

**DOCTOR OF PHILOSOPHY**

**Neuropsychophysiological Response and Phenomenological Experience of a  
Mindfulness and Compassion Course  
A Mixed Methods Evaluation**

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Neuropsychophysiological Response and  
Phenomenological Experience of a  
Mindfulness and Compassion Course: A  
Mixed Methods Evaluation

**By Laura Jane Allen**

**May 2021**



## Abstract

Understanding the neuropsychophysiological applications and the phenomenological experience is crucial to our understanding of the stages of change that take place during mindfulness interventions. This thesis investigates the neurophysiological and phenomenological experience of an 8 week or 3-4-day equivalent mindfulness and compassion course at pre, post and follow-up time points (six months).

To review similar mindfulness interventions a systematic literature review was performed to evaluate mindfulness-based and compassion-focused interventions using physiological measures of stress (heart rate and blood pressure). The review concluded that further research using physiological measures were required in mindfulness-based compassion interventions.

To answer the research question, four separate and singular studies comprising of neuropsychophysiological measures and qualitative diary entries were used within a mixed methods approach. In study One a quantitative design investigated physiological measures of heart rate, diastolic and systolic blood pressure at the start and the end of from an 8-week mindfulness and compassion course. It was hypothesised that following the course there would be a reduction in heart rate and both measures of blood pressure. Despite a reduction in mean scores no significant change was identified for any of the three physiological measures.

In a secondary part to Study One the physiological measures were expanded to examine predicted changes in brain activity. An electroencephalogram (EEG) was used to record frontal alpha wave asymmetry pre, post, and 6-months following an 8-week mindfulness and compassion course. It was hypothesised that following the course there would be increased activation in the left frontal hemisphere. A repeated measures ANOVA indicated a shift in frontal hemispheric activation from right to left hemisphere following an 8-week mindfulness

and compassion course. Stronger left sided frontal activation was found at the six-month time point but no statistically significant change.

Study Two investigated the relationship between fears of compassion and perceived stress for participants following an 8-week mindfulness and compassion course. A multiple regression analysis identified relationships between three subscales of fears of compassion using all three subscales and stress. The results indicated that stress was predicted by fear of expressing kindness and compassion to oneself. Fears of responding to compassion from others was shown to strongly correlate to fears of expressing kindness and compassion to oneself, but no significance to stress and was subsequently identified as a potential suppressor variable.

Study Three implemented a qualitative study to encapsulate the lived experience of an 8-week or equivalent 3-4 day mindfulness and compassion course using diary entries to explore participant's thoughts, feelings and emotions during the course. Interpretative Phenomenological Analysis (IPA) was used to create themes to represent the experience of the participants. Twelve themes were identified in the analysis: expectations a person brings to mindfulness training; the social awkwardness of practising in a group; meditation for beginners is hard work; the importance of the teacher in making it okay to experience uncertainty; the importance of metaphors/stories in making sense of mindfulness concepts; compassion: important but challenging; shifting awareness of body, place and mind; epiphanies/turning points/game changers: when it just makes sense; noticing suffering in everyday life; responding differently to suffering in everyday life; knowing the self-better: in a non-judgemental way; simple class vs. cluttered life: practising in class is different to practising in everyday life.

The findings are discussed in relation to previous research alongside relevant theories in psychology, neuropsychology and physiology. Further discussions are included around the neurological applications, mechanisms of mindfulness and neurophenomenological

approaches. Applications for practice of the mindfulness and compassion course are also explored including advisory notes for practitioners. Limitations of the studies were discussed alongside the clinical relevance of non-significant findings. The thesis concludes with recommendations for future research and the continued integration of mindfulness and neuropsychology to identify mechanisms of change within mindfulness courses.

## **Acknowledgements**

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## Supervision Team

Dr Luke Sage, Dr Carol Percy and Professor Andy Turner

Project Title	Chapter	Ethics Number
Mindfulness on the Heart: A Pre and Post Analysis of EEG, Blood Pressure, Resting Heart Rate, Perceived Stress, State Mindfulness, Compassion and Intrinsic Motivation.	6,7 & 8	P44199
A systematic review evaluating the effectiveness of mindfulness-based compassion interventions for improving health and well-being in an adult non-clinical population.	4	P53538



## **Certificate of Ethical Approval**

Applicant:

Laura Allen

Project Title:

Mindfulness on the Heart: A Pre and Post Analysis of EEG, Blood Pressure, Resting Heart Rate, Perceived Stress, State Mindfulness, Compassion and Intrinsic Motivation.

This is to certify that the above named applicant has completed the Coventry University Ethical Approval process and their project has been confirmed and approved as Medium Risk

Date of approval:

04 November 2016

Project Reference Number:

P44199





## **Certificate of Ethical Approval**

Applicant:

Laura Allen

Project Title:

A systematic review evaluating the effectiveness of mindfulness based compassion interventions for improving health and well-being in an adult non-clinical population.

