approximately 4% of variance within- participants.

To summarise, the effects upon the five facets of mindfulness all supported Hypothesis 1a, as mindfulness skills increased between T1 and T2 for the participants who received training compared to the control group. When considering Hypothesis 1b, there was support from the Describing and Acting with awareness facets, where the benefits shown between T1 and T2 were maintained at follow-up, however the other three facets did not support this hypothesis, with statistically significant reductions in effect between T2 and T3 meaning that Hypothesis 1b which predicts a maintenance of effects at follow-up is not supported. This lack of support at follow-up is largely influenced by the increase in reported mindfulness by the control group during the follow-up period, which will be discussed in Chapter 9, Section 9.2.

7.5 Workplace Well-being

7.5.1 Combined scale

Descriptive statistics.

As shown in Appendix D(i) and Appendix D(ii), the data for the combined workplace well-being scale were normally distributed and did not violate any of the assumptions for parametric analysis referred to in Section 7.2 above, therefore the data were analysed without transformation, or limitations to the interpretation. As shown in Figure 7.7 below and in Table 7.2 above, the mean score on the five-point scale increased for the Intervention group from T1 to T2 when the intervention took place, whilst staying relatively static for the control group. The T2 mean scores then remained relatively stable throughout the follow-up period.

Multi-level model.

Hypotheses 2a and 2b predicted that participation in a Mindfulness Based Intervention within the workplace would be related to an increase in work-related well-being, when compared to a control group, which would be maintained at follow-up. For the unconditional model (Model 1) with composite mean score on the MAI as the dependent variable, the ICC indicated that approximately 52% of the variance in well-being was due to differences between participants.

For Model 2, the -2LL value was 314.55 with five parameters. In Model 3, the -2LL value decreased to 299.04 with eight parameters – a difference of 15.511 and three additional parameters, showing a significantly improved fit of the chi-square likelihood ratio ($p < 0.005$).

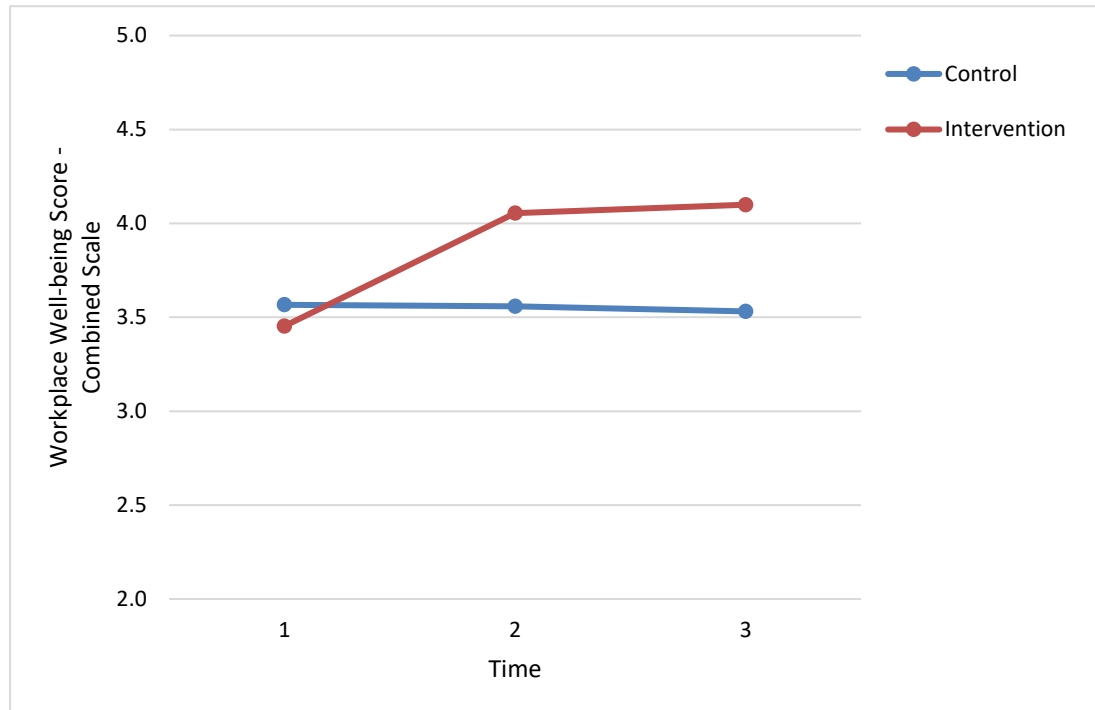


Figure 7.7. Graph of mean scores for each group at each time point for the MAI workplace well-being scale, including all 16 items.

In the full model, between T1 and T2, time did not significantly predict Acting with awareness (Change1: $F_{1, 95.07} = 0.01$, $p = 0.94$), or between T2 and T3 (Change2: $F_{1, 103.26} = 0.24$, $p = 0.62$). Group was also not a significant predictor of Acting with awareness ($F_{1, 108.30} = 0.28$, $p = 0.60$). For the interaction fixed effects, Group was found to be a highly significant predictor of change between T1 and T2 (Change1*Group: $F_{1, 95.41} = 9.55$, $p = 0.003$), but not between T2 and T3 (Change2*Group: $F_{1, 100.17} = 0.18$, $p = 0.67$). In particular, the mean score on the MAI after the intervention was higher for those in the intervention group ($M = 4.08$, $SD = 0.73$) than for those in the control group ($M = 3.55$, $SD = 0.77$), and at follow-up this changes very little for either the intervention group ($M = 4.10$, $SD = 0.67$) or the control group ($M = 3.53$, $SD = 0.80$).

The beta weights show that the estimated increase over time was 0.6 on a seven-point Likert scale on the MAI for the intervention group ($\beta = 0.57$, $SE = 0.19$, $p = 0.003$, 95% CI [0.20, 0.94]); and between T2 and T3 there was an estimated slight increase ($\beta = 0.09$, $SE = 0.21$, $p = 0.67$, 95% CI [-0.33, 0.50]). Group was found to account for approximately 3% of variance within-participants.

7.5.2 Anxiety-Comfort diagonal axis

Descriptive statistics.

As shown in Appendix D(i) and Appendix D(ii), the data for the Anxiety-Comfort axis of the workplace well-being scale were normally distributed and did not violate any of the assumptions for parametric analysis referred to in Section 7.2 above. As shown in Figure 7.8 below and in Table 7.2 above, the results are similar to those for the combined scale report in the section above; the Intervention group showed an increase in mean scores from T1 to T2, whilst staying relatively static for the control group. The T2 mean scores then remained relatively stable throughout the follow-up period, with a slight decline for the intervention group, and a slight incline for the control group.

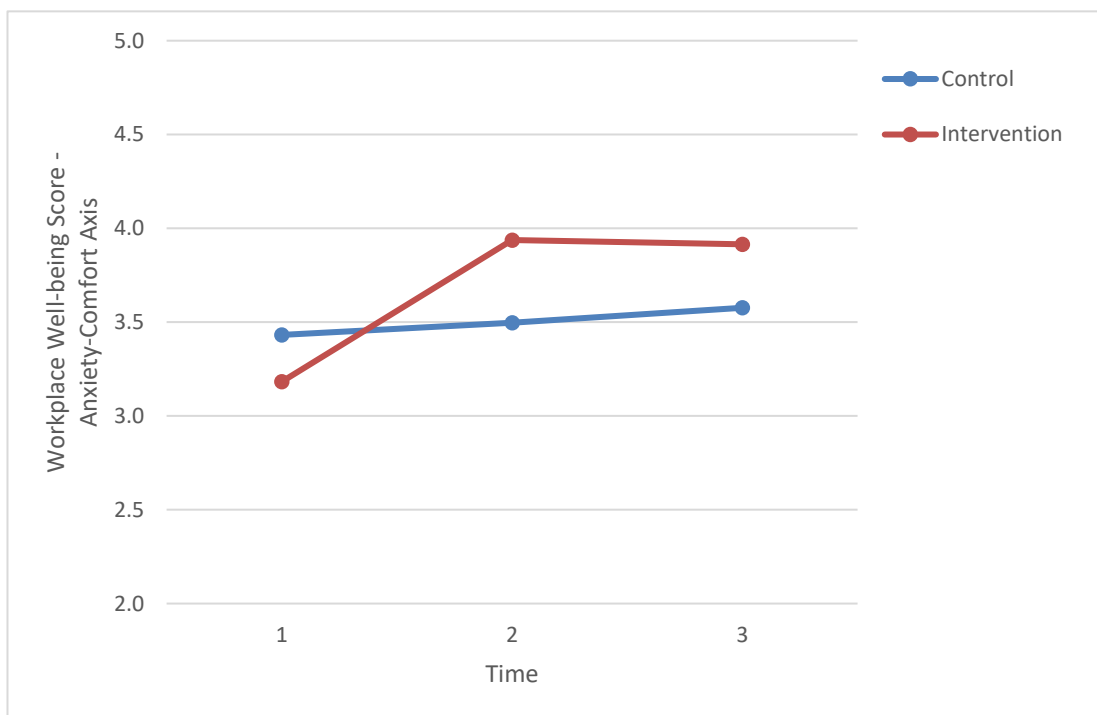


Figure 7.8. Graph of mean scores for each group at each time point for the MAI workplace well-being scale Anxiety-Comfort axis.

Multi-level model.

In further analysis of Hypothesis 2a and 2b, the unconditional model (Model 1) with the diagonal axis from Anxiety (high activation, negative affect) to Comfort (low activation, positive affect) within the MAI as the dependent variable, the ICC indicated that approximately 52% of the variance in well-being was due to differences between participants.

For Model 2, the -2LL value was 345.42 with five parameters. In Model 3, the -2LL value decreased to 333.41 with eight parameters – a difference of 12.01 and three additional parameters, showing significantly improved fit of the chi-square likelihood ratio ($p < 0.01$).

In the full model, between T1 and T2, time did not significantly predict well-being on the anxiety-comfort axis (Change1: $F_{1, 94.97} = 0.41$, $p = 0.52$), or between T2 and T3 (Change2: $F_{1, 102.59} = 0.001$, $p = 0.97$). Group was also not a significant predictor ($F_{1, 105.19} = 1.24$, $p = 0.27$). For the interaction fixed effects, Group was found to be a highly significant predictor of well-being on this axis between T1 and T2 (Change1*Group: $F_{1, 95.29} = 10.07$, $p = 0.002$), but not between T2 and T3 (Change2*Group: $F_{1, 99.72} = 0.02$, $p = 0.89$). Specifically, the mean score on the MAI after the intervention was higher for those in the intervention group ($M = 3.93$, $SD = 0.83$) than for those in the control group ($M = 3.53$, $SD = 0.84$), and at follow-up this changes very little for either the intervention group ($M = 3.92$, $SD = 0.80$) or the control group ($M = 3.58$, $SD = 0.86$).

The beta weights show that the estimated increase over time was 0.6 on a seven-point Likert scale on the MAI for the intervention group ($\beta = 0.65$, $SE = 0.20$, $p = 0.002$, 95% CI [0.24, 1.05]); and between T2 and T3 there was an estimated slight decrease ($\beta = -0.03$, $SE = 0.23$, $p = 0.89$, 95% CI [-0.49, 0.42]). Group was found to account for approximately 3% of variance within-participants.

7.5.3 Depression-Enthusiasm diagonal axis

Descriptive statistics.

As shown in Appendix D(i) and Appendix D(ii), the data for the Depression-Enthusiasm workplace well-being scale showed a negative skew (skew = -0.42, $SE = 0.20$, $z = -2.14$). This skew is slightly beyond the accepted z score range of +/- 1.96. Kurtosis was within normal range (kurtosis = -0.111, $SD = 0.39$, $z = -0.29$). As the complete data set for the well-being scale and the opposing Anxiety-Comfort axis are both normally distributed, the data were analysed without transformation, or limitations to the interpretation. As shown in Figure 7.9 below and in Table 7.2 above, the mean score on the five-point scale increased for the Intervention group during the intervention, whilst declining slightly for the control group. At follow-up, the intervention group continued to improve, whilst the control group continued to decline.

Multi-level model.

Hypothesis 2a and 2b predicted that participation in a Mindfulness Based Intervention within the workplace would be related to an increase in work-related well-being, when compared to a control group, with a maintenance of this effect at follow-up. For the unconditional model (Model 1) with the diagonal axis from Depression (low activation, negative affect) to Enthusiasm (high activation, positive affect) within the MAI as the dependent variable, the ICC indicated that approximately 53% of the variance was due to between-participant differences.

For Model 2, the -2LL value was 352.91 with five parameters. In Model 3, the -2LL value decreased to 338.67 with eight parameters – a difference of 14.24 and three additional parameters, showing significantly improved fit of the chi-square likelihood ratio ($p < 0.005$).

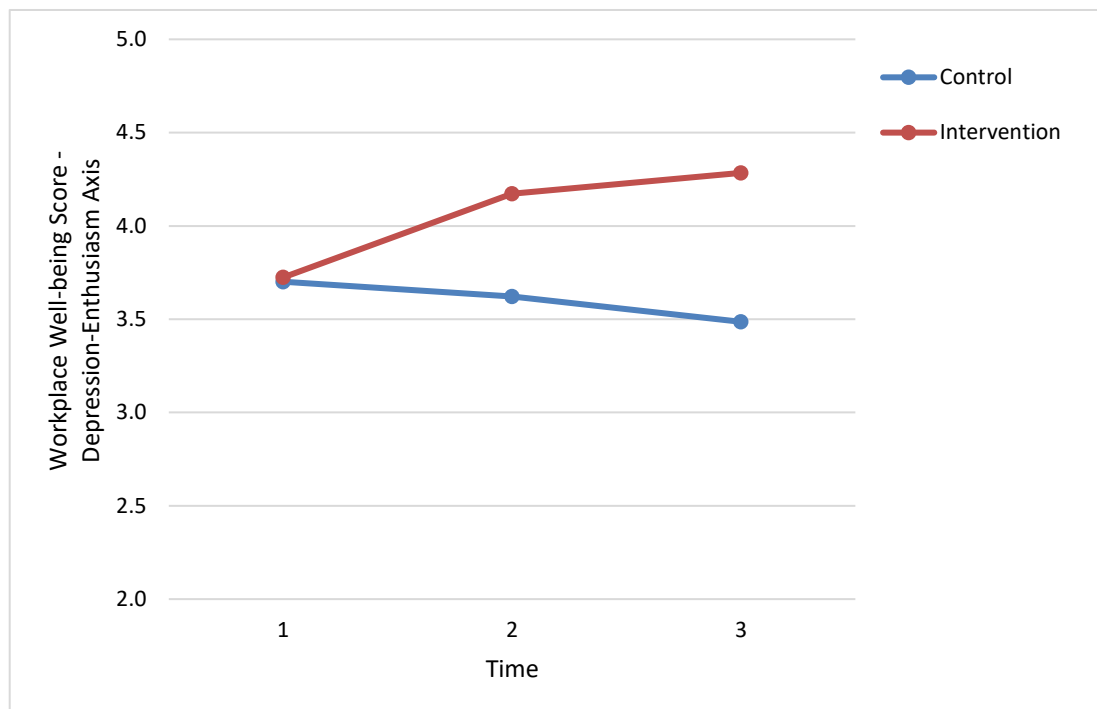


Figure 7.9. Graph of mean scores for each group at each time point for the MAI workplace well-being scale Depression-Enthusiasm axis.

In the full model, between T1 and T2, time did not significantly predict well-being on the depression-enthusiasm axis (Change1: $F_{1, 94.31} = 0.23$, $p = 0.63$), or between T2 and T3 (Change2: $F_{1, 103.37} = 0.81$, $p = 0.37$). Group was also not a significant predictor ($F_{1, 111.808} = 0.03$, $p = 0.86$). For the interaction fixed effects, Group was found to be a significant predictor of self-ratings between T1 and T2 (Change1*Group: $F_{1, 94.69} = 5.36$, $p = 0.02$), but not between T2 and T3 (Change2*Group: $F_{1, 99.94} = 0.78$, $p = 0.38$). Specifically, the mean score on the MAI after the intervention was higher for those in

the intervention group ($M = 4.23$, $SD = 0.85$) than for those in the control group ($M = 3.57$, $SD = 0.82$), and at follow-up this changes very little for either the intervention group ($M = 4.28$, $SD = 0.72$) or the control group ($M = 3.49$, $SD = 0.84$).

The beta weights show that the estimated increase over time was 0.5 on a seven-point Likert scale on the MAI for the intervention group ($\beta = 0.50$, $SE = 0.21$, $p = 0.02$, 95% CI [0.07, 0.92]); and between T2 and T3 there was an estimated slight increase ($\beta = 0.21$, $SE = 0.24$, $p = 0.38$, 95% CI [-0.27, 0.70]). Group was found to account for approximately 3% of variance within-participants.

To summarise, the effects upon well-being reported on all three scales supported Hypothesis 2a and 2b, as well-being increased on all scales between T1 and T2 for the participants who received training compared to the control group, and these effects were maintained during the follow-up period.

7.6 Resilience

Descriptive statistics.

As shown in Appendix D(i) and Appendix D(ii), the data were normally distributed and did not violate any of the assumptions for parametric analysis, therefore the data were analysed following standard procedures. As shown in Figure 7.10 below and in Table 7.2 above, the mean resilience scores are similar for the two groups at T1, which is followed by an almost 10-point increase (on a 100-point scale) for the intervention group after the mindfulness intervention, whilst the control group decline in reported resilience. At the follow-up, the intervention group have largely maintained this increase, and the control group also reports a slight increase in resilience, which gives a mean score which is only very slightly lower than the baseline level for the group.

Multi-level model.

Hypothesis 3a and 3b predicted that participation in a Mindfulness Based Intervention within the workplace would be related to an increase in psychological resilience, when compared to a control group, which would be maintained at follow-up. For the unconditional model (Model 1), where resilience was entered as the dependent variable, the ICC was 0.59, indicating that approximately 59% of the variance in resilience was due to differences between participants. This high value confirmed the need for multi-level modelling.

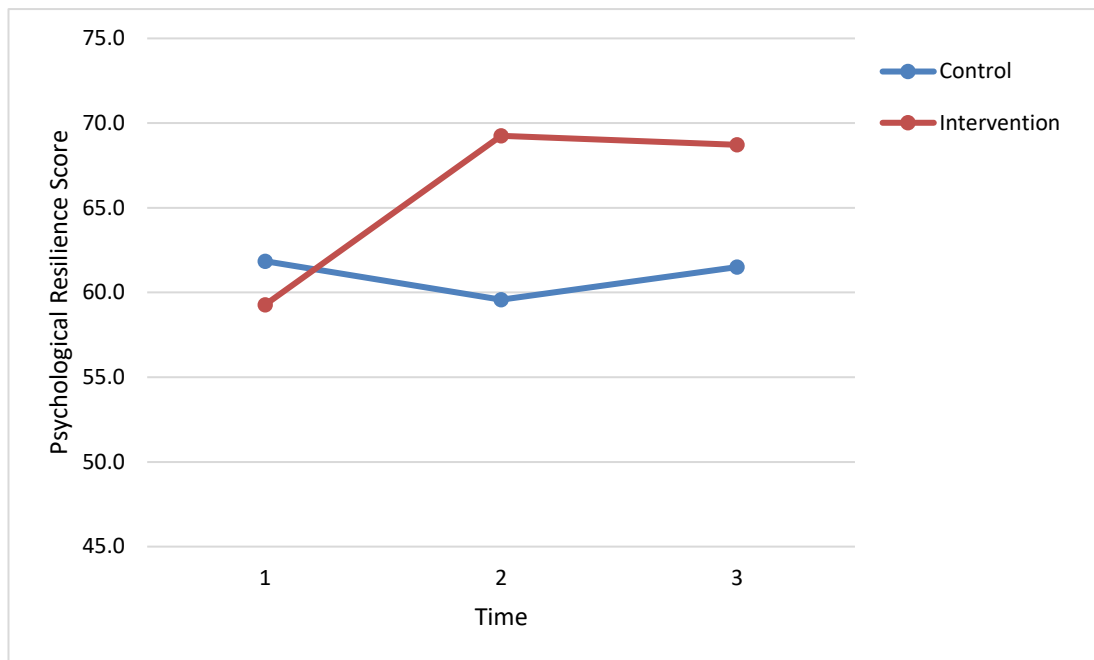


Figure 7.10. Graph of mean scores for each group at each time point for the CD-RISC psychological resilience scale.