This is to certify that the above named applicant has completed the Coventry University Ethical Approval process and their project has been confirmed and approved as Low Risk

Date of approval:

22 June 2017

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## Abbreviations

ACT	Acceptance and Commitment Therapy
ANS	Autonomic Nervous System
BP	Blood Pressure
BPM	Beats Per Minute
CASP	Critical Appraisal Skills Programme
CBM	Compassion Based Meditation
CBT	Cognitive behavioural therapy
CFT	Compassion Focused Therapy
CME	Continuing Medical Education
CRF	Corticotrophin Releasing Factor
DASS	Depression, anxiety and stress scale
DBT	Dialectical Behavioural Therapy
ECG	Electrocardiogram
EEG	Encephalogram
FOC	Fears of Compassion
FAA	Frontal Alpha Asymmetry
FAM	Focused Attention Meditation
FFMQ	Five Facets Mindfulness Questionnaire
GAS	General Adaptation Syndrome
HR	Heart Rate
HRV	Heart Rate Variability
HPA	Hypothalamus Pituitary Adrenal Axis
IPA	Interpretative Phenomenological Analysis
KBM	Kindness Based Meditation
MAAS	Mindfulness Attention Awareness Scale
MBCT	Mindfulness Based Cognitive Therapy
MBSR	Mindfulness Based Stress Reduction
NICE	National Institute for Health and Care Excellence
PNAS	Positive and Negative Affect Schedule
OMM	Open Monitoring Meditation
PNS	Parasympathetic Nervous System
PFC	Prefrontal Cortex

PSS	Perceived Stress Scale
RCT	Random Controlled Trials
RR	Relaxation Response
SCS	Self Compassion Scale
SRSI	Smith Relaxation Scale Inventory
SNS	Sympathetic Nervous System
WHO	World Health Organisation

## **Presentations and Publications**

### **Presentations**

MHPN conference attendance - including poster presentation (March,2017)

Health Interventions across the Lifespan –Porto, Portugal (May, 2017)

BACPR conference with Liz (Mindfulness on the heart) (Oct, 2017)

Guest lecturer for the MSc Mindfulness and Compassion course - Mindfulness on the Heart (Oct, 2017)

Oral presentation at Birmingham City University on 'Mindfulness and Brain Activation' BPS 1st East Midlands Conference (Aug,2018)

Mindfulness retreat presentation – Le Tilleul, France (Aug, 2018)

Guest lecture for the MSc Mindfulness and Compassion students – compassion focus (Nov, 2016, 2017, 2018)

### **Publications**

Submitted Multiple Regression to European Journal of Positive Psychology – accepted Jan 2021

### **Other notable contributions**

Peer reviewer for Mindfulness Journal

Publication in BPS for social prescribing for wellbeing



## CHAPTER 1

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### General Introduction

This thesis focuses on reviewing a mindfulness and compassion course using a mixed methods approach. In addition to capturing the lived experience through participant diaries, the mixed methods approach combines neuropsychophysiological methods to measure EEG frontal  $\alpha$ -asymmetry, heart rate, blood pressure (systolic and diastolic), fears of compassion and perceived stress. The importance of a mixed approach has been defined by Valera (1996) as a neurophenomenological approach to research. The neurophenomenological approach encourages an amalgamation of lived experiences and neuro-cognitive science. Valera proposed ‘any attempt to scientifically explain mind and consciousness must directly relate to the nature of our lived experience (Valera, 1996 p.334-345).

The mindfulness and compassion course used in this thesis was created by MindfulnessCIC to support and cultivate mindfulness and compassion practices through psychoeducation and experiential methods. Mindfulness and compassion are viewed with equal importance. The course includes the application of mindfulness skills and techniques to enable participants to flourish and grow. To date no research has evaluated this course using the combination of variables measured in this thesis. The areas include neuropsychophysiological measures alongside phenomenological experience to offer a holistic overview of the course.

Mindfulness aims to increase positive affect (Barnhofer et al., 2010) and reduce negative affect (Pace et al., 2009). Compassion meditations have also shown to have a positive impact on the distress response (Lutz et al., 2008), while activating the left prefrontal cortex which is associated with positive affect and approach motivation (Engstrom & Soderfeldt,

2010). Compassion training could also expand positive affect and reduce negative affect, helping individuals to strengthen resilience to distress (Klimecki et al., 2013).

Neurological research using mindfulness interventions have been shown to support changes in frontal hemispheric asymmetry while increasing positive affect (Davidson et al., 2003). The approach/withdrawal model (Davidson, 1983) proposes that the two hemispheres process emotions differently within the frontal cortex. The left hemisphere specialises in processing positive affect and approach motivation, in contrast increased frontal EEG  $\alpha$ -asymmetry in the right hemisphere is linked to negative affect and withdrawal or avoidance of an emotional stimulus (Davidson, 1993). Further research has also linked increases in negative affect such as distress to the dysregulation of brain asymmetry (Bob, 2008), highlighting the importance of stress management and wellbeing in supporting regulation of the body.

Physiological measures of distress such as heart rate and blood pressure decrease following mindfulness courses such as mindfulness-based stress reduction (MBSR) (Amutio et al., 2015). As a result of the research surrounding the benefits of mindfulness the American Heart Association approved the use of meditative techniques in 2013 alongside traditional forms of support for cardio conditions such as hypertension. This adds further support for the use of meditation towards positive changes.