The -2LL value for the second model was 1150.28 with five parameters, which will be compared with the final model to check if the fit to the data is improved.

In Model 3, the full model, Group was entered as a fixed-effect covariate, with two interactions. The -2LL value decreased to 1124.82 with eight parameters – a difference of 25.46 and three parameters, showing significantly improved fit of the chi-square likelihood ratio ($p < 0.001$).

In the full model, the fixed effect of time between T1 and T2 did not significantly predict resilience (Change1: $F_{1,94.50} = 1.13$, $p = 0.29$), time between T2 and T3 also did not significantly predict resilience (Change2: $F_{1,100.60} = 0.16$, $p = 0.69$). The fixed effect of Group was also a non-significant predictor of resilience ($F_{1,93.65} = 0.72$, $p = 0.40$). For the interaction fixed effects, Group was found to be a highly significant predictor of change between T1 and T2 (Change1*Group: $F_{1,94.51} = 22.95$, $p < 0.001$), but not between T2 and T3 (Change2*Group: $F_{1,98.32} = 0.46$, $p = 0.50$). Specifically, the mean score on the CD-RISC after the intervention was higher for those in the intervention group ($M = 69.00$, $SD = 11.03$) than for those in the control group ($M = 60.26$, $SD = 11.03$), and at follow-up there is only a small change in the mean scores for both the intervention group ($M = 68.73$, $SD = 11.22$) and the control group ($M = 61.50$, $SD = 10.47$).

The magnitude of the interaction effects can be assessed by inspecting the beta weights: between T1 and T2, the estimated increase over time was almost 12 points on the CD-RISC for the intervention group ($\beta = 11.72$, $SE = 2.45$, $p < 0.001$, 95% CI [6.86, 16.58]); but between T2 and T3 there was an estimated slight decrease of almost two points on the 100-point scale of the CD-RISC ($\beta = -1.89$, $SE = 8.81$, $p = 0.50$, 95% CI [-7.46, 3.68]). Group was found to account for approximately 10% of variance within-participants.

To summarise, the effect upon resilience supports Hypothesis 3a and 3b, as resilience increased between T1 and T2 for the intervention group, whilst the control group changed very little, and these effects were maintained during the follow-up period.

7.7 Emotion Regulation

7.7.1 Cognitive reappraisal

Descriptive statistics.

The data for the cognitive reappraisal subscale of the ERQ showed negative skew and kurtosis (skew = -0.68, $SD = 0.20$, $z = -3.48$; kurtosis = 0.94, $SD = 0.39$, $z = 2.44$), as shown in Appendix D(i) and Appendix D(ii). This is due to several very low scores on the cognitive reappraisal scale, and consequently, the results should be interpreted with consideration to this abnormal distribution. As shown in Figure 7.11 below and Table 7.2 above, at T1, the two group means are similar, followed by a one-point increase at T2 for the intervention group, and a much smaller increase for the control group. At follow-up, the intervention group maintained this increase whilst the control group mean increased by almost half a point.

Multi-level model.

A two-level model was used to analyse the change over time of cognitive reappraisal in the intervention group compared to the control group. Hypothesis 4a and 4b predicted that participation in a Mindfulness Based Intervention within the workplace would be related to an increase in the regulation of emotion using cognitive reappraisal techniques, when compared to a control group. For the unconditional model (Model 1), with cognitive reappraisal as the dependent variable, the ICC was 0.30, indicating 30% of the variance in this type of emotion regulation was due to differences between participants.

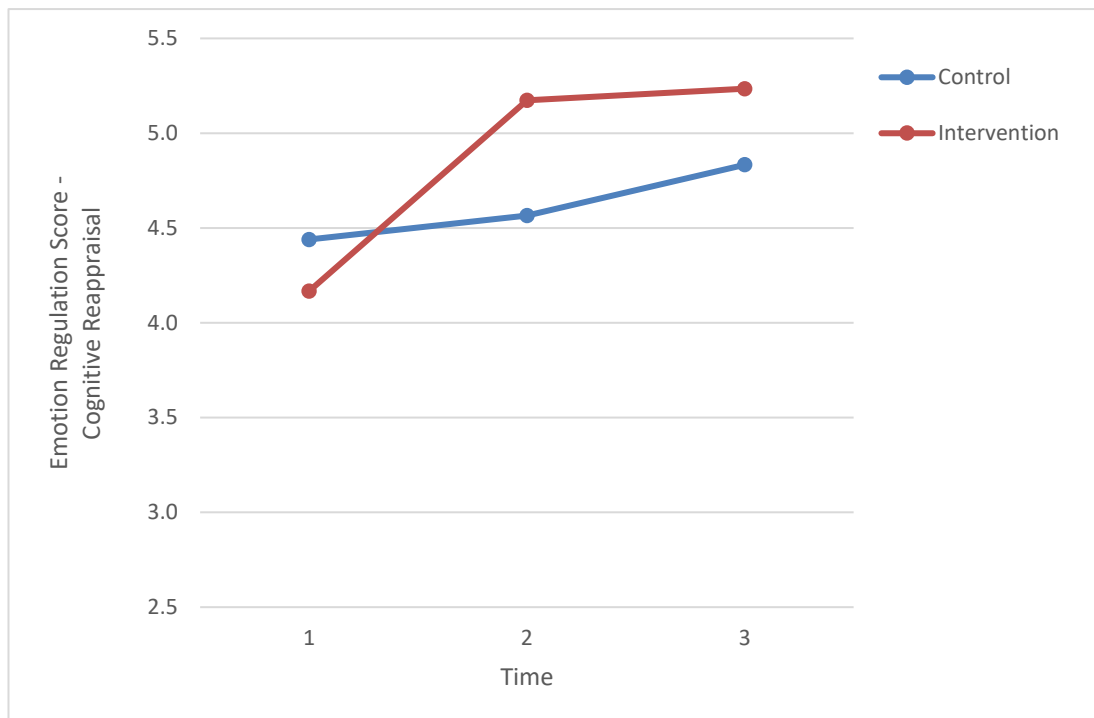


Figure 7.11. Graph of mean scores for each group at each time point for the ERQ cognitive reappraisal subscale.

In the unconditional linear growth model (Model 2), the dummy variables for time were added, giving a -2LL value of 413.65 with five parameters. In Model 3, Group was entered as a fixed-effect covariate, with two interactions. The -2LL value decreased to 400.85 with eight parameters – a difference of 12.79 and three parameters, showing significantly improved fit of the chi-square likelihood ratio ($p < 0.01$).

In the full model, the fixed effect of time between T1 and T2 did not significantly predict cognitive reappraisal (Change1: $F_{1,93.24} = 0.74$, $p = 0.40$), or between T2 and T3 (Change2: $F_{1,105.98} = 0.06$, $p = 0.80$). The fixed effect of Group was also not found to be a predictor ($F_{1,124.66} = 1.23$, $p = 0.27$). For the interaction fixed effects, Group was found to be a highly significant predictor of change between T1 and T2 (Change1*Group: $F_{1,93.25} = 9.66$, $p = 0.002$), but not between T2 and T3 (Change2*Group: $F_{1,101.09} = 0.002$, $p = 0.97$). Specifically, the mean score on the ERQ subscale after the intervention was higher for those in the intervention group ($M = 5.20$, $SD = 0.79$) than for those in the control group ($M = 4.66$, $SD = 1.01$), and at follow-up there was very little change in the mean scores for both the intervention group ($M = 5.24$, $SD = 0.64$) and the control group ($M = 4.83$, $SD = 1.20$).

Considering the beta weights, between T1 and T2, the estimated increase was 0.9 on the seven-point ERQ scale for the intervention group ($\beta = 0.86$, $SE = 0.28$, $p = 0.002$, 95% CI [0.31, 1.41]); but between T2 and T3 there was hardly any change (β

= -0.01, SE = 0.31, $p = 0.97$, 95% CI [-0.64, 0.61]). Group was found to account for approximately 7% of variance within-participants.

To summarise, the effect of MBSR upon emotion regulation in the form of cognitive reappraisal supported Hypotheses 4a and 4b, as cognitive reappraisal increased between T1 and T2 for the intervention participants compared to the control group, and these effects were maintained at follow-up.

7.7.2 Expressive suppression

Descriptive statistics.

The Expressive Suppression is the only variable which is hypothesised to decrease following the mindfulness intervention, as expressive suppression is considered to be inauthentic and draining, as with emotional labour. As shown in Appendix D(i) and Appendix D(ii), the data for the Expressive suppression subscale of the ERQ showed some kurtosis (kurtosis = -0.97, SD = 0.39, $z = -2.51$). As shown in Figure 7.11 and Table 7.2, the means at T1 are almost identical for the two groups, but the intervention group reduce the use of expressive suppression at T2, and then increase again at T3, whilst the control group mean changes very little across the time points.

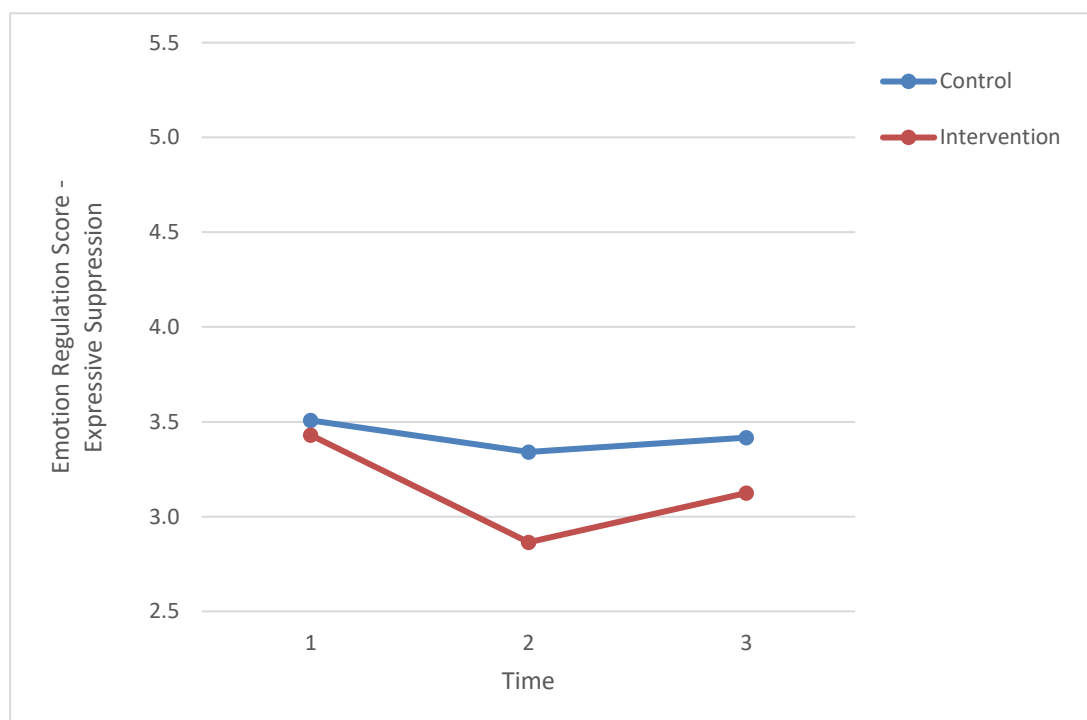


Figure 7.12. Graph of mean scores for each group at each time point for the ERQ expressive suppression subscale

Multi-level model.

Hypothesis 5a and 5b predicted that participation in a Mindfulness Based Intervention within the workplace would be related to a decrease in the regulation of emotion using expressive suppression, when compared to a control group. For Model 1, the ICC was 0.72, indicating 72% of the variance in this type of emotion regulation was due to differences between participants.

In the unconditional linear growth model (Model 2), the dummy time variables were added, the -2LL value was 444.07 with five parameters. In Model 3, the -2LL value decreased slightly to 441.66 with eight parameters – a difference of 2.41 and three parameters, which suggests that adding the grouping variable to the model has no significant effect on the fit of the chi-square likelihood ratio. As such, no significant main effects or interaction effects were found for emotion suppression, with only small variations in scores over time for the intervention group compared to the control group.

To summarise, the effect of MBSR upon expressive suppression as an emotion regulation strategy was not statistically significant between T1 and T2, or T2 and T3, thus Hypotheses 5a and 5b were not supported.

Conclusion

This chapter has reported the analyses of the direct effects of MBSR upon mindfulness, well-being, resilience, and emotion regulation within Study 2. Firstly, the characteristics of the study sample and checks for any differences between groups were reviewed, and outcome data were checked for any violations of the assumptions of parametric data. Next, the descriptive statistics and a multi-level model were reported for each outcome scale or subscale.

The results show a statistically significant effect of MBSR upon all dependent variables from baseline to post-intervention, with the exception of emotion regulation in the form of expressive suppression, which showed no significant change throughout the study. Hence, part a) of Hypotheses 1-4 is supported, but the null hypothesis cannot be rejected for 5a or 5b. During follow-up, well-being, resilience, and cognitive reappraisal show a maintenance of the benefits of MBSR for trainees relative to the control group, providing support for part b) of Hypotheses 2-4. However, there are mixed results for the five facets of mindfulness as some facets show a statistically significant negative effect during follow-up as the control group

becomes more mindful during this period. Consequently, Hypothesis 1b is not fully supported. A discussion of these results and their implications can be found in Chapter 9, Section 9.2.

The following chapter will focus on the final hypothesis of Study 2 and will report the indirect effects of MBSR through mediation analyses in order to explore the mechanisms by which MBSR training improves well-being at work.

8 Intervention Study – Results: Indirect Effects

This chapter will present analyses regarding the hypothesised mediated effect of mindfulness training upon well-being. Mediation analysis is valuable in this research as it enables exploration of *how* mindfulness training may impact upon well-being. Gaining more insight into the mechanism by which mindfulness interventions modify well-being, will allow for more targeted modification of the standard MBSR course without compromising the generally positive results demonstrated in the mindfulness literature to date, which was discussed in previous chapters.

One complex hypothesis was proposed in Chapter 3, which relates to the mediating effects of mindfulness, resilience and emotion regulation upon well-being:

Hypothesis 6: The increase in workplace well-being as a result of participation in a Mindfulness Based Intervention within the workplace will be mediated by changes in levels of mindfulness, resilience and emotion regulation (on both subscales) when compared to a control group.

8.1 Building the Multiple Mediation Model

In simple mediation, the relationship between an independent variable (X) and a dependent variable (Y) is hypothesised to pass (to some degree) through a third variable (M). In the present study, the model includes three mediators, which are positioned both in parallel – whereby they are hypothesised to influence the effect of X on Y through separate indirect pathways within the same model, and also serially – whereby the indirect pathway(s) are directed through more than one mediator in succession on their route from X and Y.

There are five key differences between the multi-level model analysis reported in Chapter 7, and the mediation analyses reported here:

- The results for all facets of the FFMQ have been combined to give a mean score across the 39 items at each time point, in order to assess the overall role of mindfulness within the model.
- As there was a significant difference in baseline mindfulness between the two groups, the effect of this was controlled for. There were no other significant differences at baseline.

- As the hypothesis regarding the effect of mindfulness training upon the expressive suppression subscale of emotion regulation was not supported, this subscale was not included in the mediation model. Only the cognitive reappraisal subscale was therefore used. All references to emotion regulation in this section therefore relate specifically to cognitive reappraisal.
- The mean of the total 16-item MAI is used to measure work well-being.
- It is important to note that the mediation analyses employ the data as they were collected from T1, T2 and T3 – they do not use the dummy variables Change1 and Change2 which were only rendered necessary in the MLM analyses due to lack of power.

Figure 8.1 below illustrates the multiple mediation model diagram, this reflects the previously presented diagram in Chapter 6, Figure 6.2, but uses the variable symbols and pathways specified within Mplus. Where X is group (independent variable), M_1 , M_2 and M_3 are the mediators mindfulness, resilience, and emotion regulation (cognitive reappraisal) respectively, W is T1 mindfulness (control variable), and Y is workplace well-being (dependent variable).

Each pathway is specified and labelled within Mplus as shown below, and path regression coefficients are calculated. Each coefficient represents the rate of change in one variable as a result of a one-unit change in the preceding variable. The indirect effect of a pathway is computed by multiplying the coefficients for each leg of the pathway. Hence, using the statistical model shown above, the indirect effect of X on Y via M_1 is calculated as a_1*b_1 and the more complex serial mediation in the indirect pathway between X on Y via M_1 and M_2 would be $a_1*d_1*b_2$.

In order to explain the effects found when testing this mediation model, an overall diagram including the coefficients for every effect will first be presented and will be used to discuss the direct effects, and total indirect effect of X on Y. In the next section, two further path diagrams will illustrate the hypothesised indirect effects with a discussion of the calculated indirect effect, and its confidence intervals as well as the portion of variance explained by the mediators involved. There will then be a brief discussion of these findings prior to the more detailed discussion in Chapter 9, Section 9.2.

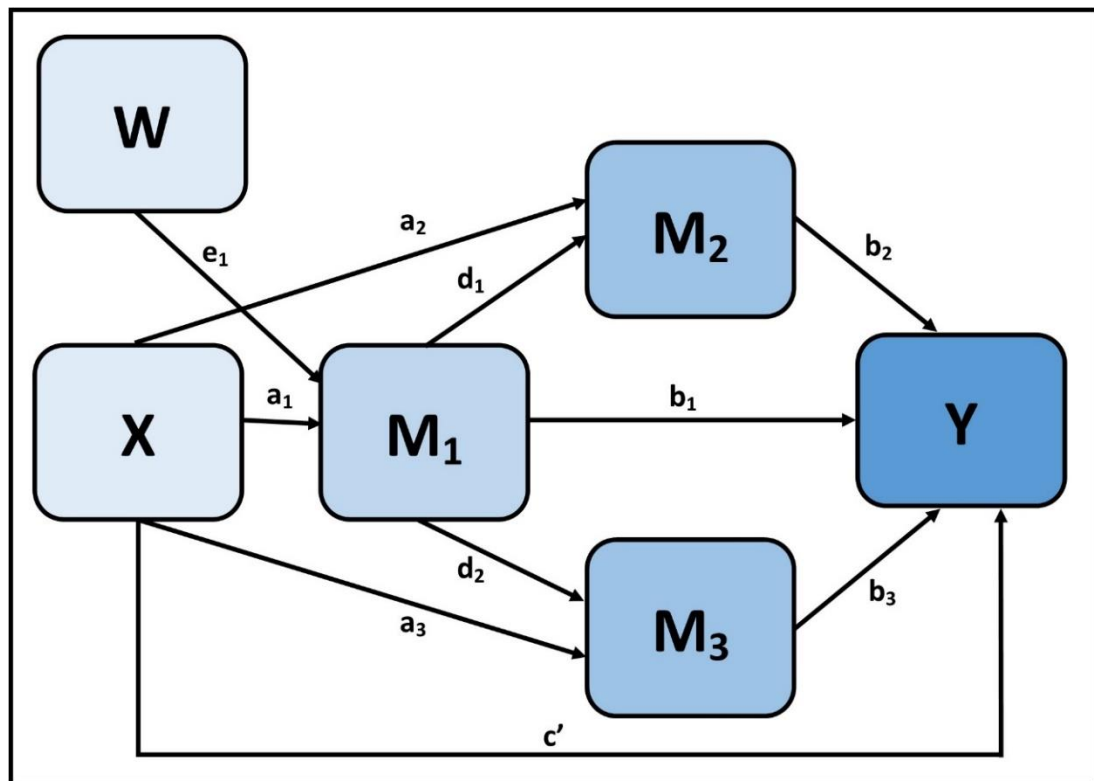


Figure 8.1. Statistical diagram of multiple mediation model with pathways labelled.

8.2 Multiple Mediation - Model 1 Results

As shown in Figure 8.2 below, Model 1 was built as described in Section 6.9.2. The mediators and dependent variable were measured at T2 i.e. after training, but before the six-month follow-up period to assess the immediate effects of the intervention period for the groups. Mindfulness scores at T1 were added as a control variable as there were significant differences between the two groups at baseline.

8.2.1 Direct effects, total indirect effect

This model is almost completely saturated, with only four degrees of freedom remaining, as such global goodness of fit statistics are of limited value in assessing the model – in this case pathway coefficients and variance explained by the variables will reveal more about the suitability of the model (Geiser, 2012). In this mediated model, the direct effect of group upon workplace well-being at T2 is not significant ($c' = 0.12$, $z = 0.49$, $p = 0.626$), with only a small increase in well-being for the intervention group compared with the control group, when controlling for the effects of the three mediators in the model. The model does, however, explain approximately 40% of the variance in well-being ($R^2 = 0.39$), and therefore it is appropriate to explore indirect effects which may be involved.

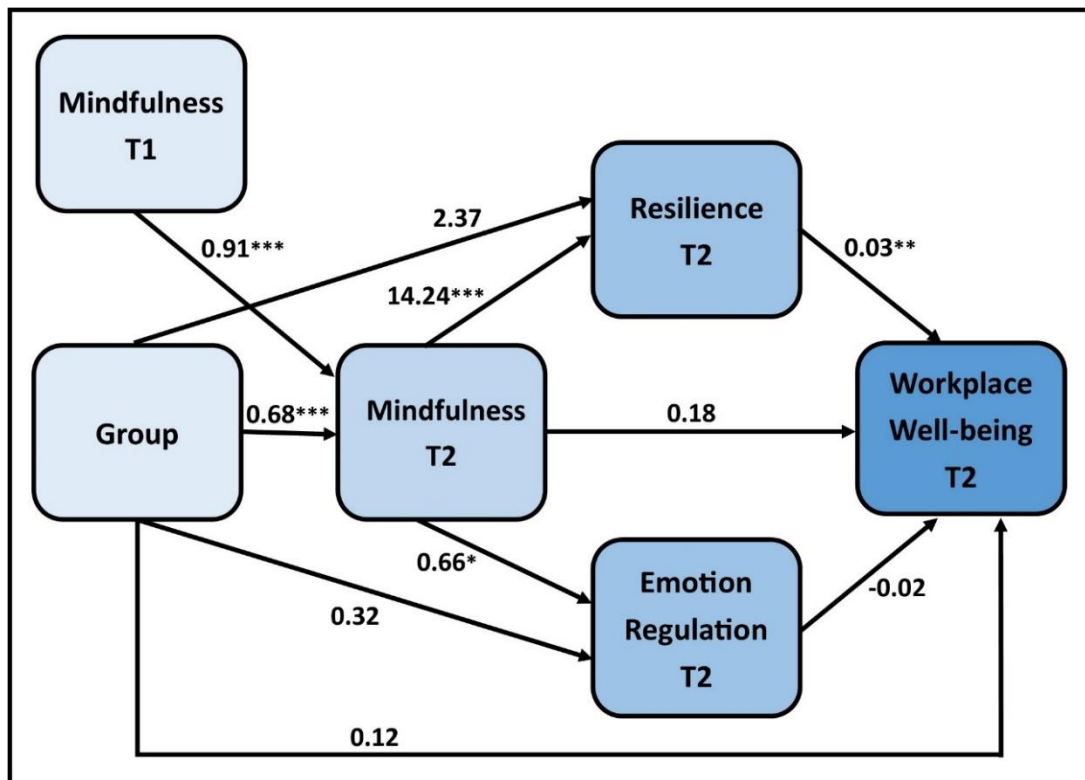


Figure 8.2. Path Diagram showing all direct effects in Model 1 with unstandardised path coefficients.

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$. $n = 54$

Other direct effects of note from Figure 8.2 are also considered here. The effect of group on mindfulness at T2 was highly significant ($a_1 = 0.68$, $z = 6.57$, $p < 0.001$), whereby being in the intervention group was associated with an estimated 0.68 increase in mindfulness on the 5-point scale compared to the control group. Mindfulness scores at T2 in turn predicted a 14.24 increase in resilience scores for every one-unit increase in mindfulness ($d_1 = 14.24$, $z = 6.17$, $p < 0.001$), and a one-unit increase on the resilience scale (with a possible maximum sum score of 100) predicted a significant increase in well-being at work at T2 ($b_2 = 0.03$, $z = 3.00$, $p = 0.003$). Finally, each one-unit change in mindfulness at T2 predicted a significant 0.66 increase in emotion regulation in the form of cognitive reappraisal ($d_2 = 0.66$, $z = 2.34$, $p = 0.019$).

The coefficient for the association between emotion regulation at T2 and well-being at T2 is not significantly different from zero, and is also a negative value suggesting that higher cognitive reappraisal is associated with lower well-being ($b_3 = -0.02$, $z = -0.18$, $p = 0.86$). Inspection of the correlations between these two variables at T2 indicates a significant, medium-sized positive correlation ($r = 0.37$, $p < 0.01$) which suggests that the association between the two variables is being suppressed by Resilience at T2 as the parallel mediator in the model. Suppression effects occur

when two variables are correlated and the stronger effect of one variable suppresses the effect of another to the point that the direction of the relationship can be reversed (Mackinnon, Krull & Lockwood, 2000). The possibility of a suppression effect is supported by the higher positive correlation between resilience at T2 and emotion regulation at T2 ($r = 0.58, p < 0.001$).

All of the remaining specified pathways within the model between the independent variable, the mediators, and/or the dependent variable were non-significant when controlling for all other effects in the model. It is noteworthy at this stage that although significant differences in both resilience and emotion regulation between the groups were found in the previous MLM analysis, these direct effects (pathways a_2 and a_3) are non-significant when they are placed in the model together with mindfulness. In addition, over 65% of the variance in mindfulness at T2 is explained by the model ($R^2 = 0.66$).

The total indirect effect for the model indicates that those in the intervention group experience an estimated 0.52 increase in workplace well-being via non-direct routes within the model ($\beta = 0.52, z = 3.05, p = 0.002$). The following two subsections will unpick this statistically significant total indirect effect and explore the hypothesised indirect pathways.

8.2.2 Indirect effect of group via mindfulness and resilience ($a_1 * d_1 * b_2$)

As shown in Figure 8.3 below, the indirect pathway from group to T2 well-being, via T2 mindfulness and T2 resilience is significant at both the 5% and 1% level when inspecting the bias-corrected bootstrap confidence intervals ($a_1 * d_1 * b_2 = 0.33, z = 2.26, 99\% \text{ CI } [0.05, 0.85]$). This means that compared to the control group, the intervention group experiences an estimated increase of 0.33 on the well-being scale via the indirect pathway shown below, whilst controlling for all other pathways in the model. Thus, a significant portion of the effect of mindfulness training upon well-being is explained by the serial mediating effect of mindfulness and resilience, whereby mindfulness training increases mindfulness skills relative to the control group, which predicts an increase in resilience, which then predicts an increase in well-being when all variables are measured immediately after the eight-week intervention. The model also explains almost 50% of the variance in resilience ($R^2 = 0.48$).

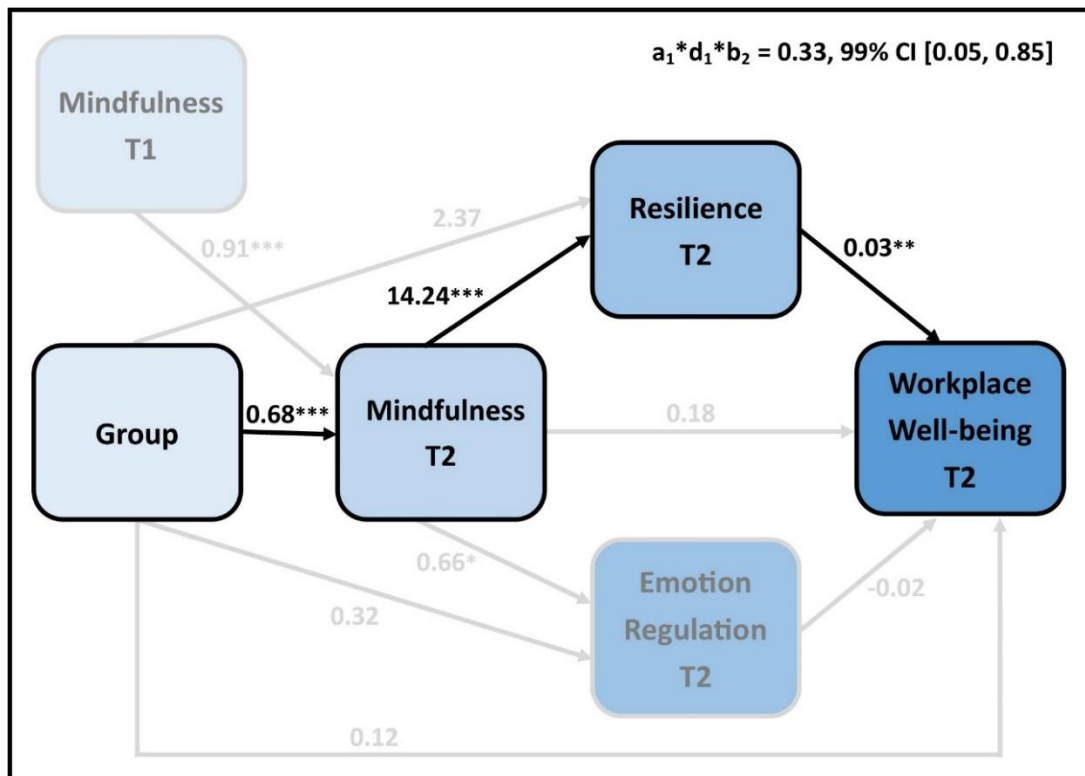


Figure 8.3. Path diagram of the indirect effect upon T2 well-being via T2 mindfulness and T2 resilience.

8.2.3 Indirect effect of group via mindfulness and emotion regulation ($a_1 * d_2 * b_3$)

The indirect pathway via T2 mindfulness and T2 emotion regulation was not found to be significant. As shown in Figure 8.4 below, the intervention group were estimated to experience a slight decrease in well-being via this pathway compared to the control group ($a_1 * d_2 * b_3 = -0.01$, $z = -0.16$, 95% CI [-0.16, 0.08]). This difference was not statistically significant at either the 1% or 5% level using the bias-corrected bootstrapped confidence intervals. This result indicates that the second hypothesised mediation pathway between group and well-being as measured immediately after the MBSR training is not supported. Compared to the other outcomes, the model explains a much smaller amount of the variance in emotion regulation ($R^2 = 0.24$), suggesting wider influences upon emotion regulation, which are beyond the scope of this model.

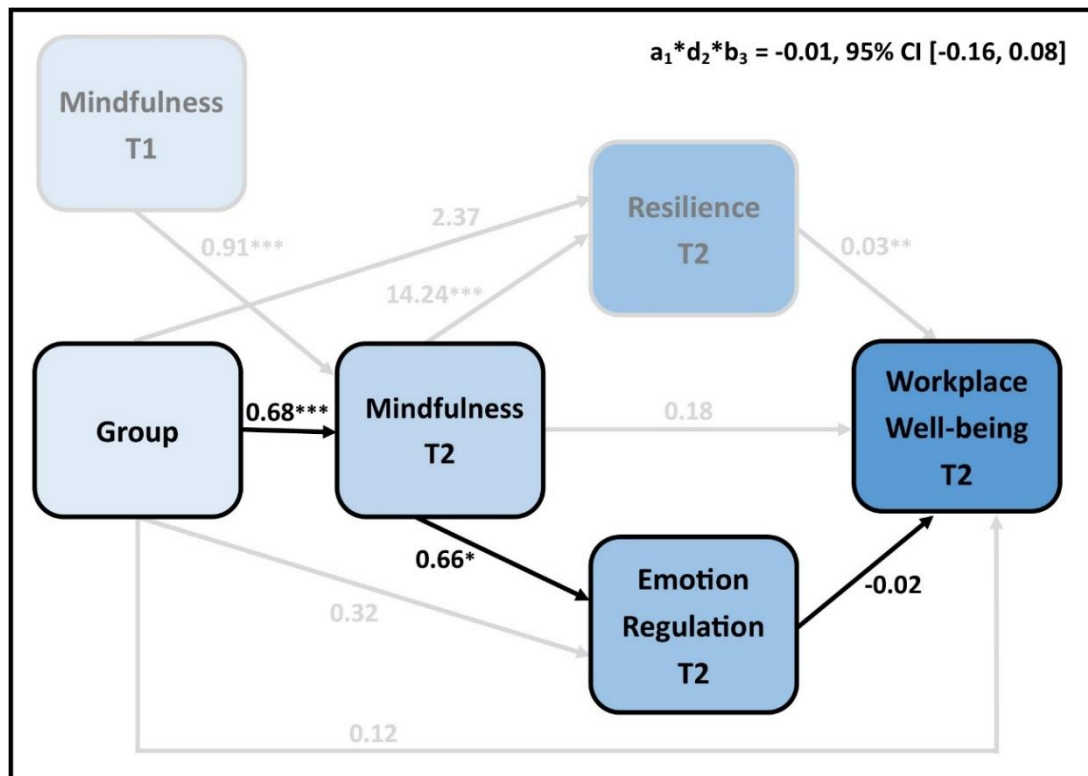


Figure 8.4. Path diagram of the indirect effect upon T2 well-being via T2 mindfulness and T2 emotion regulation.

8.3 Multiple Mediation - Model 2 Results

As shown in Figure 8.5 below, the key change in Model 2 is that the dependent variable well-being is measured at T3, whereas in Model 1 it was measured at T2. The mediators and dependent variable were again measured at T2. This model will assess whether changes in mediating variables immediately after the training create indirect pathways which predict well-being after a six-month follow-up period has passed. Mindfulness scores at T1 were again added as a control variable.

8.3.1 Direct effects, total indirect effect

In this mediated model as one would expect, the pathway coefficients are very similar to in Model 1, with exception of those which now predict well-being at T3. The direct effect of group upon workplace well-being at T3 is now significant ($c' = 0.43, z = 2.02, p = 0.044$), demonstrating a significant direct increase in well-being for the intervention group compared with the control group, when controlling for the effects of the three mediators in the model. The model explains approximately 33% of the variance in well-being ($R^2 = 0.33$), which is reduction from Model 1.

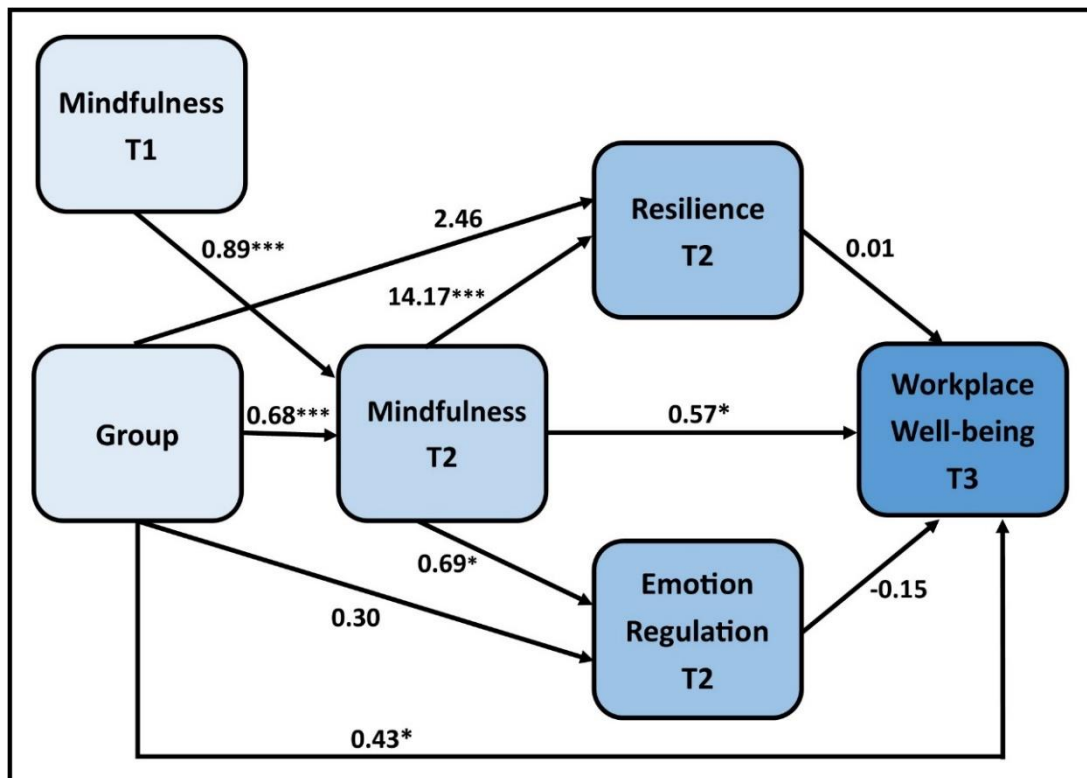


Figure 8.5. Path Diagram showing all direct effects in Model 2 with unstandardised path coefficients.

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$. $n = 58$

Other direct effects of note from Figure 8.5 are also considered here. The effect of group on mindfulness, and of mindfulness upon resilience, and mindfulness on emotion regulation all remain similar to in Model 1. In contrast, the pathway between resilience and T3 well-being is not significant, with a smaller 0.01 increase in well-being for every additional unit on the resilience scale ($b_2 = 0.01$, $z = 0.24$, $p = 0.810$). All other specified pathways in the model remain of a similar magnitude and direction to those in Model 2. In addition, a slightly higher 68% of the variance in mindfulness at T2 is explained by the model ($R^2 = 0.68$).

The coefficient for the association between emotion regulation at T2 and well-being at T3 is again not significantly different from zero, and has a slightly larger negative value suggesting that higher cognitive reappraisal is again associated with lower well-being ($b_3 = -0.15$, $z = -0.74$, $p = 0.46$). The correlation between these two variables is this time non-significant, and small, but still positive ($r = 0.22$, $p = 0.19$) which suggests that the association between emotion regulation and well-being is being suppressed by Resilience at T2 which is the parallel mediator in the model. Suppression effects occur when two variables are correlated and the stronger effect

of one variable suppresses the effect of another to the point that the direction of the relationship can be reversed.

The total indirect effect for the model indicates that those in the intervention group experience an estimated 0.33 increase in workplace well-being via non-direct routes within the model ($\beta = 0.33$, $z = 1.81$, $p = 0.070$). This is not statistically significant according to the p value, although the 95% bootstrapped confidence intervals do not include zero (95% CI [0.02, 0.73]). The following two subsections will explore findings from the hypothesised indirect pathways.

8.3.2 Indirect effect of group via mindfulness and resilience ($a_1*d_1*b_2$)

As shown in Figure 8.6 below, the indirect pathway from group to T3 well-being, via T2 mindfulness and T2 resilience was not statistically significant ($a_1*d_1*b_2 = 0.05$, $z = 0.44$, 95% CI [-0.32, 0.44]). This means that compared to the control group, the intervention group experienced a trivial increase of 0.05 on the well-being scale via the indirect pathway shown below, whilst controlling for all other pathways in the model. As such, the data does not support the hypothesis that mindfulness and resilience in series at T2 significantly influence well-being at T3. The model again explains almost 50% of the variance in resilience ($R^2 = 0.49$).