Qualitative research is also limited in the area of mindfulness in particular the exploration of experience alongside a mindfulness intervention. The lived experience of participating in a mindfulness and compassion course will explore the phenomenological experience. The findings from the qualitative study could also complement the quantitative conclusions. Therefore, the lived experience of the mindfulness and compassion course will add a further dimension to the evaluation of the course.

Thus, a mixed methods approach will offer a holistic evaluation of the mindfulness and compassion course. The findings of this studies will be used to offer further knowledge for both practitioners and participants of mindfulness courses, alongside highlighting the importance of the integration of mindfulness and compassion.

### **Aims & Objectives**

Overall research aim:

To evaluate a mindfulness and compassion course using a mixed methods design.

Aims & Objectives:

- 1) To review the current literature evaluating mindfulness-based and compassion-focused interventions (MBCI) using physiological measures of stress (heart rate and blood pressure) (Chapter 4);
- 2) To identify changes in the physiological measures of stress heart rate and blood pressure (DBP and SBP) during an 8-week mindfulness and compassion course at pre and post course time points (Chapter 6);
- 3) To identify the impact of an 8-week mindfulness and compassion course on prefrontal hemispheric  $\alpha$ -asymmetry at pre, post and follow-up time points (Chapter 6);
- 4) To explore the relationship between fears of compassion and perceived stress following an 8-week mindfulness and compassion course (Chapter 7);
- 5) To explore the lived experience of completing a mindfulness and compassion course using Interpretative Phenomenological Analysis (IPA) (Chapter 8).

## **Synopsis of the Thesis**

### **Chapter 1 - Introduction**

Chapter 1 introduces a brief outline of the mindfulness and compassion course, as well as outlining the outcome measures used in the research which include physiological measures of stress - heart rate and blood pressure (DBP & SBP), perceived stress, fears of compassion and prefrontal asymmetry alongside the lived experience of attending a mindfulness and compassion course. Chapter 1 also highlights the aims/objectives along with the purpose of the research. Finally, a synopsis of each chapter is given to guide the reader through each chapter of the thesis.

### **Chapter 2 - Mindfulness and Compassion Literature**

Chapter 2 reviews the literature around mindfulness and compassion. The first section outlines the origins of mindfulness including Buddhist philosophy, meditation practices and the mechanisms of mindfulness. The second section focuses on compassion and the science of compassion which includes the polyvagal theory and three affect regulation systems. Fears of compassion are also included to highlight the impacts on improving compassion. The chapter concludes with a brief outline of the Mindfulness-Based Compassion Interventions (MBCI).

### **Chapter 3 - Neurophysiological Literature**

Chapter 3 outlines the neurophysiological elements of the research. The first section is defined as stress physiology and begins with an outline of stress, theories and models of distress, the autonomic nervous system (ANS) and the Hypothalamic Pituitary Adrenal Axis (HPA). This leads to an overview of the physiological measures of stress, which include heart rate and blood pressure – diastolic (DBP) and systolic (SBP) in relation to mindfulness and compassion. The second section includes electroencephalogram (EEG) measures of prefrontal

$\alpha$ -asymmetry, models of  $\alpha$ -asymmetry, and the relationship between mindfulness and compassion with prefrontal  $\alpha$ -asymmetry.

#### **Chapter 4 – Systematic Review**

Chapter 4 outlines the systematic literature review offering an insight into mindfulness-based and compassion focused interventions (MBCI) with the physiological measures of stress (heart rate and blood pressure. The systematic review showed research on mindfulness-based compassion interventions measuring heart rate and blood pressure (DBP & SBP) frequently used mindfulness-based stress reduction as the primary intervention of choice. This result highlights a need for the inclusion of physiological measures of heart rate and blood pressure (DBP & SBP) as a measure of stress for non-clinical populations during mindfulness-based and compassion interventions.

#### **Chapter 5 – Research Design**

Chapter 5 aims to explain the research design of the mixed methodology used within this thesis. The chapter begins with an overview of epistemological paradigms which then leads into a rationale for mixed methodology. A section is dedicated to outlining the mindfulness and compassion course. This includes offering an overview of the weekly themes for the sessions and the requirements of the participants. A summary is also given of the shorter equivalent course and how this runs alongside the traditional course. For both quantitative and qualitative sections the procedures, ethical considerations and recruitment processes were outlined in each individual study chapter.

#### **Chapter 6 – Quantitative Studies (Physiological facets)**

Chapter 6 outlines two parts to the quantitative research, the neurophysiological study and the multiple regression. Part one begins by introducing the research area followed by the

methodology used to measure the physiological measures of heart rate and blood during the mindfulness and compassion course at pre and post (8-weeks) course. A second part to Study One used an electroencephalogram (EEG) to measure prefrontal asymmetry at pre, post (8-weeks) and follow-up (6-months).

### **Chapter 7 – Quantitative Studies (Psychological facets)**

Chapter 7 is dedicated to the multiple regression and the relationship between all three subscales of fears of compassion (all three sub scales) with stress following an 8-week mindfulness and compassion course. The study ends with an overview of the findings and the implications for future research. Both chapter 6 and 7 offer an outline of changes made following an 8-week mindfulness and compassion course using neuropsychophysiological facets.