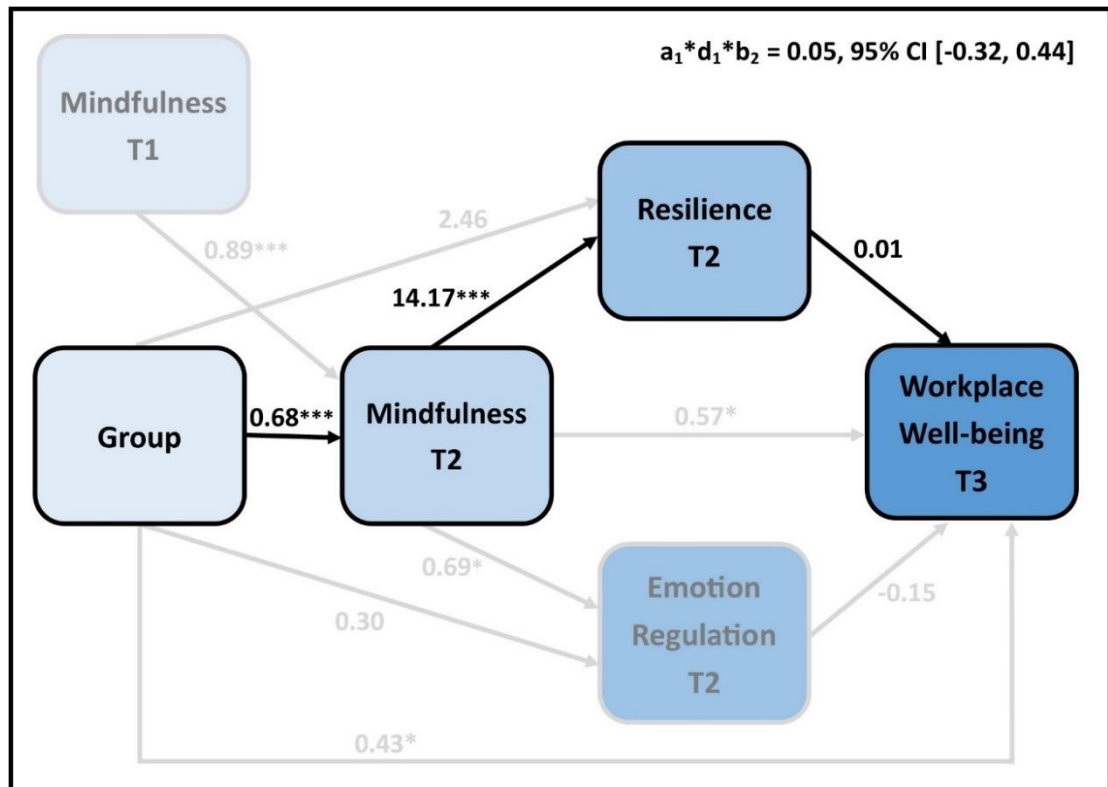


Figure 8.6. Path diagram of the indirect effect upon T3 well-being via T2 mindfulness and T2 resilience.

8.3.3 Indirect effect of group via mindfulness and emotion regulation ($a_1*d_2*b_3$)

The indirect pathway via T2 mindfulness and T2 emotion regulation was again not found to be significant. As shown in Figure 8.7 below, the intervention group were estimated to experience an insignificant decrease in well-being via this pathway compared to the control group ($a_1*d_2*b_3 = -0.07$, $z = -0.66$, 95% CI [-0.39, 0.06]). As such, the second hypothesised mediation pathway between group and T3 well-being is not supported. Compared to the other outcomes, the model again explains a much smaller amount of the variance in emotion regulation ($R^2 = 0.24$), suggesting wider influences upon emotion regulation, which are beyond the scope of this model.

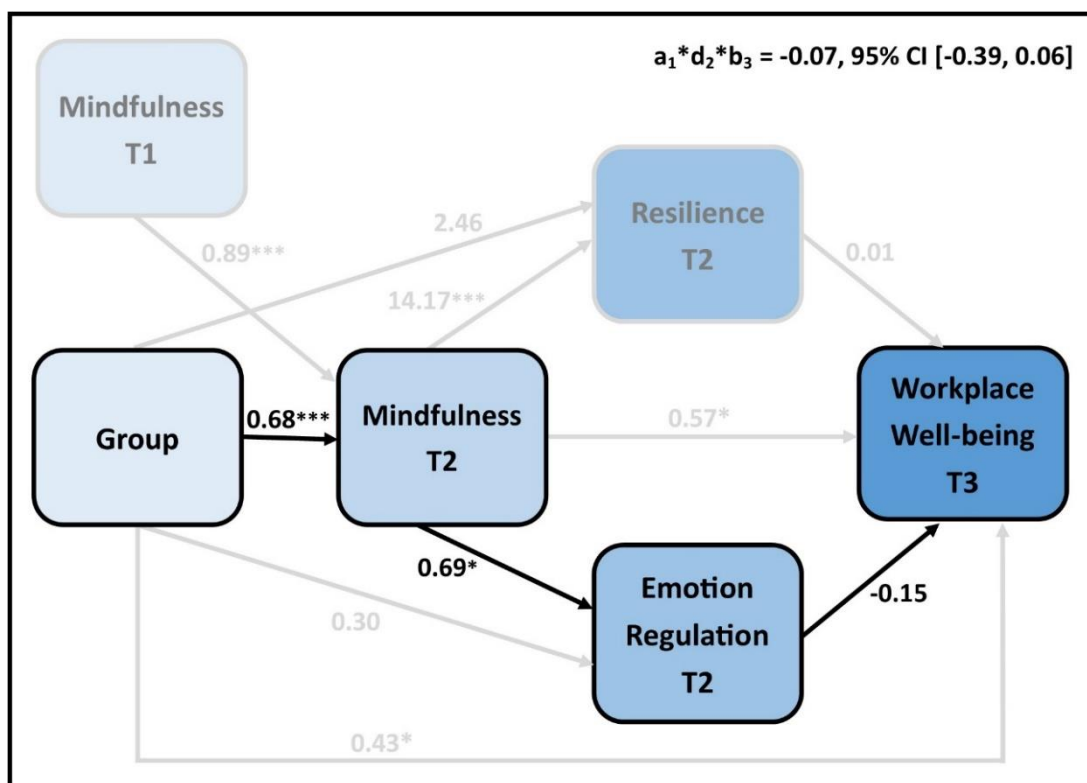


Figure 8.7. Path diagram of the indirect effect upon T3 well-being via T2 mindfulness and T2 emotion regulation.

Conclusion

This portion of the results has addressed Hypothesis 6 proposed in Chapter 3 which was concerned with the possible mediation pathways between the variables of interest within the NHS intervention study. In particular, the first proposed mediation pathway was between group and well-being via mindfulness and resilience in series, with the second mediated pathway via mindfulness and emotion regulation. Due to incomplete data, a total sample of 54 participants were included in the analysis of Model 1 which considered the effect of both of these mediation pathways in parallel

using data collected at T2, immediately after the training. The indirect pathway via mindfulness and resilience was found to be highly significant using 99% confidence intervals, whilst the pathway via mindfulness and emotion regulation was not found to be significant. As such, the data from this intervention research indicates an effect of mindfulness training, which is achieved via increases in both mindfulness and resilience in series, but not through emotion regulation, with a very slight effect of the mindfulness and emotion regulation pathway in the opposite direction to that which was hypothesised.

When placed in one model together, the direct effects of group upon all of the measured outcome variables found in the previous MLM analysis are no longer evident, with the exception of mindfulness, indicating that mindfulness training is firstly impacting strongly and directly upon mindfulness skills, with later or diminished effects upon resilience, emotion regulation and well-being. This conceptualisation of increased mindfulness as a 'gateway' to other benefits is in keeping with Buddhist literature, and with more contemporary research findings. The discussion of the mediation results will continue in Chapter 9, Section 9.2, along with the limitations of the study and these analyses, and the implications these findings may have for future research and the reality of workplace mindfulness interventions.

In Model 2, the key difference is that well-being is measured at T3 after the six-month follow-up period. Here the path regression coefficients change considerably, whereby T2 mindfulness is now found to significantly predict T3 well-being when controlling for the other pathways in the model (where it was previously non-significant for T2 well-being), and T2 resilience does not predict T3 well-being (where it was previously significant for T2 well-being). This has in turn impacted upon the significance of the indirect pathways meaning that neither of the hypothesised mediation pathways showed significant effects in the long-term. Although not hypothesised, the simple mediating effect of T2 mindfulness between group and T3 well-being is approaching significance with 90% confidence intervals which do not include zero ($a_1*b_1 = 0.39$, $z = 1.96$, 90% CI [0.06, 0.66]) suggesting that the intervention group experiences a 0.39 increase in well-being via the simple mediating effect of mindfulness compared to the control group. Possible explanations and implications of these results will be discussed next in Chapter 9, from Section 9.2.

9 Discussion and Conclusion

This final chapter is divided into three sections. The first section is concerned with Study 1 and discusses the estimated summary effects of MBSR for mindfulness and well-being for working adults through systematic review and meta-analysis, whilst the second section focuses on Study 2, discussing the effects MBSR upon mindfulness, well-being, resilience, and emotion regulation for employees in an NHS Trust. These two sections follow a similar format, as they both provide a descriptive summary of the results, agreements and disagreements with previous research, implications and contributions, and limitations of the findings, and finish the author's conclusions relating to the study's findings when taken together. The third section of the chapter draws together the findings of Study 1 and Study 2, considers their similarities and differences and how their combined contribution can support previous findings relating to mindfulness interventions at work, and inform future research into this relatively new area of inquiry.

9.1 Study 1: Systematic Review – MBSR for mindfulness and well-being in working adults

For Study 1, the format of the discussion section will be organised as recommended in the Cochrane Handbook (Higgins & Green, 2009) and be divided into six parts. Firstly, a summary of the result reported in Chapter 5 will be given, followed by an objective assessment of the overall completeness and applicability of the evidence to a wider working population. Next, potential biases of the review will be suggested, and the impact they may have upon the review's findings will be considered, and in the fourth section, the ways in which the current review agrees or differs to previous systematic reviews will be discussed. Finally, I will address each aim of the systematic review in turn when making author's conclusions in relation to Study 1.

9.1.1 Summary of main results

The systematic review searched, assessed for eligibility, and finally meta-analysed studies evaluating the effect of MBSR upon working populations within randomised controlled trials. Eighteen eligible papers were identified, with 16 papers suitable for meta-analysis from 15 individual studies. This summary of Study 1 is given prior to critical discussion and interpretation of the findings in the following sections. As a reminder, a summary of results is presented in Table 9.1 below.

Table 9.1 Summary of findings – aims of systematic review

Systematic Review Aim	Hedges' <i>g</i>	95% CI	No. of studies	No. of participants
Aim 1: Mindfulness T1-T2				
Inactive control group	0.50*	0.32, 0.68	8	477
Active control group	0.18	-0.12, 0.48	1	175
Aim 2: Mindfulness T1-T3				
Inactive control group	0.26	-0.29, 0.81	2	366
Active control group	0.29	-0.005, 0.59	1	175
Aim 5: Well-being T1-T2				
Inactive control group	0.54*	0.39, 0.69	12	718
Active control group	0.15	-0.11, 0.42	2	216
Aim 6: Well-being T1-T3				
Inactive control group	0.31*	0.04, 0.59	3	513
Active control group	0.16	-0.13, 0.45	1	184
	Hedges' <i>g</i> Difference	Z score, p value	No. of studies	No. of participants
Aim 3: Standard vs Modified				
Mindfulness	-0.14	-0.72, p = 0.47	8	477
Well-being	0.13	0.82, p = 0.41	12	718
Aim 4: No Retreat vs Retreat				
Mindfulness	-0.004	-0.02, p = 0.99	8	477
Well-being	0.07	0.39, p = 0.70	12	718

Note: *Statistically significant effect size with 95% confidence intervals that do not span zero. Results reported to 3dp when close to zero.

Well-being was the primary outcome of interest within the systematic review – with a focus on MBSR training compared to an inactive control group, using standardised mean differences from baseline to post-intervention (T1-T2) to establish whether the trainees improved more than the control group did during the time the intervention took place. This outcome utilised the largest subset of the data with 12 studies included. As shown in the Summary of Results Table (Table 9.1), the estimated mean effect was medium-sized ($g=0.54$, 95% CI [0.39, 0.69], $k=12$), with low heterogeneity and with symmetry in the funnel plot. This indicates that the estimated overall effect is robust across the range of studies included in this analysis, and that no evidence was found of potential publication bias, which would change the results if unpublished or unfound studies were to be included. The results of the heterogeneity and publication bias analyses therefore do not call into question the robustness of the estimated mean effect size found. However, risk of bias analysis for the included studies identified concerns whereby studies that were rated at high risk of bias found larger effect sizes. As such, it is possible that the beneficial results have been inflated by bias in the studies, particularly by selection bias – as most studies did not report how their participants were randomised, and detection bias – as most studies did not

report whether the researchers analysing the data were blinded to the identity of each group. The majority of this potential risk was conservatively assessed as many studies did not explicitly describe the randomisation, or the blinding steps taken (if any), indicating a lack of precision in reporting of study methodologies and results, which may or may not represent a lack of precision when carrying out the study, therefore the risk of bias may have been lower if these elements had been written into the study details.

Subgroup analyses were conducted to explore several of the additional aims of the systematic review. The estimated mean effect of MBSR compared to inactive control groups did not change substantially when the number of training hours was reduced, or when the retreat day, which is included in traditional MBSR training, was omitted. This shows that shortening the course to fit into a busy work routine is possible without compromising the benefits to mindfulness and well-being. Controlled follow-up data was only available for three of the studies with inactive control groups, and showed a smaller effect of MBSR training between T1 and T3 than the larger data set for T1-T2, over a follow-up period between two and three months ($g=0.31$, 95% CI [0.04, 0.59], $k=3$). This suggests that the benefits of MBSR training for well-being do decrease somewhat after the training ends, however, there is still a lasting effect 2-3 months later when participants no longer have the support of the group and the facilitator. Of these three studies, one found no significant effect of MBSR upon either well-being or mindfulness at follow-up (Van Berkel, 2014), and two found robust medium-sized effects for both mindfulness and well-being (Huang, 2015; Roeser, 2013). Due to this difference, heterogeneity between the studies was high, and the results are unlikely to be applicable to a larger population without the inclusion of more research that reports controlled follow-up data from future studies.

Studies with active control groups were analysed separately, however only two studies fell into this category. The findings suggest that there is little difference in outcome for both well-being and mindfulness when MBSR is compared to other types of group intervention – in this case a leadership intervention and a lifestyle education intervention. These findings were derived from one large study reporting no effects for well-being or mindfulness (Malarkey, 2013), and one small study reporting a medium sized effect that was not statistically significant (Pipe, 2009). Again, the results on both outcomes are unlikely to be robust when extrapolated to a wider population, nor were subgroup analyses possible due to the small sample size.

The systematic review also explored the effects of MBSR training upon self-reported mindfulness skills, and the results were very similar to those reported for well-being for inactive control groups between T1 and T2. A subset of 10 studies measured mindfulness using a validated scale. The estimated mean effect when compared to inactive control groups was also medium-sized ($g=0.50$, 95% CI [0.32, 0.68], $k=8$), again with low heterogeneity, indicating a robust estimated effect that can be generalised to the wider working population. However, as with the well-being summary, higher risk of bias scores were associated with higher effects of the training upon mindfulness skills, highlighting the possibility of inflated effect sizes for these studies due to bias.

Mirroring the well-being findings, reducing training hours or omitting the retreat day was not harmful to the overall benefits to mindfulness skills. Only two studies with inactive control groups assessed mindfulness at a controlled follow-up – and these showed a non-significant effect of MBSR training between baseline and follow-up, with a wide confidence interval spanning zero ($g=0.26$, 95% CI [-0.29, 0.81], $k=2$). This suggests that although MBSR was found to have a strong effect on mindfulness initially, this effect fades with time after the training. This result is from two studies with very different mindfulness results – one that found no significant effects (Van Berkel, 2014) and one that found statistically significant medium-sized effects (Roeser, 2013). As such, these results cannot be generalised to other working samples, and as with well-being, more research with controlled follow-up data is needed to explore this effect further.

Post hoc analyses were conducted to determine the estimated mean effect of MBSR on the different facets of mindfulness measured by the FFMQ (Baer et al., 2006), with five studies reporting results for the five facets separately. These analyses may indicate which specific elements of mindfulness are being improved by MBSR training, which is useful when proposing theories on the mechanism by which MBSR works to influence participants. As shown previously in Table 5.7, statistically significant beneficial effects were found for all five facets of mindfulness measured by the FFMQ. A large effect upon Observing skills was found, with near medium-sized effects on the Non-reactivity to inner experience, Non-judgement of inner experience and Acting with awareness subscales, and a small effect upon Describing. These findings suggest that when measured immediately after the intervention, MBSR has the strongest effect upon participants' self-reported ability to observe objects in consciousness, with moderate improvement in the ability to allow thoughts to occur

without reaction or judgement and to acting mindfully, and smaller effects on the perceived ability to articulate thoughts and feelings.

9.1.2 Overall completeness and applicability of evidence

A systematic search of a number of academic databases and the grey literature was performed in order to maximise the number of eligible studies found for this review. The review includes studies with a variety of working populations, across four continents, which increases the generalisability of the findings to a general working population. Only a small subset of studies included active control groups and/or controlled follow-up measurements, which limited the possible analyses. These tended to be more recent publications, suggesting a shift to consider these elements in evaluations over time, and it is anticipated and hoped that this number will continue to increase in the future.

Strict eligibility criteria have curtailed the number of studies that could be included in this review; all studies were required to be RCTs, and to have derived from MBSR, containing at least three of the four elements defined as core to an MBSR intervention (de Vibe et al., 2012; see Figure 4.1). This led to exclusions of alternative mindfulness-based interventions and those that were modified to an extent that less than three elements of MBSR were retained – this has undoubtedly influenced the results. Some flexibility was present in the selection criteria in order for modified versions of MBSR to be included if they retained enough elements of the core programme. Consequently, the findings reported here can only be applied to similar MBSR-based interventions and not to all forms of mindfulness-intervention conducted in the workplace. The literature evaluating MBSR outcomes at work is arguably the largest and most homogenous body of intervention research on mindfulness at work to date, as it is a long-standing, well-established course and therefore a review of this area has the largest applicability to wider populations and the largest potential to impact future directions of both research and practice.

Due to the small number of studies with an active control group, it was not possible to conduct any meaningful subgroup analyses on this dataset. This may become possible in the future as the field of research expands to consider the effects of MBSR compared to other interventions, as well as in comparison to waiting list or no-intervention control groups. The publication dates of the included studies suggest growth in this area, as 70% of the included studies were published between 2013 and 2015.

9.1.3 Potential biases and strengths in the review process

This review has a number of strengths in relation to minimising bias during the review process. Although not a Cochrane systematic review, I have followed the guidelines in the Cochrane Handbook (Higgins & Green, 2008) as closely as possible during the planning, implementation, and also in the writing-up of the review, whilst also adapting the written format to fit within a PhD thesis. A protocol for the review was written prior to commencement of the process in order to limit the influence of results as they were generated. Using this protocol as detailed in Chapter 4, a predefined set of search terms were used to search for eligible studies, with further searches of the grey literature and hand searchers of reference lists, to minimise the risk of missed studies. The results of the analyses for publication bias suggest that a representative portion of existing studies were located during the systematic search, and a further 142 studies reporting no effects would be required to render the primary effect upon well-being non-significant. A second coder with an occupational psychology research background independently checked all of the short-listed studies for inclusion in the review. Unlike me, the second coder does not have a background in mindfulness training, or a personal interest in the concept, which ensured that decisions to include studies were not influenced by my background. Furthermore, the statistical analyses were conducted using software designed for meta-analysis (Comprehensive Meta-Analysis, Version. 3.3.070, 2014) which ensured that the methods used were error-free, and tailored to this kind of analyses. This software also allowed for the pooling of multiple well-being or mindfulness measures within studies whilst accounting for the consequent dependency of data – this allowed for results based upon a larger number of observations from a range of related instruments to build a more accurate picture of the effects.

There are also limitations to the process, which have the potential to introduce bias into the review. Firstly, as a single researcher with limited resources, the language of eligible studies was restricted to English – it is therefore possible that studies published in other languages exist which were not included, and which may have changed the results. Secondly, the protocol for the review was not registered at the beginning of the research, which would have provided a means of contact for authors wishing to send their study details for consideration in the review process.

9.1.4 Agreements and disagreements with other reviews

This section is divided to discuss how the findings of the present review compare to existing reviews with a wider adult population as previously discussed in Chapter 4,

Section 4.3.1, followed by those relating specifically to mindfulness interventions with working adults as previously discussed in Chapter 4, Section 4.3.2.

Previous mindfulness reviews outside the workplace.