### **Chapter 8 - Qualitative Study (Participant Diaries)**

Chapter 8 begins with an overview of qualitative research using mindfulness and the benefits of reflective diary entries used to capture the lived experience of the participants during the mindfulness and compassion course. An overview and rationale of using Interpretative Phenomenological Analysis (IPA) as the method of analysis is given before the results are outlined. The diaries review thoughts, feelings, and behaviours of the participants during their mindfulness journey. The chapter ends with an overview of the findings and implications for future participants and practitioners. Chapter 8 not only offers an insight into the lived experience of participation in a mindfulness and compassion course but also offering additions to quantitative findings.

### **Chapter 9 – General Discussion**

The concluding chapter combines the findings from the quantitative and qualitative studies, while discussing the overall findings. This chapter includes an outline of the strengths and weaknesses as well as future directions for research. Finally, chapter 9 outlines implications for practice and what the current research can add for future consideration. An exploration of the thesis is given to mark the end of the thesis.

**Chapter 2**  
Review of Literature  
Mindfulness and Compassion



## CHAPTER 2 Review of Literature

---

### Origins of Mindfulness

The concept of Buddhism was first conceived by Siddhartha Gautama, a Nepalese prince who lived 2500 years ago. Siddhartha lived a luxurious lifestyle hidden away from the poverty and deprivations of the outside world. When Siddhartha was accidentally exposed to the sufferings of others, he decided to leave his riches behind to seek freedom and a new path towards enlightenment using meditation practices. 'At its heart lies a system of training that leads to insight and the overcoming of suffering' (Bodhi, 2011, p20). Originally derived from Buddhist Ethics but more specifically *The EightFold Path*, mindfulness is part of this route that directs individuals down the middle way to enlightenment. Mindfulness in Buddhism plays an important role in the development of the path leading to the reduction in suffering (Thera, 1962). Components of the middle path include three core areas, ethical conduct, mental discipline and wisdom (Bodhi, 1994). Ethical conduct (based on love and compassion) comprises of right speech, right action and right livelihood. Mental discipline includes right effort, right mindfulness and right concentration. Lastly, wisdom includes right thought and right understanding.

Compassion lays at the heart of the practices and teachings in Buddhism with 'Mayana practices consider compassion the ultimate source of happiness' (Kingsland, 2016, p181). Buddhist teachings define compassion as 'the heart that trembles in the face of suffering' (Feldman & Kuyken, 2011, p.144). Within Buddhism there are four limitless contemplations, these are guidelines for living and include support for increasing awareness and compassion. These include (in Pali): *karuṇā* (compassion); *mettā* (loving-kindness); *muditā* (sympathetic or vicarious happiness); and *upekkha* (equanimity). Buddhist compassion is not only seen as an emotion but also the inclusion of wisdom and reason (Strauss et al., 2016).

## Mindfulness

Mindfulness can be identified as operating within two different schools of thought defined as the Eastern and Western views (Weick & Putnam, 2006). An eastern definition of mindfulness is defined (in Pali) as ‘Sati’ simply meaning ‘awareness’. Awareness includes the ability to focus on current objects, to remember them, and not to lose sight of them through distraction or wandering attention (Weick & Putnam, 2006). Bodhi describes this as ‘keeping the mind as steady as a stone instead of letting it bob about like a pumpkin in water’ (Bodhi, 2000, p. 371). In contrast, research has shown that a wandering mind is associated with an unhappy mind (Killingsworth & Gilbert, 2010). To support the building of mindfulness skills the Buddha states that ‘the only way to purify your mind, to overcome sorrow and lamentation, to overcome pain and grief, to reach the Noble Path and to realise nibbana... is none other than the way of the Four Foundations of Mindfulness’ (Silananda, 2004, p.22). The four foundations of mindfulness comprise of: 1) awareness of the body, activities and experiences (Kāyānupassanā Satipaṭṭhāna); 2) awareness of feelings and emotions (Vedanānupassanā Satipaṭṭhāna); 3) awareness of the conscious mind (Cittānupassanā Satipaṭṭhāna); 4) awareness of mental objects (Dhammānupassanā Satipaṭṭhāna). Therefore, the focus in eastern mindfulness is primarily centred on the internal awareness of experiences (Giluk, 2010).

The development of the western interpretation of mindfulness has been largely propagated by the American social Psychologist Ellen Langer and the Biologist Jon Kabat Zinn. However, both viewing mindfulness from different perspectives. The traditional Buddhist mindfulness approach places emphasis on the inner experience such as thoughts, feelings and emotion much in line with Kabat Zinn’s framework. In contrast Langer (1989) changed the focus to external experiences which encompassed goal orientated cognitive tasks (Baer, 2003). Langer describes mindfulness as ‘a flexible state of mind in which we are actively engaged in the present, noticing new things and sensitive to context’, in contrast to

*mindlessness* which is when we ‘act according to the sense our behaviour made in the past, rather than the present ... we are stuck in a single, rigid perspective and we are oblivious to alternative ways of knowing’ (Langer, 2000, p.220). Langer argues that mindlessness, a mental state diametrically opposite to mindfulness, could result in negative psychological and physical states thus potentially limiting human potential (Langer, 1989). Langer’s definition and approach imbue originality due to the emphasis on the importance of mindfulness and mindlessness and the relationship with cognition and learning. An advancement on the definition was later given by Langer and Moldoveanu who stated that mindfulness was ‘a greater sensitivity to one’s environment, more openness to new information, the creation of new categories for structuring perception, and enhanced awareness of multiple perspectives in problem solving’ (Langer & Moldoveanu, 2000, p. 1).