The results reported in this review have parity with those reported by de Vibe et al., (2012; 2017), who consider the effect of MBSR on the psychological health of adults, including only studies with an RCT design. In the original review, a moderately large effect upon mental health of $g = 0.62$ was reported for 10 studies with non-clinical samples. In the updated review published in 2017 including 101 studies in total from a range of adult samples, an overall effect upon mental health of $g = 0.54$ ($k = 96$), was reported with no significant difference found between clinical and non-clinical populations. There was also a medium-sized effect of MBSR upon mindfulness ($g = 0.53$, CI [0.31, 0.74]) across all adult populations, which is again similar to the results of the current systematic review. Like Study 1, the systematic review by de Vibe and colleagues (2017) also found no significant difference in effect for studies that analysed participant data per protocol versus those that employed ITT analyses, or for studies that reduced the content of MBSR. The de Vibe et al. review (2017) also found an effect of risk of bias scores in the same direction, whereby higher risk of bias was associated with larger effect sizes. Analyses of whether effects were still evident at follow-up was inconclusive in the present review, however de Vibe and colleagues (2017) found that effects were generally maintained at follow-up, with more data available for their analyses ($k = 21$). The larger sample and more precise estimate suggest that de Vibe and colleagues' (2017) results are more robust, and that more follow-up data from working populations is needed in the future to explore this issue further amongst employees. It is encouraging to find correspondence with a large Campbell Collaboration systematic review of the effects of MBSR on an adult population, despite the much smaller sample of studies eligible for the current systematic review and meta-analysis in the workplace. These findings also suggest that the effect of MBSR upon working adults compared to a control group of their working peers is similar to that found for adults in general when compared to their peers.

The de Vibe and colleagues' systematic review (2017) included a much larger sample of studies with active control groups. In their review, the estimated mean effect of MBSR was smaller but still significant for both well-being ($g = 0.18$, CI [0.05, 0.30], $k = 25$) and mindfulness ($g = 0.31$, CI [0.12, 0.50], $k = 9$). Examples of the active control groups included group health education programmes, group therapy programmes,

and stress management interventions, suggesting that a mindfulness intervention has additive, specific benefits for well-being and mindfulness beyond those of learning in a group-based setting, with the attention and encouragement of an instructor. The effect upon mindfulness also provides a manipulation check that the intervention is increasing mindfulness to a greater degree than other non-mindfulness interventions as we would expect. All of the studies with active control groups were found during the systematic review update in 2017 by de Vibe and colleagues, supporting the statement above that the inclusion of active control groups in study designs is a more recent adaptation, which may also increase in workplace studies over time.

Previous mindfulness reviews in the workplace.

As discussed in Chapter 4, Section 4.3.2, the meta-analysis by Virgili (2015) was probably the first to evaluate mindfulness interventions at work and their effect upon psychological distress. Virgili's (2015) study includes both RCT and non-RCT controlled designs in a between group (pre-post) comparison, with an estimated effect size of $g = 0.68$, including 10 studies, an effect which is larger than the one found in the present study. Virgili (2015) also conducted subgroup analyses using RCT, controlled, and uncontrolled designs combined, finding no significant difference between interventions with more or less than 20 hours of contact time, as is the case in the present study.

Five studies with active control groups were narratively reviewed separately and no significant difference in the effect sizes for the mindfulness intervention and the active intervention were found in four of these, with a significant difference reported for Pipe and colleagues (2009), which is actually reported as non-significant in the present study, which is likely to be due to Virgili (2015) utilising a different method of calculating Hedges' g , to the method used in Study 1 (Hedges' g was calculated from the reported difference in scores between the independent groups, along with the p value for Pipe, 2009, giving the same result as is reported by de Vibe et al., 2012). The other four studies did not meet the criteria for the present systematic review, as they were either not RCTs or did not use MBSR and as such, it is difficult to draw conclusions from these data in the context of the current review, suggesting again that more RCTs with active control groups evaluating MBSR are needed.

The findings of the present review do not accord with those of Virgili (2015) when assessing risk of bias. Virgili (2015) found that potential areas of bias including randomisation, blinding, and completeness of outcome data as measured by the Jadad scale (Jadad et al., 1996) were not correlated with effect size, and suggested

that therefore study quality did not impact upon the effect of the intervention. The use of the Jadad scale however, is “explicitly discouraged” by the Cochrane Handbook (Higgins & Green, 2008, p. 192), and has been criticised for measuring quality of reporting and not methodological quality, using a smaller range of criteria than the Cochrane Collaboration tool used in the present systematic review. The Virgili review does not include ITT as a moderator, and does not analyse the effect upon mindfulness; as such, the analysis of the effect upon mindfulness upon employees is a novel contribution of the current systematic review.

The findings of Study 1 are concurrent with the findings of the narrative reviews by Lomas and colleagues (2017a; 2017b). When focusing on the effects of mindfulness interventions for educators, Lomas et al. (2017a) found that mindfulness training was generally positively related to mental health and well-being. Furthermore, in a wider review of mindfulness interventions across working populations, Lomas et al. (2017b) also found that most of the 112 included papers found improvements in well-being and stress after a mindfulness intervention. These narrative reviews included a mixture of RCT and non-RCT designs, and a range of mindfulness-based training schemes, which means that their findings are applied to a broader population, and with generally less rigorous study designs, although the trend towards the beneficial effects of mindfulness training is in line with the findings of the present systematic review.

In another narrative systematic review, Lamothe and colleagues (2016) linked MBSR-based interventions to improvements in a range of mental health outcomes and mindfulness skills based on 39 included studies, 14 of which were RCTs. This generally positive effect of interventions upon well-being and mindfulness is also concurrent with the findings of this systematic review.

A further narrative systematic review has more recently been published by Janssen and colleagues (Janssen, Heerkens, Kuijer, van der Heijden & Engels, 2018), assessing the effects of MBSR and MBCT upon employee mental health using controlled and randomised controlled studies. In an evaluation of 24 papers from 23 studies, the findings are acquiescent with those of Study 1, whereby MBSR (and in one study, MBCT) was related to improvements on a range well-being outcomes, including burnout, anxiety and depression. Study 1 builds upon the findings of this systematic review by locating a larger number of RCT papers during the same time period, and exploring these results through meta-analysis.

In summary, the findings of the current systematic review are largely in agreement with key existing systematic reviews – both with a general adult population and a working one, which differences where results are based upon a small and heterogeneous group of studies. The body of evidence, including the present study, demonstrates a consistent medium-sized effect of MBSR training upon both well-being and mindfulness, which is not affected by a reduction of MBSR training time or removal of the retreat day. Risk of bias is also highlighted as an important consideration when attempting to estimate an effect size that is as close to the true effect size as possible, and these reviews suggest that high risk of bias may inflate effect sizes. There are some underpowered and less precise areas of the current review, which do not agree with findings from larger studies, including uncertainty over the long-term effects of MBSR at follow-up, and whether MBSR at work has specific benefits beyond other group-based interventions. The implication of these findings for research and practice will be discussed in the following section.

9.1.5 Implications and contributions

This section will discuss the implications of Study 1, and the contributions this research makes to theory, methodology and practice in the field of workplace mindfulness interventions.

Theoretical implications and contributions.

The systematic review findings have implications for theory and research. The present meta-analysis estimates the effect of MBSR upon mindfulness skills, which was not included in Virgili's (2015) meta-analysis. This inclusion not only contributes to research by confirming that MBSR does in fact improve mindfulness skills, but also allows an examination of the facets of mindfulness as they are measured using the FFMQ, which has not been conducted in a meta-analysis before as far as I am aware. This addition makes clear that the active ingredient of MBSR is actually mindfulness.

The post hoc analyses of the facets of mindfulness, particularly the positive effects upon Observing, non-reactivity and non-judgement, also indicate participants are developing a 'watcher self' as discussed in the literature review (Deatherage, 1975; Chapter 3, Section 3.1.1). Which is achieved by noticing more about surroundings and thoughts, and by learning to perceive these in an objective and non-judgemental way, as described in Shapiro and colleagues' (2006) re-perceiving process. This finding supports the proposition that re-perceiving is the mechanism by which mindfulness skills invoke changes in meta-cognition, thus adding to evidence in support of their proposed model of the mechanisms of mindfulness.

Methodological implications and contributions.

The four elements of mindfulness (defined by de Vibe et al., 2012, Figure 4.1) provide a novel set of criteria in this study with which to assess the fidelity of a programme to the original elements of MBSR, which could help future studies to determine if the presence or absence of benefits is due to a key element of the course being removed, or to other factors linked to course reduction, such as a lack of time for in-depth explanation of the topic. The present findings clarify that the course is equally effective when modified, when the reduced programme still contains tasters from each element of the original format, supporting the potential importance of all four elements.

By conducting an RCT-only systematic review with a broad search strategy, and searching for papers up to the end 2015, the systematic review found 16 eligible studies which could be meta-analysed, this includes 12 more RCT studies on MBSR than Virgili's (2015) review at work, and also contains five studies which were not included in either of the de Vibe et al. reviews of all adults (2012; 2017). As such, Study 1 makes a unique contribution by providing a more thorough and up-to-date evaluation of the research literature specifically focussed upon MBSR, and isolated to the specific effects for working samples.

The findings on the variety of well-being and mindfulness scales were each combined to provide the composite well-being and mindfulness outcomes. Although some previous authors have not included a meta-analysis in their systematic reviews, citing this variety of outcome measures as a barrier, the present review successfully combined outcome measures, whilst accounting for the resultant dependency of results through the use of robust standard errors. This method has allowed a systematic and objective review of a specific area of workplace mindfulness research, which could not have taken place for a number of years if the gradual accumulation of studies all using the same outcome measures was required.

Practical implications and contributions.

When considering the implications for practice, the effectiveness of MBSR in the workplace seems to be equivalent to the effects in both ill and healthy adult populations, supporting the use of this type of training in the workplace, despite its origins as a treatment for chronic pain in a healthcare environment. As such, MBSR seems to have spanned the gap between these two domains without heavy adaptation. This suggests that the language and exercises in the programme, as well as the attitude required in order to take part, are attainable for healthy employees,

who do not have the challenge, or perhaps, the motivation, of a long-standing illness shaping their experience. Consequently, the use of MBSR at work to improve well-being can be recommended by this study.

The effects of MBSR were assessed by a range of measures of well-being from around the affective circumplex, including unpleasant affect which is high in activation – such as anxiety, and low in activation – such as depression and burnout, and also for pleasant affect which is high in activation – such as engagement and vigour, and low in activation – such as work or life satisfaction. This is novel in occupational psychology, as Vigili's (2015) meta-analysis focused on psychological distress and did not include positive measures of well-being such as engagement and satisfaction. The training appears to be effective at reducing negative mental states, as well as boosting positive affective experiences, as shown by the beneficial effects on measures from around the affective circumplex, suggesting that the training is suitable for a range of populations and different affective baselines at work whether the aim is to boost engagement and satisfaction, reduce depression and anxiety, or a mixture from the quadrants of the circumplex.

The subgroup analyses indicate varying effects on each of the five facets of mindfulness and suggest that modified MBSR should maintain opportunities to practise Observing and becoming more attentive to inner and outer experience if it is to be successful. This division of meta-analytic data into the five facets gives a novel perspective to consider that is not evident in earlier reviews.

To my knowledge, there has not previously been an examination of the effect of removing the retreat day from the traditional MBSR format, although this is common practice in work-based interventions. The inclusion of this subgroup analysis has indicated that retreat day removal is not significantly detrimental to course success, and furthermore that the success or failure of a course should not be attributed to this modification. This will have positive implications for practitioners when a full retreat day is not feasible for an organisation as this should not rule out MBSR as an effective intervention.

9.1.6 Author's Conclusions

In order to conclude the discussion of Study 1, final observations will be made addressing each aim of the systematic review. Thus far, this section has summarised the findings of the review, discussed potential biases, strengths, and limitations of the process, considered how the present findings compare to existing reviews in this field,

and highlighted the contributions of the research findings in creating actionable knowledge. This final part of Section 9.1 will draw together the conclusions for Study 1 within each aim of the systematic review and propose future research directions.

Aim 1: To ascertain the mean effect of MBSR training upon a) well-being and b) mindfulness skills of working populations, using meta-analysis.

MBSR training was found to have a medium-sized effect upon both well-being and mindfulness, when compared to an inactive control group. The studies included in each of these analyses showed low heterogeneity, suggesting that a single estimated overall effect size could be applied to this group of studies. Meta-regression indicated a positive relationship between risk of bias and effect size, which may mean that this overall effect size has been over-estimated; however, the inclusion of only RCT studies, which necessarily mitigate some of the risks of bias in their design, means that this over-estimation should not be as large as in the case of uncontrolled or quasi-experimental study designs. For the avoidance of overly conservative assessments of risk of bias, future study findings should be reported in line with CONSORT guidelines (Montgomery et al., 2013), which make potential biases clear.

Post hoc analyses of a subset of studies that reported results for the five subscales of the FFMQ (Baer et al., 2006) show a large effect of MBSR upon Observing skills. In practical terms, this could suggest that noticing more about things happening both inside and outside of the body and mind, is the key mindfulness skill learnt on the course. Opportunities to practise observing and becoming more attentive to inner and outer experience should therefore be maintained as some of the key outcomes of the course. The effect of MBSR upon different elements of the FFMQ is also considered in Study 2, and is discussed in the next section of this chapter (Section 9.2). The findings indicate that MBSR is an effective way of improving the well-being and mindfulness of working participants.

Aim 2: To ascertain the mean effect of MBSR training upon a) well-being and b) mindfulness skills of working populations at a follow-up measurement point beyond the end of the intervention, using meta-analysis.

The sample showed a paucity of follow-up measurements where the control group were maintained, which is a common consequence of using waiting-list control groups of individuals keen to experience the intervention themselves. For the three studies that included a controlled follow-up, a small and statistically significant effect was

found upon well-being, and for the two of these that measured mindfulness, a non-significant effect was found.

In contrast to previous research findings (e.g. Benn et al., 2012; Kemeny et al., 2012; Virgili, 2015), the effects of MBSR upon mindfulness were not maintained at a six-month follow up therefore Study 1's findings are not as strong as expected. The small sample and high variation in studies prevent any firm practice-related conclusions in this area, and validate the need for more RCTs that maintain the control group to a follow-up measurement point before offering the intervention to any wait-list control participants. Such follow-up evaluations are essential when determining the long-lasting effects of MBSR.

Aim 3: To ascertain the effect upon a) well-being and b) mindfulness skills of a reduced programme of MBSR, when compared to studies that include the standard minimum of 16 hours contact time, using moderated meta-analysis.

A third of the included studies utilised interventions that reduced the standard number of contact hours, with subgroup analysis showing no significant difference between the estimated effects for studies that reduced training time and studies that did not. In the present review, all studies were required to maintain at least three out of four of the core elements of MBSR (see Figure 4.1), and this may have ensured that courses were shortened without detriment to quality. However, in the current sample, all studies maintained all four core elements meaning that it was not possible to conduct post hoc sensitivity analyses to see if studies retaining only three elements differed in their effects. This could prove to be an interesting area of study as more evaluations of modified MBSR are published, in order to explore the differential effects when specific elements of the programme are removed. The four elements of mindfulness (defined by de Vibe et al., 2012) provide a novel way with which to assess the fidelity of a modified course to the original elements of MBSR. The present findings suggest that the course is equally effective when modified, if the reduced programme still contains tasters from each element of the original format. In addition, assessing other factors that may contribute to the success of a shortened intervention, such as participant attendance, and participant homework compliance, may become more important when contact time is shortened. Such elements are difficult to assess in a systematic review without subject-level data, and a call has been made for researchers to share such data in order to allow large-scale analysis of trends at an individual level (de Vibe et al., 2017).

Aim 4: To ascertain the effect upon a) well-being and b) mindfulness skills of MBSR programmes which include a retreat day, compared to those that omit this from the traditional MBSR format, using moderated meta-analysis.

The removal of the retreat day is another common form of course modification, with two thirds of the included studies omitting this element of MBSR. Although reasons were not explicitly given for this modification, it is possible that the extra cost to organisations – in terms of working hours lost, instructor fees, and the coordination of a whole group's working schedules to accommodate a day-long session – may be unpopular in many organisations. It is also possible that a full day of mindfulness practice, usually conducted in silence, represents the more 'New Age' end of the spectrum of mindfulness activities, which may be unpopular in a corporate setting. In the present sample, the inclusion or exclusion of the retreat day did not produce substantially different effects upon well-being or mindfulness, suggesting that this is a logical modification of the intervention if it serves to make MBSR more acceptable to participants, and more feasible for organisations in terms of costs and employee time.

In summary, the first section of the discussion chapter has gathered and critically appraised the findings of the systematic review. As recommended by the Cochrane Handbook (Higgins & Green, 2009), the completeness, strengths, and limitations of the systematic review process have been considered carefully to give the reader a clear idea of how close to the true effects of MBSR at work this systematic review has come in its estimations. The findings have been weighed against existing narrative and meta-analytic systematic reviews, implications and contributions of the study to theory, methodology, and practice have been highlighted, and recommendations for future research have been proposed. The second part of the discussion chapter will critically appraise the findings of Study 2, which also evaluates the effect of MBSR upon well-being and mindfulness of employees, as well as the effect upon resilience and emotion regulation.

9.2 Study 2: Intervention Study – Evaluating the effects of MBSR upon well-being, mindfulness, resilience and emotion regulation for NHS employees

9.2.1 Summary of main results

For Study 2, the discussion is divided into five subsections. Firstly, a descriptive summary of the results reported in Chapters 7 and 8 of the direct and indirect effects respectively will be given. Next, a critical synthesis of these findings with the existing

literature will be considered, as well as possible explanations for any unexpected results. The implications of the direct and indirect results will be considered and the contributions the research makes to theory, methodology and practice. Limitations and possible areas of future research will then be outlined, and the discussion of Study 2 will end with conclusions of all of the findings when taken together.

Direct effects of MBSR.

In the first chapter of results for the intervention study (Chapter 7), data from 61 participants were analysed using multi-level modelling to ascertain the effect of MBSR relative to a control group comparing baseline data with post-intervention data (T1-T2), and post-intervention data with six-month follow-up data (T2-T3) for the four key outcome measures: mindfulness, workplace well-being, resilience, and emotion regulation.

As can be seen in Table 9.2 below, the estimated effect size between T1 and T2 varied for each facet of mindfulness measured by the FFMQ (Baer et al., 2006) although all of the effects were large and statistically significant, with the largest effects for Observing and Non-reactivity to inner experience, followed by Describing and Non-judging of inner experience, and then Acting with awareness. As such, Hypothesis 1a was supported and MBSR significantly improved mindfulness skills relative to the control group when measured immediately after the intervention, and broken down into the five facets of mindfulness. Breaking mindfulness down into facets shows which areas of skill are most improved by the training – there was a much stronger effect upon Observing skills and Non-reactivity to inner experience than the other facets, suggesting that these are key areas of development in MBSR training and contribute substantially to the increase in mindfulness skill overall.

Table 9.2 Summary of findings – effect sizes for all outcomes of Study 2

SCALE	SUBSCALE	Effect Sizes		
		<i>g</i> (95% CI)		
		T1-T2	T2-T3	T1-T3
FFMQ	Composite Scale	1.48* (0.89, 2.07)	-0.90* (-1.55, -0.26)	0.61 (-0.02, 1.24)
	Observing	1.48* (0.89, 2.08)	-0.94* (-1.59, -0.29)	0.36 (-0.26, 0.98)
	Describing	1.08* (0.52, 1.64)	-0.49 (-1.11, 0.14)	0.53 (-0.10, 1.15)
	Acting with Awareness	0.90* (0.35, 1.46)	-0.59 (-1.22, 0.04)	0.44 (-0.19, 1.06)
	Non-Judging	1.08* (0.52, 1.64)	-0.65* (-1.22, 0.04)	0.44 (-0.19, 1.06)

	Non-Reactivity	(0.52, 1.64) 1.44* (0.85, 2.03)	(-1.28, -0.01) -0.75* (-1.39, -0.11)	(-0.19, 1.06) 0.57 (-0.06, 1.20)
MAI	Composite Scale	0.77* (0.23, 1.31)	0.10 (-0.51, 0.71)	0.91* (0.27, 1.56)
	Anxiety-Comfort	0.80* (0.26, 1.33)	-0.12 (-0.73, 0.49)	0.70* (0.07, 1.33)
	Depression-Enthusiasm	0.59* (0.06, 1.12)	0.31 (-0.30, 0.93)	0.98* (0.33, 1.63)
CD-RISC		1.05* (0.50, 1.60)	-0.22 (-0.83, 0.39)	0.88* (0.24, 1.52)
ERQ	Cognitive Reappraisal	0.96* (0.41, 1.50)	-0.22 (-0.83, 0.40)	0.71* (0.08, 1.34)
	Expressive Suppression	0.28 (-0.24, 0.80)	-0.14 (-0.75, 0.48)	0.16 (-0.45, 0.77)

Note. g = Hedges' g . FFMQ Composite Score only used in mediation models in Chapter 8.
*Statistically significant effect size with 95% confidence intervals that do not span zero.

Table 9.2 also summarises the standardised effects of MBSR between T2 and T3 compared to the control group, in order to test Hypotheses 1b, which predicts the maintenance of beneficial effects during the six-month follow-up period. However, the results are mixed for the facets of mindfulness – three of the mindfulness facets with the largest effect sizes between T1 and T2, are now showing statistically significant reductions in effect in Observing, Non-reactivity to inner experience, and Non-judgement of inner experience, whilst the changes during the follow-up period to Describing and Acting with awareness were not statistically significant.

In order to assess the overall effect of MBSR upon mindfulness across the two months of training and the six-month follow-up combined, and determine whether the large benefits between T1 and T2 are completely reversed between T2 and T3 for any variables, effect sizes were also calculated comparing group means at T1 and T3, which are also shown in Table 9.2. For the five facets of mindfulness separately, these do not show a significant improvement relative to the control group (the estimated effect sizes themselves are mostly medium-sized and are all positive, but the confidence intervals span zero indicating that they could be due to chance), and the combination of the facets to give an overall mindfulness score shows a medium-sized effect which is nearing statistical significance (with a confidence interval starting close to zero). Despite an improvement of mindfulness scores from baseline (when the intervention group showed lower levels of mindfulness than the control group) to the end of the follow-up eight months later, this improvement is not significant when

compared to the control group. This is largely because the control group also improves over time, particularly within the follow-up period, which results in both groups reporting similar mindfulness scores by the end of the study.

In summary, all facets of mindfulness ceased to improve once the training had finished, and in some cases, there was a decline in the level of mindfulness skill or an increase in mindfulness in the control group over the same time period, which narrowed the difference between the two groups. It may be the case that without on-going group practise and support, MBSR effects upon mindfulness begin to fade, and that the continued support of the group may be needed to achieve long-lasting effects upon mindfulness.

Work well-being was measured using the MAI (Warr et al., 2014), with a focus upon the 16-item total scale score and the two diagonal axes. Hypotheses and effect sizes relating to the well-being outcome are shown in Table 9.2. When analysing all items of the MAI from around the affective circumplex, there was a medium-to-large, statistically significant effect of MBSR upon well-being at work, relative to the control group between T1 and T2. When divided into the two diagonal axes of well-being, this effect was made up of a slightly higher effect on the Anxiety-Comfort axis of $g = 0.80$, and a slightly smaller effect of $g = 0.59$ on the Depression-Enthusiasm axis, both of which were statistically significant. Hypothesis 2a is therefore supported for these outcomes. For the full-scale and the two diagonal axes, these findings are maintained at follow-up, supporting Hypothesis 2b and suggesting that the beneficial effects of MBSR upon work well-being are maintained outside of the supportive environment of the MBSR programme, even when participants report decreased mindfulness skills. Inspecting the estimated effect between T1 and T3, the significant, large effects indicate that the intervention group were more mindful after eight months than when they entered into the study compared to the control group, who reported similar mean scores at all of the time points.

As hypothesised, resilience significantly improved relative to the control group between T1 and T2, with an effect size of $g = 1.05$ and was then maintained at follow-up where no significant change in effect was found. Consequently, Hypotheses 3a and 3b are also supported, indicating that MBSR has a strong and long-lasting effect upon resilience skills, which extends for at least six months beyond the support of the intervention. This effect is confirmed when comparing T1 and T3 mean differences, where control group scores remain flat as the intervention group becomes more resilient over time.

Emotion regulation was the final outcome of interest, divided into two subscales in the ERQ: cognitive reappraisal and expressive suppression (Gross & John, 2003). Cognitive reappraisal was hypothesised to increase as a result of MBSR (Hypothesis 4a), and this hypothesis was supported with a large and significant effect size between T1 and T2. This effect was maintained at follow-up, in support of Hypothesis 4b, and similarly, the effect size for T1 to T3 mean change was large and significant, as intervention group scores increased, but control group scores increased only slightly. Expressive suppression was hypothesised to reduce as a result of the intervention (Hypothesis 5a); however, the null hypothesis could not be rejected in this case. Although expressive suppression was used slightly less frequently by intervention participants after the training, this was not significantly different from the control group between T1 and T2, or between T2 and T3 (Hypothesis 5b). The estimated effect between T1 and T3 was also small and non-significant as intervention group use of suppression decreased only slightly more than control group use. These findings indicate that MBSR improves cognitive reappraisal relative to a control group and that participants still report high levels of cognitive reappraisal six months later. Consequently, MBSR trainees are altering how they think about a situation as a means to regulate emotions about the situation. However, it does not have any immediate or delayed effects upon expressive suppression when measured six months after the end of the intervention, and there was no evidence that MBSR significantly reduced the degree to which they used suppression to hide their emotions as a form of regulation. Expressive suppression was consequently not included in any further modelling of the mediation pathways of MBSR reported in Chapter 8.

Indirect effects of MBSR upon well-being.

Analyses of possible mediation pathways were conducted in order to explore how mindfulness training may impact upon well-being. The proposed mediation model is shown in Chapter 6, Figure 6.2, and tests Hypothesis 6 proposing that the effect of MBSR training upon well-being is mediated by mindfulness, resilience and emotion regulation. This is further broken down into two models – one which explores mediation pathways across T1 and T2 (see Figure 8.2), and one which considers them across all three time points (see Figure 8.5).

In Model 1, which uses outcome measures from T2, the hypothesised mediation pathway via mindfulness and resilience was supported. Specifically, the unstandardized coefficients show that being a member of the intervention group

increased mindfulness scores by approximately 0.68 on the five-point scale, with every one-point increase in mindfulness then increasing resilience by approximately 14 points on the 100-point scale, and each one-point increase in resilience leading to a 0.03 point increase in well-being on the six-point scale used in this study compared to the control group. In contrast, the pathway via mindfulness and emotion regulation was not significant, as although a one-point increase in mindfulness was linked to a statistically significant 0.66 increase in cognitive reappraisal on the seven-point scale, this was not linked to a significant change in well-being. When the three mediators were present in the same model, there was no direct effect of mindfulness upon well-being, and the overall indirect effect was highly significant, demonstrating that the effect was dispersed between mindfulness, resilience and emotion regulation, which were together explaining 40% of the variance in well-being. These findings suggest that between T1 and T2, MBSR training exerts effects by improving mindfulness skills, which in turn increase resilience and emotion regulation, and that it is the increase in resilience, which is related to improvements in participant perceptions of well-being at work.

The key difference in Model 2 was the inclusion of well-being data from T3 instead of T2 to create a causal six-month time lag between the mediators and the dependent variable. This change resulted in weaker mediation pathways to well-being. In this model, the total indirect effect is small and only just significant, and explains 33% of the variance in well-being. Looking at these indirect pathways in more detail, both the indirect pathway via mindfulness and resilience, and the indirect pathway via mindfulness and emotion regulation are no longer statistically significant. Furthermore, the indirect pathway via mindfulness alone is now approaching significance and the direct effect of group upon well-being is significant. These findings suggest that when measured six months after intervention, well-being is being directly and positively affected by having had MBSR training compared to the control group. This effect is independent of the levels of resilience and emotion regulation measured immediately after the training, but may be bolstered indirectly by increases in mindfulness straight after the course. It may be that the increases in mindfulness and resilience at T2 as a result of training are catalysts for an increase in well-being, and the way that this positively changes participant judgements of their affective quality of life outlasts its previous mediators and is still evident six months after the intervention.

9.2.2 Agreements and disagreements with previous literature

This section reflects back on the literature reviewed in Chapters 2 and 3, and critically appraises how Study 2 fits into the existing body of knowledge regarding the use of MBSR in the workplace in relation to mindfulness, well-being at work, resilience, and emotion regulation.

Mindfulness.

Chapter 2 Section 2.1 reviewed Buddhist perspectives of mindfulness as a means to train the mind to deal with both the ordinary and extraordinary events of daily life, extending to the attainment of enlightenment. The beneficial increase in mindfulness skills following MBSR, and particularly the large improvement in Observing skills, suggests that participants are developing their capacity for 'bare attention' (Nyanaponika, 1962). The questions on the Observing subscale of the FFMQ relate to noticing external stimuli and the ways they affect cognition; when combined with Non-judging of inner experience, it is possible that these enhanced skills are cultivating a watcher self as described by Deatherage (1975). There are also parallels with the meta-analytical findings of Study 1 (discussed in Section 9.1.5 above), where MBSR was also found to have the largest effect upon observation skills and Non-reactivity to inner experience, with slightly lower effects on the other facets. These elements suggest that during the training participants are developing the qualities of attention described as a first step in becoming more mindful.

The findings of Study 2 can be discussed within the context of the theory of the mechanisms of mindfulness proposed by Shapiro and colleagues (2006) as shown previously in Figure 3.1, and discussed in depth in Chapter 3, Section 3.1.1. Immediately after the training at T2, the axioms of attitude and attention are evident in the FFMQ facet scores; the development of an *attitude* of non-judging and non-reactivity is shown compared to the control group, and greater *attention* to thoughts, sensations and external stimuli is shown with the very high levels of Observing measured after the intervention. Whilst the axiom of intention is not directly measured within Study 2, it could be said that by agreeing to the terms and conditions of the MBSR training schedule (relating to attendance, home practice, and communication with the teacher) and by completing the course, participants have maintained a clear motivating intention. This motivation is necessary as the training requires a high level of commitment, particularly with regards to practising at home six days per week. In summary, the results on the FFMQ lend support to the concept of three axioms of intention, attention and attitude, and their improvement through MBSR training.

In Shapiro and colleagues' theory (2006), the axioms bring about a process of re-perceiving or decentering; this is an aspect of the theorised mechanism that is more elusive to empirical study, as it represents a cognitive shift, which is evidenced chiefly in its outcomes. The axioms of intention, attention, and awareness allow for the open, patient, and non-judgemental processing of stimuli in the present, they create a pause before predictions, automatic reactions, or habitual responses are triggered. By pulling oneself up short of any typical, knee-jerk, or auto-pilot behaviours, a void opens between stimulus and response which affords the opportunity to look at things differently – to re-perceive events through the lens of an objective observer and, if action is required, to make a conscious and mindful choice of how to proceed. The large effect of MBSR training upon the Acting with awareness facet of the FFMQ indicates that the training has facilitated this pause for thought and resultant deliberate action. As was discussed in Chapter 3, Section 3.1.1, improved self-regulation, values clarification, flexibility, and exposure are the theorised outcomes of re-perceiving, some of which are demonstrated in the results of Study 2 using the resilience and emotion regulation outcomes – these results will be discussed in the relevant subsections below. The findings also concur with previous individual studies of workplace MBSR interventions that have found an increase in mindfulness skills pre- to post-intervention (e.g., Asuero et al., 2014; Manotas et al., 2014; Roeser et al., 2013) and the findings of de Vibe and colleagues' (2012; 2017) systematic review of MBSR for adults. However, the results of Study 2 also show that the effects of MBSR upon mindfulness did not last, and are no longer present at the six-month follow-up, despite the maintenance of high levels of workplace well-being, resilience, and emotion regulation. This unexpected finding is counter to existing research and will be discussed below.

During the six-month follow-up period after the MBSR course, it was hypothesised that mindfulness skills would be maintained, however the null hypothesis could not be rejected in this case, as the intervention group showed significantly improved mindfulness levels relative to the control group between T1 and T2, but then showed significantly reduced levels relative to the control group between T2 and T3. In the few prior studies that have included a follow-up, the effect of MBSR upon mindfulness has generally been found to extend into follow-up periods of varying lengths. For example, Roeser and colleagues (2013) found that improvements in mindfulness measured by the FFMQ were maintained at a three-month follow-up for the intervention group, whilst control group levels did not change from baseline. When inspecting the means for each group in Study 2, there are two ways in which the

pattern of results for the mindfulness outcome are unexpected. Firstly, the intervention group report large reductions of mindfulness skill on the Observing subscale, and secondly, the control group show large improvements during the follow-up period on every subscale. The combination of these two elements means that at T3, the means for the two groups on all subscales are almost the same. It is possible that external factors have contributed to this finding – as this is a waiting-list control group, those waiting for training may have supplemented their interest in mindfulness with some of the many self-directed mindfulness resources available. This is a common problem in field research where the control group is not completely under the control of the researcher.

Another possible explanation for the improvement in control group mindfulness is that the mindfulness of colleagues is crossing-over from the intervention participants to control group participants with whom they work. The crossover effects of workplace well-being (whereby effects upon one individual are transmitted to other individuals in close proximity) have been shown in the marital partners of employees experiencing work strain (Bakker, Demerouti & Burke, 2009), and recently in relation to the crossover of high work engagement to colleagues in work teams (van Mierlo & Bakker, 2018). More specifically, daily mindfulness at work has been found to effect spousal relationship satisfaction at home (Montes-Maroto, Rodríguez-Muñoz, Antino & Gil, 2017). As such, it is possible that increased mindfulness of MBSR participants during training has crossed-over to colleagues, some of whom were in the control group, explaining their increase in mindfulness over time. However, well-being and resilience remained relatively unchanged for the control group at all time points, suggesting that crossover has not occurred in these areas. The crossover effects of mindfulness from individuals to work groups would form an interesting area of future study whereby the benefits and consequences of training upon the wider organisation could be explored when only a subset of employees have received the intervention.

As has been previously discussed in Chapter 3, Section 3.2.3, MBSR evaluations have not always included a measure of mindfulness in the outcomes of interest. Study 2 therefore answers a call for mindfulness to be measured pre- and post-intervention, and at follow-up as a matter of course in evaluations (Jamieson & Tuckey, 2017). This bolsters the internal validity of interventions claiming to operate via an increase in mindfulness, and helps the researcher to determine if the training was fit for purpose. In addition, Study 2 follows the recommendation of de Vibe et al. (2012) for researchers to utilise the FFMQ to measure mindfulness as a

comprehensive and well-validated measure of several key features of mindfulness, and in doing so, helps to clarify the processes occurring during MBSR training.

Well-being.

In Chapter 3, Section 3.2, well-being as a quality of life self-evaluation based on affective experiences was discussed in the context of work using Warr's theoretical framework of affect around the circumplex (Warr, 1990; Warr, 2007; Warr et al., 2014). In order to evaluate the effect of MBSR upon affect at varying levels of activation (high/low) and valence (pleasant/unpleasant), the MAI was used to measure overall well-being at work using the 16-items from around the circumplex, and on the two axes of Anxiety-Comfort and Depression-Enthusiasm. The effect of mindfulness interventions upon well-being is arguably the most researched area of workplace mindfulness to date, and existing research resulted in hypotheses that well-being would be improved and then maintained at follow-up compared to the control group. These hypotheses were confirmed, with large effects found for overall well-being and for the Anxiety-Comfort and Depression-Enthusiasm axes, which were maintained at follow-up, whilst control group scores remained static throughout. As argued in the previous section's discussion of Study 1 (see Section 9.1.4), this effect is in line with several systematic reviews and meta-analyses from general populations of adults (de Vibe et al, 2012, 2017), and working adults (Virgili, 2015) and specifically healthcare practitioners similar to those in the present NHS-based study (Lamothe et al., 2016). It is also in agreement with, although a somewhat stronger effect than found in, a more recent meta-analysis of studies involving health care practitioner samples utilising a range of mindfulness-based interventions ($r = 0.34$, CI 95% [0.20-0.47]; Burton, Burgess, Dean, Koutsopoulou & Hugh-Jones, 2017). As such, the study adds further support to the use of MBSR as an effective and long-lasting means to improve well-being.

Returning to Shapiro and colleagues' (2006) theory of the mechanisms of mindfulness, increased well-being is proposed as the final outcome in a chain of beneficial effects resulting from the intention, attention, and awareness axioms of mindfulness, and the cognitive re-perceiving they invoke. Consequently, the results of Study 2 discussed thus far support the beginning and the end points of the theory with mindfulness and well-being, but have yet to address the mechanisms that may create indirect pathways between mindfulness and well-being in the applied situation of an MBSR course. These mechanisms are explored using measures of resilience and emotion regulation, which will now be discussed in turn.

Resilience.

Resilience literature was previously reviewed in Chapter 3, Section 3.3, where it is characterised by successful coping strategies and adaptation when confronted with difficulty. In a work context, such difficulties may include threat of redundancy, large-scale organisational change, or a disagreement with a manager or colleague. In order to cope with these challenges effectively, Richardson and others (Richardson et al., 1990; Richardson, 2002) propose in their resiliency model that an individual must deconstruct and then reorganise their world view in order to make space for the disruption in a way that not only deals with the disruption, but becomes an opportunity for growth and the learning of new coping strategies. As mindfulness training has often been advertised as a means to boost the resilience of participants at work, the effect of MBSR upon psychological resilience in Study 2 is an important and rare test of this claim, and of the potential mediating effect of resilience upon well-being.

The results of Study 2 for resilience follow a similar pattern to those of well-being discussed above – resilience was found to increase significantly between T1 and T2, which was maintained between T2 and T3, whilst the control group scores fluctuated very little around the baseline mean. When comparing MBSR to other resilience training interventions, the effect upon well-being is much larger than was found in the review by Vanhove and colleagues (2016; $d = 0.21$, 95% CI [0.13, 0.29], $k = 42$, $n = 16,348$), suggesting that MBSR has merit as a means to improve resilience, although this is not generally the primary intention. Furthermore, unlike previously discussed interventions (Mealer et al., 2014; Pidgeon et al., 2014), MBSR shows a significant effect upon resilience immediately after training for the intervention group relative to the control group.

Of particular note here is the study by Aikens and colleagues (2014) which was also included in the systematic review for Study 1. The Aikens study also measured resilience as a dependent variable using the CD-RISC, and the reported means and standard deviations indicate a large, significant effect of the intervention upon resilience ($g = 0.80$, 95% CI [0.37, 1.23]) for their intervention group compared to the control group between T1 and T2, which although slightly smaller than the effect found in Study 2, supports the concept of increased resilience as a result of MBSR training. Aikens and colleagues (2014) included an uncontrolled six-month follow-up in their study, showing a maintenance of resilience scores for the intervention group, which is also in line with the findings of Study 2, and suggests that the effects of MBSR upon resilience are maintained for a considerable time after the intervention

concludes. Aikens and colleagues also briefly describe mediation analysis stating that mindfulness partially mediates the effect on resiliency and fully mediates the effect upon perceived stress. No further data or methodological details are provided however, so it is not clear if the mediation analysis is cross-sectional or longitudinal, or which groups are included from the study. Overall, these findings are encouraging, yet more research is needed to evaluate effects on resilience across occupational samples before there is sufficient evidence behind the bold statements made about the resilience-boosting effects of MBSR.

Emotion regulation.

Gross defines emotion regulation as "...how individuals influence which emotions they have, when they have them, and how they experience and express them" (Gross, 1998, p. 271). The literature reviewed in Chapter 3, Section 3.4, highlights cognitive reappraisal – the capacity to change how one thinks about a positive or negative stimulus, in order to make sense of and cope with it, and expressive suppression – the ability to change the expression of emotion at the point of responding to a stimulus. These are two elements of the process model of emotion regulation (Gross, 1998) and are measured using the ERQ (Gross & John, 2003) in Study 2.

Between T1 and T2, there was a large, significant effect of MBSR upon cognitive reappraisal for the intervention group relative to the control group and continuing six months later at follow-up, showing that after the training, participants were more likely to change how they thought about events as a means to influence their own emotions. This finding supports previously discussed research using the ERQ to measure cognitive reappraisal in teachers after a mindfulness-based intervention (Jennings et al., 2013). In another parallel to the work of Jennings and colleagues, no significant effect of MBSR upon expressive suppression was found in Study 2. Jennings and colleagues propose that this result is due to effects needing more time to develop, and this proposition is tested in Study 2 with the six-month follow-up but is not supported, as the effect size is actually smaller during the follow-up period and therefore is not growing over time. It is possible that the two-stage process of becoming more mindful is not captured in the reporting of emotion regulation – firstly, participants become more aware of their surroundings, thoughts and emotions, and as such, compared to baseline they observe that they actually suppress their emotions more often than they initially thought (resulting in higher levels of reported suppression). In the second stage of development, as this objective awareness

creates a pause between stimulus and response, participants may now be in a position to sometimes choose to regulate emotions in different ways before they come to a response, thereby reducing the need for expressive suppression (resulting in lower levels reported suppression). If these two processes are both happening between two measurement points, it may be possible that they are cancelling each other out. In order to test this in the future, it may be necessary to test the sensitivity of the ERQ with populations with different levels of mindfulness experience, or to measure outcomes at more time points during and after the intervention to capture the nuances of this process.