In the west, a common definition used in both clinical and non-clinical settings defines mindfulness ‘paying attention, on purpose, in the present moment, and nonjudgmentally, to things as they are’ (Williams, Teasdale et al., 2007, p. 47). An important concept of mindfulness is not to change the state but to only observe with neutrality. Enhancing one’s capacity to observe every state with neutrality allows for the practice of acceptance. In order to support this process towards acceptance, mindfulness encourages a ‘beginner’s mindset’ which includes viewing each experience as if it was the first time (Kabat-Zinn, 1990, pp. 35-36).

The application of mindfulness in the west began with a secular mindfulness programme introduced by Jon Kabat-Zinn in 1979 to offer support for those with chronic pain who were deemed as incurable by the medical professions. The programme sought to include the skills such as present moment attention, acceptance and non-judgement without the belief system enshrined in Buddhism. The programme was called the stress reduction and relaxation programme and ran for 10-weeks (Kabat Zinn, 1982), but it was later changed to an 8-week

mindfulness-based stress reduction course (MBSR). The initial 10-week programme was shown to reduce pain in 65% of patients alongside a lessening in mood instabilities and psychiatric symptoms following the course (Kabat Zinn, 1982). MBSR continued to expand across the globe reaching those who could benefit from stress reduction and pain management in both clinical and non-clinical settings.

Mindfulness however is not only found in Buddhism but is also evident in other practices and beliefs including Christianity, Hinduism, Islam and Judaism (Trousselard et al., 2014). Even though the beginnings of mindfulness are associated with Buddhism, other belief systems have also included the practice in some form. Other common mind body practices such as yoga originated from Hinduism. In the Yoga Sutras of Patanjali a text offering a pathway for the practice of yoga, Astanga yoga highlights the importance of pranayama (breath control) and dhyana (meditation) situated within the 29<sup>th</sup> Sutra. This demonstrates that not only do other belief systems including mindfulness but also other mind body practices.

### **Meditation Practices**

Typically, mindfulness is taught and practiced through both formal and informal practices. The formal practices of mindfulness consist of regular intentional time set aside for meditation. The informal practices consist of learning and developing skills around mindfulness in daily living. A common example of informal meditation includes the brushing of one's teeth in a mindful way. This simple exercise can highlight how little we attend in the present, before we build the skills of focused attention and living in the present.

Mindfulness meditation includes different types of practices these include, Focused Attention Meditation (FAM), Open Monitoring Meditation (OMM) and Loving Kindness Meditations (LKM) (which include compassion meditations (CBM)) (Lippelt et al., 2014). FAM uses an anchor to bring the wandering mind back to a point of focus. The anchor is

typically the breath but can be anything that can be used to re-focus. The anchor is a technique mainly used to help regulate the mind and body when feeling overwhelmed but can be used as part of the formal practice. In biofeedback, a technique used to help an individual regulate one's own body functions, an anchor allows the user to accept the normal physiological processes as well as those felt during dysregulation such as the heartbeat, breathing and body sensations (Khazan, 2015). As Bishop highlights 'sustained attention on the breath keeps attention anchored in current experience so that thoughts, feelings, and sensations can be detected in the stream of consciousness' (Bishop et al., 2004, p.232).

OMM is more in line with the Buddhist practice defined as being open to what comes into one's experience during the practice. This practice includes an opening to our present reality and senses, while allowing one to become more accepting of our free-flowing thoughts and experiences, while opening-up with curiosity and acceptance. This technique not only strengthens the mind-body connection but can also add to our wider connection with reality and the environment. In biofeedback, mindfulness training has been shown to help awareness of regulating physiological and neurological outcomes. While self-compassion practices allow gentle, encouraging self-talk and acceptance during feelings of failure (Khazan, 2015).

The third practice includes LKM and compassion meditations. The loving kindness practice typically includes four components in which a mantra can be repeated 'May you be well, May you be healthy, May you be happy'. This mantra is internally directed towards a neutral person, the self, a person easy to love and a challenging person. The intention of LKM is to promote 'compassion, joy, equanimity and the sense of love and connectedness with others' (Kristeller & Johnson, 2005, p. 395). A systematic review and meta-analysis on the effects of KBM on health and wellbeing showed decreases in depression, mindfulness, compassion, and self-compassion compared with passive controls (Galante et al., 2014). It was also noted that KBM promoted low arousal positive states, enabling participants to achieve a

calmer state. Compassion meditations such as Tonglen, translated in Tibetan as ‘sending and taking’ (Chodron, 2001), offers the individual an opportunity to use visualizations to take in the suffering of others while returning compassion. As Mann and Youd (1988, p.65) observed, ‘Practising *metta* on a regular basis produces a mind which is warm, open and accepting’. Other compassion meditations include those aimed at increasing self-compassion, some examples include soften, soothe and allow, (working with emotions in the body) and affectionate breathing (Germer & Neff, 2013).