It may also be the case that the ERQ is not the most appropriate measure of changes in emotion regulation as a result of mindfulness training. Some items on the ERQ relate to the active control of emotion, either positive or negative, and although reappraisal (i.e. changing how one thinks about a situation in order to change an emotion) is considered an adaptive form of regulation, mindfulness is not intended as a method of control. Being more aware of habitual judgements of and responses to stimuli *may* lead a person to decide to behave differently, but this is not dictated and controlled by being mindful. As such, the ERQ may not be nuanced enough to measure changes in emotion regulation that are a possible consequence of the training, but not the goal. Future research using alternative emotion regulation measures is needed to explore this further.

Mediation model.

As summarised in Section 9.2 earlier in this chapter, mediation analysis allowed for the exploration of the mechanisms by which mindfulness training impacted upon well-being at work. When considering all outcome variables at T2, a significant indirect pathway was found between group (intervention/control) and well-being via mindfulness and resilience in sequence. As such, being in the intervention group and receiving MBSR training was associated with greater mindfulness, which was related to more resilience, which in turn was related to greater well-being at work. The subsections above have already considered how the reported results for mindfulness and well-being may fit into the theory of the mechanism of mindfulness proposed by Shapiro and colleagues (2006), and this subsection will extend that discussion to include the two further mediators – resilience and emotion regulation.

As discussed above, the large effect of MBSR upon both mindfulness and well-being supports the beginning and end points of the process described by Shapiro and colleagues (2006; Figure 3.1), and by considering the mediation model results in more

detail, the inner workings of the proposed theory can also be discussed. In the theory, re-perceiving is posited to impact upon four key areas of self-regulation, values clarification, flexibility (in cognition, emotion and behaviour), and exposure. Resilience relates closely to self-regulation, requiring an assessment of the current state, what action needs to be taken, and what resources will be required (Richardson et al., 1990), whilst the ERQ measures self-regulation of emotions, and also the capacity for emotional flexibility when faced with both positive and negative situations. As such, these two measures function as mediators in the theory between mindful re-perceiving and improved well-being. The results at T2 support this theory via resilience, but not via emotion regulation, where no significant indirect pathway was found. This meant that although increased emotion regulation (in the form of cognitive reappraisal) was mediated by increased mindfulness, this improved regulation did not go on to impact upon workplace well-being, whereas resilience did.

One possible explanation for the lack of relationship between emotion regulation and well-being is that the new increased capacity for reappraising situations before reacting emotionally to them is an effortful process, which dampens the positive effect upon well-being. The process of experimentation to determine what alternative cognitive approaches one could take towards a situation or stimulus may be one that is resource-depleting and sometimes unsuccessful until it is well practised. The cost to well-being of actively altering one's authentic emotions for public display is well documented in research into emotional labour (e.g., Grandey, 2000; Hochschild, 1983), therefore future, potentially qualitative research could explore how effortful individuals find the development of this ability to reappraise situations before reacting, particularly when this may be a skill participants were not conscious of prior to training.

In order to test for a causal chain between the mediators and the well-being outcome, the second mediation model used the mediator measurements at T2 and the well-being measure at T3. The results for this model were quite different to the previous one, as the indirect pathway via mindfulness and resilience was no longer significant and there was a direct effect of group membership on well-being, with an almost significant indirect pathway via mindfulness only. These findings suggest that six-months after training MBSR is still positively impacting directly upon work well-being, but other improvements in mindfulness and resilience are no longer contributing to this effect. It is possible however that this mediation model is underpowered – the only difference between Model 1 and Model 2 is the inclusion of well-being data from

T3 instead of T2, and at T3 attrition causes a drop in total sample size of almost a third from 61 to 40 participants, which may have resulted in a type II error. As a result, replication of this design with a larger sample may provide more accurate results.

9.2.3 Implications and contributions

This section will discuss the implications of Study 2, and the contributions this research makes to theory, methodology and practice in the field of workplace mindfulness interventions.

Theoretical implications and contributions.

Study 2's primary contribution to theory is the testing of Shapiro and colleagues' (2006) theory of the mechanisms of mindfulness, specifically in a work setting. The study results indicate that MBSR conducted in the workplace develops the three axioms of mindfulness (intention, attention and attitude), and creates an opportunity for re-perceiving to occur, which is apparent from the increase in Acting with awareness after training. Furthermore, Study 2 indicates that this increase in mindfulness has a subsequent effect upon self-regulation and emotional flexibility in the forms of resilience and emotion regulation. Immediately after training, the effect upon resilience mediates the resultant effect upon well-being, however this effect seems to fade after training. Such applications of the mechanism of mindfulness theory are rare, and to my knowledge this theory has not been applied to MBSR interventions in the workplace previously.

Methodological implications and contributions.

The application of the MAI, which measures affect that is high and low in both activation and valence, as part of a workplace MBSR evaluation is novel, and allows for measurement of a range of affect within one consistent and validated measure, rather than using different instruments to measure affect in each quadrant of the affective circumplex. The use of this measure has indicated that MBSR reduces negative affect and increases positive affect that is both high and low in activation and has slightly different effects on the two diagonal axes of anxiety-comfort and depression-enthusiasm that characterise prevention-focused self-regulation and promotion-focused self-regulation respectively. Furthermore, the MAI in Study 2 asks participants about affective states at work, as opposed to life in general, which is of greater interest in organisations who expect increased well-being at work to also be beneficial to organisation-level outcomes such as sickness absence or performance.

The mediation analyses in Chapter 8 extend current methodological approaches by not only assessing individual mediators which may be part of the process by which MBSR increased well-being, but building a complex mediation model including serial and parallel mediation in order to explore a theorised mechanism. This was made possible by using Mplus, a pathway analysis software, rather than other add-ons available to use with SPSS. Such complex models have increased ecological validity reflecting the reality of a process which is unlikely to be influenced by only one mediator at a time.

Practical implications and contributions.

Like Study 1, the findings of Study 2 support the use of MBSR as an effective tool for increasing well-being in the workplace. In particular, the study demonstrates the benefits of MBSR to NHS staff in the UK, whereas the majority of research is conducted outside of the UK. No eligible studies for the systematic review were found from the UK, and NHS staff mindfulness interventions more often employ MBCT (perhaps because this is the intervention given to NHS patients with recurring depression under NICE guidelines, and therefore is most familiar). This study shows that MBSR without the inclusion of cognitive therapy techniques, and without a population that have a diagnosis of depression, is also an effective way to increase employee well-being. However, the effects upon mindfulness fade over time, and this may suggest the need for organisations to support the maintenance of these skills by providing facilities, and encouragement to trainees to continue their practice, for example by making a meditation space available at break times.

A claim is often made by practitioners that MBSR will boost resilience at work, yet this proposition has rarely been tested, as discussed previously in Section 9.2.2. A very large effect of MBSR upon resilience in this study provides support for this claim, and when compared to previous resilience research suggests that MBSR may be more effective in this area than other resilience-focused interventions. Consequently, MBSR may be of additional benefit where organisations wish to not only enhance well-being but also cultivate employees who are more confident in their own abilities to deal with challenging situations at work.

The inclusion of emotion regulation as a possible outcome is also rare in mindfulness interventions as discussed in Section 9.2.2. Emotional labour is more commonly researched in the workplace, with a focus upon employees in customer-facing roles. Study 2 provides evidence of the benefits of MBSR upon cognitive reappraisal of stimuli as a means to control emotion, and has practical relevance by confirming that

the effect of mindfulness upon emotion extends beyond emotional displays in service workers by using a general emotional regulation scale, and a sample including staff with in administrative as well as patient-facing roles.

9.2.4 Limitations and areas for future research

There are a number of limitations to Study 2 that may have influenced the strength and direction of the results found, which will now be discussed. Firstly, it was not possible to conduct an RCT as intended when this study was designed due to objections by the NHS Trust's local Research and Development team, despite this design receiving full ethical approval in the peer-review process at The University of Sheffield. In a large-scale research project, with a Principle Investigator with more agency to negotiate around this decision, it may have been possible to make a stronger case for the implementation of a randomised selection process, however, with limited time before the start of the first MBSR course, a decision was made to quickly resubmit a request to conduct the same research as a quasi-experiment, and the Trust chose to fill places on the courses with employees able to commit to the timings on a first come, first served basis. Participants were then recruited from the course members or the waiting list.

There is a potential for this recruitment process to introduce bias into the research – as this was a Community Trust, many employees worked away from the office or within local prison sites for much of their time, meaning that office-based staff were more likely to see and respond to the advertisements for course participants than those who are working in the community and do not have access to their emails. As the administrators responsible for the training allocation prioritised filling the courses before the start dates, it is also possible that colleagues who kept in touch and showed enthusiasm for the training would be given a place, over those who were slow to commit or asked to switch to another course at short notice.

These factors mean that not all interested employees had an equal chance of being selected for the training, and therefore the population eligible to take part in this research may not have been representative of the Trust's population as a whole. Future, larger-scale studies within NHS Trusts with more time and resource for lengthy planning stages prior to implementation, and with control over the scheduling of MBSR courses with the external provider may allow for successful RCTs in the future. Such difficulties in conducting experimental research in the field are not unknown, but despite the challenges, I still believe that RCTs provide the best opportunity for the quantitative evaluation of new individual-level interventions whilst

attempting to control for as many extraneous known and unknown variables as possible to confidently estimate the true effect of the training.

Secondly, and in relation to the design issues discussed above, a further limitation of Study 2 is the small sample size, which began as 61 participants and declined to 40 sets of eligible participant data at T3. As potential participants in the study could not be approached until after each course had been filled, this drastically reduced the eligible population for the intervention group, resulting in the need to recruit from three rounds of MBSR training. Recruitment could not continue for any further phases as this would not have left enough time for the six-month follow-up period. In general, attrition from the study was low until T3, where a misunderstanding in the Trust's administration team meant that several of the control group were allocated a place on an MBSR course prior to the end of the six-month follow-up period, and therefore 12 sets of control data at T3 had to be removed from the analysis. The local collaborators for the study were experiencing the organisational pressures and challenges discussed in Chapter 6, Section 6.2 of high stress and low morale and a time of government imposed austerity measures. Long-term sickness and the main local collaborator eventually being made redundant were understandable factors in some of the challenges of maintaining the study design. Whilst I successfully applied for an NHS Research Passport in order to reduce the burden of administrating the research and to take direct control over contact with participants, I was not able to control the training schedule and arrangements with the external MBSR provider. This was an ambitious research design for a single researcher, and every attempt was made to continue the running of the study, and to redesign the statistical analyses in order to retain as much participant data as possible whilst testing the study's hypotheses. As suggested above, a larger research project with time and resources to maintain oversight of the entire research process including the intervention and to recruit a larger sample to the available training, would increase the power of the study and therefore increase confidence in the precision of its findings.

A final key limitation of the study was the collection of data at only three time points during the study. Whilst the addition of a long follow-up period was an important contribution of this study, more time points would have allowed for more accurate modelling of the growth curves of each group. For example, the addition of a mid-course measurement point after four weeks could indicate which outcomes improve most quickly in the initial stages of the course, which focus upon being aware of the body, and breath, compared to the second half, when training has turned more

specifically to the application of mindfulness in everyday life. Furthermore, an earlier follow-up measurement point would have modelled more accurately whether effects continued to increase for a period after the training. Additional time points would also populate a more complex mediation model where each sequential outcome could be measured at the following time point to look in more detail at causal relationships between the variables.

There is also much potential for more qualitative research in this area. Whilst Study 2 has been able to analyse trends and mean changes over time, in-depth qualitative research in the form of interviews or focus groups would provide rich context to the results found and help to explain how participants perceive and experience the changes they are numerically scoring in a quantitative survey. This would be particularly beneficial where the results have not supported the hypotheses, for example, the finding that increases in mindfulness skills are not maintained at follow-up. Qualitative research exploring an individual's perceived mindfulness skill over that time period, any rate of decline that individuals may have felt, and whether they felt that the reduction in mindfulness skills was correlated with how much they continued to practice the mindfulness exercises after the course, are all potential avenues of research. Such findings would help to inform academics and practitioners about the type of follow-on support, advice, or encouragement trainees might need in order to retain their newly attained high levels of mindfulness. In addition, the finding that well-being and resilience are maintained despite the decline in mindfulness levels during the follow-up could also be explored qualitatively, to ascertain whether there are elements of the training that have endured that are not captured in the FFMQ.

9.2.5 Author's conclusions

In conclusion, the second part of the discussion has focused upon the results of an MBSR intervention for employees of an NHS Trust in Study 2. A summary of the results from the multi-level modelling of direct outcomes, and the mediation modelling of indirect outcomes was given, and then the findings were critically appraised in comparison to existing research, and explanations were proposed for the findings relating to each hypothesis. In the third part of this section, the implications of the research and its contributions to research, methodology and practice were evaluated, followed by consideration of the limitations of Study 2 as a small, quasi-experimental study with only three measurement time points, and avenues for further research in this relatively new area were proposed.

Using the most rigorous study design possible in the circumstances, Study 2 indicates that MBSR is a viable workplace intervention for the improvement of well-being by reducing the frequency of feelings of depression and anxiety and increasing the frequency of comfort and enthusiasm at work. It increases people's confidence in their ability to cope well with difficult situations, and when wanting to control their emotions in response to life events, makes them more likely to change how they are thinking about the situation. All of these changes bear the hallmarks of awareness and freedom to choose the outcomes of a situation, and to feel happier whilst doing so. As was the case when MBSR was designed for sufferers of chronic pain, it does not eradicate symptoms of poor well-being, but facilitates an increased ability to perceive, evaluate, and then consciously act in situations that may previously have induced a knee-jerk reaction that was not conducive to wellness. In the case of Study 2, this has been possible during a difficult time of redundancy, recession and budget reductions in the NHS, showing the potential to develop well-being through mindfulness even in adverse times. The reduction in benefits to mindfulness skills after the course has finished, suggests that even greater, longer-lasting effects may be possible in the future if people were supported at work to continue their mindfulness practice. Examples of such support include making a room available for meditation during work breaks, encouraging groups to continue to meet informally after the course, and facilitating contact between former trainees, such as online discussion boards or forums, a newsletter, or organising informal gatherings.

9.3 Overall Conclusions

As a final conclusion, the following subsection will return to the overarching research aims of each study as described in Chapter 1, Section 1.1, and the extent to which these aims have been met. The findings of Study 1 and Study 2 will then be synthesised in order to give a complete overview of the findings and implications of this body of research, and the thesis will conclude with final remarks about the future of research into MBSR in the workplace.

9.3.1 Meeting the research aims of Study 1 and Study 2

For Study 1, the overarching aim of the systematic review was to analyse and evaluate the overall effect of MBSR at work for well-being and mindfulness, using a systematic search and meta-analysis of eligible papers. This aim was successfully achieved as almost three thousand research papers were hand-checked for inclusion in the review, resulting in 15 data sets from 16 papers being included in the meta-

analysis. As well as evaluating the effects pre- and post-intervention, the systematic review considered the effects at follow-up, and subgroup analyses were conducted to establish the impact of excluding a retreat day, or reducing the number of hours of contact time. The low heterogeneity in this sample of papers allowed for an overall estimated mean effect to be calculated for each analysis, indicating a medium-sized and statistically significant effect of MBSR upon mindfulness and well-being measured pre- and post-intervention, and a maintained beneficial effect at follow-up for well-being. Subgroup analyses reported no difference in effects upon well-being or mindfulness when the retreat day was removed from the training, or when the training was reduced to less than 16 hours of contact time. The review also analysed the effect of MBSR compared to active control groups receiving different interventions, but no significant differences in effect were found – there is however a paucity of research comparing MBSR to other interventions within RCTs, and more research is needed in this area in order for future synthesis of findings.

For the intervention evaluated in Study 2, the main aim was to longitudinally analyse the direct effects of MBSR upon mindfulness, well-being, resilience, and emotion regulation, and then explore the mechanisms influenced by MBSR by testing mediation models of the effect upon well-being via mindfulness, resilience, and emotion regulation. This aim has also been achieved, as multi-level modelling of the intervention data from 61 participants indicated a large and significant effect of MBSR upon well-being, mindfulness, resilience, and emotion regulation (cognitive reappraisal) compared to the control group. Longitudinal analyses showed that these effects were maintained for most variables, although some mindfulness facets showed a statistically significant decline during the follow-up. Mediation analysis was successfully conducted upon the data and indicated an indirect pathway from the training to well-being via mindfulness and resilience when well-being was considered at T2, but not when well-being was measured at T3. The long-term effects upon well-being were instead found to be a direct result of training, without the contribution of mediators. It is possible, however, that the second mediation model was underpowered due attrition and exclusion of data at T3.

9.3.2 Synthesis of findings from Study 1 and Study 2

When considered together, Studies 1 and 2 combine to provide support to a number of findings when MBSR is compared to an inactive control group. Firstly, both studies report a medium-to-large statistically significant effect of MBSR upon well-being, thus providing evidence of the benefits of MBSR to employees who undertake training in

order to be happier at work. In addition, for the three studies in the meta-analysis that included an inactive control group at follow-up, there was a small significant effect upon well-being between T1 and T3, which was also present, although much larger in Study 2, demonstrating the long-term benefits to well-being from MBSR up to six months after the intervention. When combining studies that measured the facets of mindfulness using the FFMQ between T1 and T2, the results are very similar in the systematic review as in Study 2. Both analyses found Observing to be the facet upon which MBSR exerts the strongest effects, with large and significant effect sizes reported in both analyses, followed by Non-reactivity and Non-judging respectively, although the effects are much stronger in Study 2. In another parallel, the two studies which measure mindfulness in a controlled follow-up find no statistically significant effects between T1 and T3, and this is also the case in Study 2, where mindfulness decreases for the intervention group and increases for the control group, resulting in a medium-sized effect overall which is only approaching statistical significance.

It is not surprising that the effect sizes in Study 2 are all generally larger than those found in Study 1; firstly, the effect sizes in Study 1 are an estimated mean effect across a range of studies which found large, small, or no effects of MBSR individually, which produces an aggregate effect which represents the mid-point within this range, rather than the raw effects of Study 2. Secondly, Study 2 is a quasi-experiment and not an RCT, and therefore is at higher risk of bias in the results. Study 1 demonstrates that within RCTs, those with a higher risk of bias score report larger effects, and in Study 2 participants have not been randomised to create equivalence in the groups before the intervention, thus creating more risk than in an RCT. Consequently, it is likely that the effects found in Study 2 have been inflated somewhat by the risk of bias inherent in the quasi-experimental design.

The intervention in Study 2 did not include a retreat day, and included the standard minimum of 16 hours of contact time. No significant differences were found in Study 1 between subgroups that did or didn't make these changes, and therefore the removal of the retreat day is not expected to have had a significant positive or negative effect upon the overall benefits. Importantly, the intervention in Study 2 also included all of four of the core elements of MBSR: breath meditations, body-focussed meditations, mindful movement and mindfulness in everyday activities – as is the case with all the papers included in Study 1 – maintaining these four elements through any modifications may be a crucial factor in their success, but this proposal requires further evidence from studies which dismantle MBSR into the four elements and

evaluate the unique effects of each element and of different combinations of elements.

In summary, Studies 1 and 2 provide support for the beneficial effects of MBSR for the well-being and mindfulness skills of working populations, whether or not these interventions include a retreat day, and even when the contact time is less than 16 hours, although the caveat here is that the four key elements of mindfulness from Figure 4.1 were maintained throughout this research. The mediation analysis evidences the important role of increased mindfulness skills as the first step of the mechanism by which well-being and other beneficial effects of MBSR are developed. This is further supported by the observation from the systematic review that, where mindfulness was measured ($k=10$), only one study found a significant effect of MBSR upon well-being without an accompanying significant effect upon mindfulness. In all other cases, both or neither outcomes were changed significantly, or mindfulness alone saw a significant increase. This suggests (although is not causally definitive) that in the studies reviewed, improvements in mindfulness are preceding those in well-being. Determining increased mindfulness as the active ingredient of MBSR seems elementary, but is often taken for granted, and this confirmation from studies 1 and 2 is important in two ways.