## **Ethical Issues in Mindfulness**

### **Westernised Mindfulness**

One of the current ethical debates within mindfulness is the lack of regulation and training requirements to be a ‘mindfulness teacher’ (Monteiro et al., 2015). This causes two main dilemmas, firstly mindfulness is touted as one of the biggest wellness industries with a yearly growth of 12%. As Purser and Loy (2013) aptly state in ‘Beyond McMindfulness’, that mindfulness has become the ‘New Capitalist Spirituality’. The ethical issue around the nature of Capitalism was raised in Schumacher’s seminal piece in the 1970’s ‘Small is Beautiful’ which encourages walking the middle path within a Buddhist economic framework. The application of ‘ethical livelihood’ explores the dangers of capitalism on individual wellbeing alongside the depletion of natural resources, while advocating a simpler life very much in line with Buddhism (Schumacher, 1973). In turn, a practice used to seek ‘a simpler life’ has now been engulfed by the Capitalist system with the potential for negative repercussions.

In sum, within the western hemisphere mindfulness is a growing industry with an intention to support a reduction in dis-ease from areas such as stress, anxiety and depression. Ironically, this support is driven by not only a lack of regulation but an industry which could be attractive to potential clinical or pre-clinical populations. Consequently, a combination of a growing industry with a lack of regulation lends itself towards a reduction in ethical conduct and increased risk of harm - a simple by-product of the Westernised system.

### **Ethical Conduct**

A secondary issue of concern includes the exclusion of the ethical principles derived from the framework that Mindfulness has been taken from. Mindfulness is one part of the eightfold path, a guideline supporting those with the intention to reach enlightenment. There has been a long-standing debate as to whether mindfulness can just be simply 'plucked' from the eightfold path and whether it is ethical to do so. The secularization of mindfulness has deemed mindfulness to be without any religious connection. Neuroscientist Sam Harris offers support towards secular mindfulness highlighting the importance of spirituality, but goes on to state that it does not need to be tainted by religion (Harris, 2014). However, Mindfulness Teacher Trudy Goodman (2014) describes secular mindfulness as a type of 'Stealth Buddhism' in which there is little difference compared to Buddhist classes except the vocabulary used purposely doesn't include Buddhist related terminology. A further contradiction includes the requirement within MBSR teacher training to abide by certain 'Buddhist' notions (Purser, 2015). The taking of mindfulness from the eightfold path has also raised questions around the stripping away of the remaining ethical principles such as right speech, right action and, right livelihood (Monteiro et al.,2015). In response to the secularization of Buddhism Bodhi (2011) states in a reinterpretation of the Buddha's words "we can let anyone take from the Dhamma whatever they find useful even if it is for secular purposes".

## **Do No Harm**

The debates around the ethical issues also lend to a further discussion around the potential harm imposed on the participant from mindfulness interventions. Harm is an area that all therapeutic modalities have to assess and manage. Baer et al. (2019) states mindfulness is not the exception to this assessment. Within this assessment there are three areas of potential harm; 1) Program factors, 2) Participant factors and 3) Teacher/Clinician factors (Baer et al., 2019). A recent meta-analysis (Farias et al., 2020) highlighted the calculated harm using adverse events in comparison to other therapeutic modalities of meditation-based therapies. The average percentage of harm across all modalities ranges from 3%-12%. In this review meditation-based therapies were calculated at 8.3% with anxiety and depression representing the most common adverse events. However, this result was similar to those reported in psychotherapy. As with all health and wellbeing changes experiencing difficulties is expected (Baer et al., 2019), however this needs to be balanced with harm and risk management. The review highlights the potential negative impacts of meditation and the adverse effects. Further research is required to identify if these adverse effects have short- and long-term impacts and how individual differences could influence the risk of harm. In sum, managing risk and the safety of all participants is an area that requires ongoing research.

## **Mindfulness and Compassion**

The importance of the integration of mindfulness and compassion is identified within the Buddhist pathway. In this training mindfulness offers a starting point in which the student then progresses and advances to compassion practices to the self and to all beings (Thurman, 1997). Mindfulness and compassion have been identified as being so strongly intertwined that it is said that “Wisdom can never be brought to completion without the perfection of compassion” (Candrakīrti. 2002, P.15). In the West, the connection between mindfulness and compassion



has also been likened to ‘two wings of a bird’ (Germer & Siegel, 2012), with mindfulness offering a context for compassion focused approaches to flourish (Tirch, 2010). The evolution of compassion training began to encompass both compassion and loving kindness meditations (Tirch, 2010).