Firstly, this body of research shows that not only is mindfulness a facilitator of well-being, but also that through MBSR the different facets of mindfulness are influenced to different degrees. In particular, becoming more aware of surroundings and thoughts (Observing facet) has been shown to be a key outcome of MBSR – this awakening to internal and external experience is cited in both Buddhist and academic theory as the gateway to the conscious change of attitudes and behaviours. Furthermore, in the present research this increased awareness is caused by training that includes mindfulness exercises focusing on the body, breath, movement, and everyday experiences. Confirming these relationships gives a solid starting point from which to modify and adapt mindfulness interventions at work if required – we know that this format works, and the pilot of any future modifications, particularly if any of the four core elements are removed, should include a comprehensive measure of mindfulness such as the FFMQ (Baer et al., 2006) to ensure that MBSR has not been diluted to a point where it no longer sufficiently expands awareness to allow subsequent benefits for well-being to become possible.

Secondly, simply becoming more observant is not the sum total of being mindful – a person who is hyper-vigilant of their surroundings and thoughts with an attitude that

is negative and self-critical could easily feel inadequate, unimaginative or frustrated when becoming aware of the unconscious, habitual patterns of their experience. In designing MBSR, Kabat-Zin (2013) highlighted the importance of an attitude that is open, non-judging and kindly towards experience, and the results from the FFMQ in both studies support this element with significant effects of MBSR upon Non-judgement and Non-reactivity to inner experience. As such, no matter how an MBSR course is modified, it should instil this kindly but objective approach to awareness – this attitude centres awareness as an opportunity for change in the future, as opposed to a post-mortem of mistakes or regrets.

This research also demonstrates the positive impact of MBSR upon resilience and emotion regulation, and suggests that whilst training is underway, becoming more resilient is a vital part of the process by which the training changes levels of well-being, but over the long term, it is the experience of the training itself which has a long-lasting effect upon well-being. Separate to their roles as mediators, improvements in both mindfulness and cognitive reappraisal were large and significant, and were maintained six months after training. These are added benefits of MBSR which have only been researched in a handful of studies, and which should be explored further to ascertain what elements of the training give people more confidence in their ability to deal with challenges in their lives, and in their capacity to change how they feel about a situation when they wish to take control of their emotional responses. These benefits are of merit when seeking to build and support a confident, strong and happy workforce.

This thesis of research has the strength of considering the evaluation of MBSR using the data from over 1,000 participants, considering types of well-being from around the affective circumplex, and breaking mindfulness down where possible into the five facets of mindfulness defined by the FFMQ (Baer et al., 2006), and delves deeper into the effects of modifications to the traditional format, and the possible mechanisms at work. At the same time, this research increases the breadth of knowledge by considering the roles of resilience and emotion regulation with MBSR training. The research is not without limitation however; considering only research reported in the English language, although more research may be available in other languages. Furthermore, this remains a small area of research within occupational psychology, and in the future it is hoped that larger RCT studies, leading to updates of this systematic review with larger samples of eligible studies, will be possible in order to explore some of the proposed explanations for these findings in more detail and

continue to advance understanding of how MBSR exerts its effects, how long they last, and how much it can and should be modified in the workplace and still be effective.

As interest and research into the effects of mindfulness at work continue to grow, it is hoped that these findings encourage practitioners and researchers to continue to mindfully design, implement, evaluate, and report the findings of MBSR interventions at work so that more can be understood about how the training works and which parts are indispensable for a working population, therefore enhancing the beneficial effects for MBSR participants on courses yet to come.

10 References

* Indicates study included in Systematic Review

? Indicates study unclassified in Systematic Review

X Indicates study excluded in Systematic Review

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11 Appendices

Appendix A Systematic Review – Additional Information

Appendix A(i) Abbreviations for well-being measures

Abbreviation	Outcome Measure
BDI	Beck Depression Inventory
BSI-18-GSI	Global Symptom Inventory - Average Of The Three Subscales Of The BSI-18 (Depression, Anxiety, Somatization)
BSI-53	Brief Symptom Inventory 53 Items
CES-D	Center For Epidemiological Studies Depression Scale
CHQ-12	Chinese Health Questionnaire 12 items
CIS	Checklist of Individual Strength
GSI	Global Symptom Inventory
IJS	Intrinsic Job Satisfaction - Subscale From The Job Satisfaction Scale
MBI	Maslach Burnout Inventory
MBI-DE	Maslach Burnout Inventory – Depersonalisation
MBI-EE	Maslach Burnout Inventory - Emotional Exhaustion
MBI-PA	Maslach Burnout Inventory - Personal Accomplishment
OST	Occupational Stress In Teachers
POMS	Profile Of Mood States - Short Version 15 Items
PSS	Perceived Stress Scale
PSS-10	Perceived Stress Scale 10 Items
RAND-MH	Rand-36 - Mental Health Subscale Only
SC 90-R	Symptom Checklist 90 items
SRDI	Smith Relaxation Dispositions Inventory
SRSI-BR	Smith Relaxation States Inventory - Basic Relaxation
STAI-S	State Subscale Only From The State-Trait Anxiety Inventory
STAI-T	Trait Subscale Only From The State-Trait Anxiety Inventory
SVS-CL	Shirom Vigor Scale – Cognitive Liveliness
SVS-EE	Shirom Vigor Scale – Emotional Energy
SVS-PS	Shirom Vigor Scale – Physical Strength
SWLS	Satisfaction With Life Scale
UWES	Utrecht Work Engagement Scale (Vigor, Dedication, Absorption)

Appendix A(ii) Search terms**PsychINFO search terms:**

1. Mindfulness/
2. Meditation/
3. meditat\$.ti,ab.
4. mindful\$.ti,ab.
5. mbsr\$.ti,ab.
6. mbct\$.ti,ab.
7. 1 or 2 or 3 or 4 or 5 or 6
8. randomi?ed controlled trial\$.tw.
9. rct.tw.
10. cancer.ti.
11. patients.ti.
12. survivors.ti.
13. 10 or 11 or 12
14. 8 or 9
15. 7 and 14
16. 15 not 13
17. limit 16 to (human and english language and yr="1979 - 2015")

Scopus search terms:

```
((((( ((( (TITLE-ABS-KEY ( meditat* ) ) OR ( TITLE-ABS-KEY ( mindful* ) ) OR
( TITLE-ABS ( mbsr* ) ) OR ( TITLE-ABS ( mbct* ) ) ) AND ( ( TITLE-ABS-KEY (
randomi?ed AND controlled AND trial ) ) OR ( TITLE-ABS-KEY ( rct ) ) ) ) AND
PUBYEAR > 1978 AND PUBYEAR < 2016 ) AND LANGUAGE ( english ) )
AND NOT ( ( TITLE ( patients ) ) OR ( TITLE ( cancer ) ) ) ) AND NOT ( TITLE (
disorder ) ) ) AND NOT ( TITLE ( older AND adults ) ) ) AND NOT ( TITLE (
youth* ) ) ) AND NOT ( ( TITLE ( older AND adult* ) ) OR ( TITLE ( disorder* ) ) )
AND ( EXCLUDE ( DOCTYPE , "re" ) )
```

ProQuest search terms:

(Including International Bibliography of Social Sciences, Dissertations and Theses A&I, UK & Ireland, Dissertation Abstracts International, ERIC, Social Services Abstracts, Sociological Abstracts, CINAHL and Business Source Premier)

```
((SU(meditation) OR SU(mindfulness) OR (ti(mindful*) OR ab(mindful*)) OR
(ti(meditat*) OR ab(meditat*)) OR (ti(mbsr*) OR ab(mbsr*)) OR (ti(mbct*) OR
ab(mbct*))) AND ((ti(randomi?ed controlled trial*) OR ab(randomi?ed controlled
trial*)) OR (ti(rct*) OR ab(rct*))) AND (la.exact("ENG") AND pd(19790101-
20151231))) NOT (ti(youth* OR cancer OR "older adult*" OR patients OR survivor*
OR disorder) OR ab(youth* OR cancer OR "older adult*" OR patients OR survivor*
OR disorder))
```


Appendix B Intervention Study – Questionnaire format**Appendix B(i) Opening Survey Questions**

ID: _____



The
University
Of
Sheffield.

Benefits of Mindfulness for NHS Staff.

January 2015

Thank you for agreeing to take part in this research.

As we will be contacting you three times during this evaluation, it is important that we are able to match up your three response booklets to see if there is any change over time. Because this is the first time you are filling in the questionnaire, we need to know your name to attach an ID code to it – your name is shown on the consent form you have completed but will be separated from the booklet at the end of the session once the ID has been assigned. This ID will remain yours until the end of the research. The data you provide will only ever be associated with an ID code, and not your personal details.

All information will remain confidential; no report of this work will identify any individual by name or by implication. Your data will be stored securely by the University of Sheffield on a secure server.

It is possible that completing this questionnaire may draw your attention to problems which you are experiencing with your own well-being. If you are worried that these are serious we would advise you to contact your GP or Occupational Health Unit.

Please answer the questions below about you and your experience of mindfulness.

Your Gender: _____

Your Age: _____

Your Job Title: _____

The Band your
Job falls into: _____

Have you had any previous experience of mindfulness or other meditative practices?

(Circle one, please do not include yoga unless it was mindfulness-based or involved meditation, such as Hatha yoga)

Yes

No

Please give details of the type of experience you have:

(For example, courses/workshops attended, self-taught books used, audio resources used)

How long have you been practising the above method(s)?

(Circle one or enter a number in 'Other')

Less than 6 months

Six months to 1 year

1-2 Years

Other number of years: _____

Appendix C Intervention Study – Assessment Scales

**Appendix C(i) The Five Facet Mindfulness Questionnaire
(FFMQ; Baer et al., 2006)**

Please rate each of the following statements using the scale provided. Write the number in the blank that best describes *your own opinion* of what is *generally true for you*.

1	2	3	4	5
Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true

1. When I'm walking, I deliberately notice the sensations of my body moving.
2. I'm good at finding words to describe my feelings.
3. I criticize myself for having irrational or inappropriate emotions.
4. I perceive my feelings and emotions without having to react to them.
5. When I do things, my mind wanders off and I'm easily distracted.
6. When I take a shower or bath, I stay alert to the sensations of water on my body.
7. I can easily put my beliefs, opinions, and expectations into words.
8. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.
9. I watch my feelings without getting lost in them.
10. I tell myself I shouldn't be feeling the way I'm feeling.
11. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.
12. It's hard for me to find the words to describe what I'm thinking.
13. I am easily distracted.
14. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.
15. I pay attention to sensations, such as the wind in my hair or sun on my face.

16. I have trouble thinking of the right words to express how I feel about things.
17. I make judgments about whether my thoughts are good or bad.
18. I find it difficult to stay focused on what's happening in the present.
19. When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.
20. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.
21. In difficult situations, I can pause without immediately reacting.
22. When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words.
23. It seems I am "running on automatic" without much awareness of what I'm doing.
24. When I have distressing thoughts or images, I feel calm soon after.
25. I tell myself that I shouldn't be thinking the way I'm thinking.
26. I notice the smells and aromas of things.
27. Even when I'm feeling terribly upset, I can find a way to put it into words.
28. I rush through activities without being really attentive to them.
29. When I have distressing thoughts or images, I am able just to notice them without reacting.
30. I think some of my emotions are bad or inappropriate and I shouldn't feel them.
31. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.
32. My natural tendency is to put my experiences into words.
33. When I have distressing thoughts or images, I just notice them and let them go.
34. I do jobs or tasks automatically without being aware of what I'm doing.
35. When I have distressing thoughts or images, I judge myself as good or bad depending what the thought or image is about.
36. I pay attention to how my emotions affect my thoughts and behavior.
37. I can usually describe how I feel at the moment in considerable detail.
38. I find myself doing things without paying attention.
39. I disapprove of myself when I have irrational ideas.

Scoring The FFMQ

(Note: R = reverse-scored item)

Observing: Sum responses to items 1, 6, 11, 15, 20, 26, 31, and 36.

Describing: Sum responses to items 2, 7, 12R, 16R, 22R, 27, 32, and 37.

Acting with Awareness: Sum responses to items 5R, 8R, 13R, 18R, 23R, 28R, 34R, and 38R.

Nonjudging of inner experience: Sum responses to items 3R, 10R, 14R, 17R, 25R, 30R, 35R, and 39R.

Nonreactivity to inner experience: Sum responses to items 4, 9, 19, 21, 24, 29, and 33.

**Appendix C(ii) The Multi-Affect Indicator
(MAI; Warr et al., 2014)**

Feelings at Work

For the past week, please indicate below approximately how often you have felt the following while you were working in your job. Everyone has a lot of overlapping feelings, so you'll have a total for all the items that is much greater than 100% of the time.

		Approximate amount of your time when at work in the past week						
	I have felt:	Never	A little of the time	Some of the time	About half the time	Much of the time	A lot of the time	Always
		0% of the time	1% to roughly 20%	Roughly 21% to 40%	Roughly 41% to 60%	Roughly 61% to 80%	Roughly 81% to 99%	100% of the time
1	Enthusiastic							
2	Nervous							
3	Calm							
4	Depressed							
5	Joyful							
6	Anxious							
7	Relaxed							
8	Dejected							
9	Inspired							
10	Tense							
11	Laid-back							
12	Despondent							
13	Excited							
14	Worried							
15	At ease							
16	Hopeless							

Scoring the MAI

Item responses are scored from 1 to 7, and negative items (2, 4, 6, 8, 10, 12, 14, 16) are reverse-scored so that higher scores always represent higher well-being. Mean values are used for each type of affect, as follows:

Single-quadrant scores

- Activated negative affect: top-left quadrant (Anxiety or HANA): items 2, 6, 10, 14, all reverse-scored
- Activated positive affect: top-right quadrant (Enthusiasm or HAPA): 1, 5, 9, 13
- Low activation negative affect: bottom-left quadrant (Depression or LANA): 4, 8, 12, 16, all reverse-scored
- Low-activation positive affect: bottom-right quadrant (Comfort or LAPA): 3, 7, 11, 15

Double-quadrant scores

- The Anxiety-Comfort (HANA to LAPA) dimension: top-left (reverse-scored) and bottom-right quadrants: 2, 3, 6, 7, 10, 11, 14, 15
- The Depression-Enthusiasm (LANA to HAPA) dimension: bottom-left (reverse-scored) and top-right quadrants: 1, 4, 5, 8, 9, 12, 13, 16

Other double-quadrant scores

- All negative affect: the two left-hand quadrants (HANA and LANA): 2, 4, 6, 8, 10, 12, 14, 16, all reverse-scored
- All positive affect: the two right-hand quadrants (HAPA and LAPA): 1, 3, 5, 7, 9, 11, 13, 15

**Appendix C(iii) The Connor-Davidson Resilience Scale
(CD-RISC; Connor & Davidson, 2003)**

0	1	2	3	4
Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time

1. I am able to adapt when changes occur.
2. I have at least one close and secure relationship that helps me when I am stressed.
3. When there are no clear solutions to my problems, sometimes fate or God can help.
4. I can deal with whatever comes my way.
5. Past successes give me confidence in dealing with new challenges and difficulties.
6. I try to see the humorous side of things when I am faced with problems.
7. Having to cope with stress can make me stronger.
8. I tend to bounce back after illness, injury, or other hardships.
9. Good or bad, I believe that most things happen for a reason.
10. I give my best effort no matter what the outcome may be.
11. I believe I can achieve my goals, even if there are obstacles.
12. Even when things look hopeless, I don't give up.
13. During times of stress/crisis, I know where to turn for help.
14. Under pressure, I stay focused and think clearly.
15. I prefer to take the lead in solving problems rather than letting others make all the decisions.
16. I am not easily discouraged by failure.
17. I think of myself as a strong person when dealing with life's challenges and difficulties.
18. I can make unpopular or difficult decisions that affect other people, if it is necessary.
19. I am able to handle unpleasant or painful feelings like sadness, fear, and anger.
20. In dealing with life's problems, sometimes you have to act on a hunch without knowing why.
21. I have a strong sense of purpose in life.
22. I feel in control of my life.
23. I like challenges.
24. I work to attain my goals no matter what roadblocks I encounter along the way.
25. I take pride in my achievements.

Responses are summed to give a total scale score from 0-100, where a high score equals high levels of resilience

Appendix C(iv) The Emotion Regulation Questionnaire (ERQ; Gross & John, 2003)

Instructions and Items

We would like to ask you some questions about your emotional life, in particular, how you control (that is, regulate and manage) your emotions. The questions below involve two distinct aspects of your emotional life. One is your emotional experience, or what you feel like inside. The other is your emotional expression, or how you show your emotions in the way you talk, gesture, or behave. Although some of the following questions may seem similar to one another, they differ in important ways. For each item, please answer using the following scale:

1-----2-----3-----4-----5-----6-----7

**strongly
disagree**

neutral

**strongly
agree**

1. ____ When I want to feel more *positive* emotion (such as joy or amusement), I *change what I'm thinking about*.
2. ____ I keep my emotions to myself.
3. ____ When I want to feel less *negative* emotion (such as sadness or anger), I *change what I'm thinking about*.
4. ____ When I am feeling *positive* emotions, I am careful not to express them.
5. ____ When I'm faced with a stressful situation, I make myself *think about it* in a way that helps me stay calm.
6. ____ I control my emotions by *not expressing them*.
7. ____ When I want to feel more *positive* emotion, I *change the way I'm thinking about the situation*.
8. ____ I control my emotions by *changing the way I think about the situation I'm in*.
9. ____ When I am feeling *negative* emotions, I make sure not to express them.
10. ____ When I want to feel less *negative* emotion, I *change the way I'm thinking about the situation*.

Note

Do not change item order, as items 1 and 3 at the beginning of the questionnaire define the terms “positive emotion” and “negative emotion”.

Scoring (no reversals)

Reappraisal Items: 1, 3, 5, 7, 8, 10; Suppression Items: 2, 4, 6, 9.

Appendix D Intervention Study – Additional Results from statistical Analysis**Appendix D(i) Results of skew analyses for outcome data in Study 2**

SCALE	SUBSCALE	Mean	SD	Skew	Skew SE	Z score
FFMQ	Composite Scale	3.12	0.56	0.19	0.20	0.97
	Observing	3.14	0.71	-0.01	0.20	-0.06
	Describing	3.32	0.74	0.17	0.20	0.89
	Acting with Awareness	2.86	0.66	0.08	0.20	0.39
	Non-Judging	3.35	0.80	-0.07	0.20	-0.38
	Non-Reactivity	2.90	0.56	0.17	0.20	0.87
MAI	Composite Scale	3.67	0.78	-0.10	0.20	-0.49
	Anxiety-Comfort	3.57	0.87	-0.07	0.20	-0.37
	Depression-Enthusiasm	3.82	0.86	-0.42	0.20	-2.14*
CD-RISC		63.03	11.73	0.29	0.20	1.49
ERQ	Cognitive Reappraisal	4.70	1.01	-0.68	0.20	-3.48*
	Expressive Suppression	3.30	1.34	0.16	0.20	0.83

Note. * $p < 0.05$ - significant skew is indicated by a Z score greater than +/-1.96.

Appendix D(ii) Results of kurtosis analyses for outcome data in Study 2

SCALE	SUBSCALE	Mean	SD	Kurtosis	Kurtosis SE	Z score
FFMQ	Composite Scale	3.12	0.56	-0.14	0.39	-0.36
	Observing	3.14	0.71	-0.10	0.39	-0.25
	Describing	3.32	0.74	-0.74	0.39	-1.91
	Acting with Awareness	2.86	0.66	0.45	0.39	1.14
	Non-Judging	3.35	0.80	-0.29	0.39	-0.73
	Non-Reactivity	2.90	0.56	-0.21	0.39	-0.53
MAI	Composite Scale	3.67	0.78	-0.35	0.39	-0.90
	Anxiety-Comfort	3.57	0.87	-0.69	0.39	-1.77
	Depression-Enthusiasm	3.82	0.86	-0.11	0.39	-0.29
CD-RISC		63.03	11.73	-0.08	0.39	-0.20
ERQ	Cognitive Reappraisal	4.70	1.01	0.94	0.39	2.44*
	Expressive Suppression	3.30	1.34	-0.97	0.39	-2.51*

Note. * $p < 0.05$ - significant kurtosis is indicated by a Z score greater than +/-1.96.