Right mindfulness as found in the eightfold path encourages the development of a richer awareness of life (Suzuki & Jung, 1991). This can be achieved by using the four foundations of mindfulness which include (1) the body (*kaya*), (2) feelings (*vedana*), (3) the mind (*citta*), (4) physical and mental processes (*dhamma*). As mindfulness and compassion are strongly connected using right mindfulness would allow the individual to become aware and attentive to one’s internal experiences which could support and widen one’s relationship with compassionate thoughts, feelings and actions towards self and others. Compassion goes beyond similar definitions such as kindness which includes the motivation towards action rather than just feeling. Compassion therefore becomes engrained into the ethical principles of right speech, right action, right livelihood, right effort and, right concentration (Makransky, 2012) as a requirement towards action (Rahula, 1974). What is missed in secular mindfulness when considering the inclusion of ethics is how this leads to the increase of ‘the stakes to act and care for the suffering of others’ (Purser, 2015).

However, there has been a shift to include compassion practices within Western mindfulness interventions such as compassion and loving kindness meditations. As compassion is now being integrated alongside mindfulness further work is required to understand and explore the implications and potential difficulties around the inclusion of compassion practices. Even though mindfulness is still seen as being in its infancy, research has been growing exponential since the 80’s. Difficulties and challenges using meditation have been identified in Buddhist traditions leading to potential long-term impacts (Lindahl et al., 2017). Recent research interviewed male Buddhist meditators found that increased adverse effects were related to

advanced meditation practices alongside being a beginner without much guidance from the teacher rather than the mindfulness or loving kindness meditation (Lomas et al., 2015). In contrast fears of compassion have shown to highlighted blocks and resistance towards the inclusion of compassion (Gilbert et al., 2011). In Westernised mindfulness interventions compassion practices are very much dependent on teacher's preferences for inclusion as it is not formally included in MBSR or MBCT training (Barnhofer et al., 2010). Therefore, this decision is left up to the teacher or practitioner to decide with very little guidance to follow.

A further consideration includes the competencies and training of teachers in compassion to enable participant safety and discomfort when integrating compassion practices. Given the current ethical issues around mindfulness, further research is required to assess the inclusion for both practitioners and participants. Difficulties around the inclusion of compassion has been identified alongside the importance of compassion alongside mindfulness. However, as the current literature is conflicting around the inclusion of compassion further research is required to understand the impact of compassion practices alongside mindfulness within interventions.

### **Going Forward**

Firstly, further research is required to continue assessing risk management around mindfulness which would lead to potential issues and benefits around the inclusion of compassion. A further consideration is the concept of compassion fatigue, a concept defined as the negative effect of helping individuals in pain or suffering from traumatic events which leads to a decrease in compassion from the giver (Şirin & Yurttas, 2015). This needs to be taken into consideration when reviewing the inclusion of compassion and how this can be implemented safely. Returning back to the ideas of Schumacher's Buddhist Economics, the inclusion of compassion and ethics may support a movement towards a more compassionate and ethical society, offering an enhancement of wellbeing for all.

## Compassion

### Definitions of Compassion

A review of existing definitions has identified compassion as consisting of five key fundamentals: recognizing suffering; understanding the universality of human suffering; feeling for the person suffering; tolerating uncomfortable feelings; motivation to act/acting to alleviate suffering (Strauss et al., 2016). The definition commonly used within the literature defines compassion as ‘a deep awareness of the suffering of another, coupled with the wish to relieve it’ (Gilbert, 2010). Self-compassion as a singular component has been defined using three components: kindness; mindfulness; common humanity (Neff, 2003). Kindness would entail offering support towards oneself during times of suffering. Common humanity has been outlined as ‘...the sense of common humanity central to self-compassion involves recognizing that everyone fails, makes mistakes, and gets it wrong sometimes (Neff & Dahm, 2013, p.5). Mindfulness would encompass the standard definition of ‘paying attention, on purpose, in the present moment, and nonjudgmentally, to things as they are’ (Williams, Teasdale et al., 2007, p. 47).

Alongside improving compassion to the self and others, an additional concept within compassion has been identified as contributing to compassion, which has been defined as fears of compassion (Gilbert et al., 2011). Rather than improving compassion individuals can become fearful of compassion which can lead to blocks and resistances to compassion towards the self and others. Fears of compassion include three dimensions: fears of expressing compassion to others; fears of kindness and compassion to oneself; fears of receiving compassion from others. Fears of expressing compassion to others includes expressing compassion to others including the responses received. Fears of kindness and compassion to

oneself includes the compassion we have for ourselves, particularly in times of judgement; Fears of receiving compassion from others is the compassion that we receive from other people.

In contrast it was shown that feelings of kindness and warmth towards the self and from others can activate a likeness to grief (Gilbert et al., 2011). Earlier support by Bowlby (1969) identified within the attachment theory that the creation of a safe place with positive feelings of the self and others was essential for healthy attachment. For individuals who have not experienced kindness and compassion from others may result in a struggle to give self-compassion when needed, but would also likely block or resist giving or receiving compassion from others, this would be particularly pertinent for those individuals with insecure attachments (Gilbert, 2010).

A research finding identified a relationship between fears of expressing kindness and compassion towards one's self and fears of responding to compassion from others (Gilbert et al., 2011). In addition, fears of compassion for the self and others has also been shown to be positively related to stress and negatively correlated with mindfulness (Gilbert et al., 2012). This highlights the beneficial impacts of mindfulness on fears of compassion and also the interrelationship between fears of expressing kindness and compassion towards oneself and fears of responding to compassion from others. Kirby et al. (2019) suggests that because both of these areas of fears of compassion have a similar activation system, this may lead to a greater impact on mental health.

### **The Science behind Compassion**

The Autonomic Nervous System (ANS) includes two opposing but essential systems – the parasympathetic nervous system (PSN) and the sympathetic nervous system (SNS). The PSN is known as the rest and digest while the SNS is associated with flight or fight threat responses. Both the PSN and SNS are connected to physiological responses such as the heart

rate and blood pressure and neurological areas (McCorry, 2007). The vagus nerve is connected to the heart, allowing a link between the heart and the brain to respond bi-directionally. This has a direct relationship on both blood pressure and heart rate with exaltation directly under the control of the vagus nerve (Chang et al., 2015). The SNS would typically increase both HR & BP in response to perceived danger; however, the PNS would bring the body systems back to homeostasis (Gerritsen & Bond, 2018).

### **Polyvagal Theory – The Gateway to Compassion**

The Polyvagal theory postulated by Porges (2007) states that the vagus nerve is a major component within the neurophysiological flow of compassion. The vagus nerve also allows shifts in state depending on safety and neuroception. The Polyvagal system comprises of three states of response during an interaction with our environment. This includes the dorsal vagus (immobilization), the sympathetic nervous system (mobilization) and the parasympathetic nervous system (connection and social engagement). The vagus nerve is part of the cranial nerves, defined in Latin as the wandering nerve due to the far-reaching touch points from brain stem to anus, opening up a direct mind body link. The vagus nerve is more impactful than other nerves as it touches eighty-seven points within the body including many organs (Figure 1).

The vagus nerve is specifically connected to the parasympathetic nervous system (PNS) which allows a pathway for the PNS to flourish, while also inhibit the reactivity of the sympathetic nervous system (SNS) (Porges, 2007). Recent research has shown that when the vagus nerve is activated through practices such as meditation and/or compassion a vagal-mediated state is created, along with increasing positive emotions (Kok et al., 2013). Mindfulness and compassion practices are used to help shift one's state from the SNS to the PNS which facilitates homeostasis and emotional regulation to return.

**Figure 1.***Diagram of Vagus Nerve Pathway*

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Note. From *Cranial Nerves Function and Dysfunction*, by Wilson-Pauwels et al, 1988 (<https://bmc.utm.utoronto.ca/cranialnerves/>).

This activation of the vagus nerve is completed during exhalation which slows the heart rate while inducing the PNS. Heart rate variability (HRV) is used to measure vagus nerve activity. Low frequency HRV is associated with the sympathetic nervous system, while high frequency HRV is associated with the parasympathetic nervous system. Vagal activity increases have been linked to higher levels of compassion (Stellar et al, 2015). Patients suffering with clinical depression have shown to exhibit decreased HRV, showing an increase in sympathetic nervous system activity (Kemp et al, 2010). Depression is also linked to a decline in the production of cytokines (antibodies), which reduces immune functioning throughout the body (Miller et al, 2009).

Compassion is linked to the neurophysiological systems by working bi-directionally between the mind and the body. The process of compassion relies on the link with the body,

therefore learning compassion skills is achieved using the body. It is suggested that mindfulness starts with the body, but in addition the body also offers the means to supporting compassionate states (Kerr et al., 2013). For compassion to be experienced, neuroception is required to support the body's ability to recognise safety through sensory perception. Neuroception assesses the environment for risk and then communicates this to the rest of the body (Porges, 2017). Neuroception is an important step within the compassion practice as it is the initial sensory perception that enables the body to determine safety. Once safety has been confirmed, the parasympathetic nervous system will be activated, regulating the body with oxytocin and opiates. Oxytocin is the chemical that supports social bonding. Oxytocin has also shown to reduce the activation of the amygdala leading to a reduction in fear (Macdonald & Macdonald, 2010). Incidents of trauma related difficulties have shown to inhibit the ability to feel safe within the environment, potentially even in the presence of others.

### **Three Affect Regulation Systems**

The three affect regulation systems (Gilbert, 2009) are defined as the emotional regulation system combining the interactions between the new brain and old brain processes. The old brain is a system that humans required to survive the perils of existence. This included the ability to be able to react quickly and to decide on the best course of action to maximise survival. Therefore, the flight or fight system was the one of the best operating systems to allow an assessment of safety.

**Figure 2***Three Types of Affect Regulation*

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Note. *The Compassionate Mind: a New Approach to the Challenge of Life* (p.24) Gilbert, 2009 London, UK: Constable Robinson

This system continues to operate to protect against threats even though threats to life have reduced as humans have transitioned to civilised societies. From an evolutionary perspective, humans only required the threat system to determine threat to life and the appropriate action for survival (Mobbs et al., 2015). Therefore, the old part of the brain is set to detect and alert the rest of the body to the threat. During human development, the brain grew in size to accommodate the new part of the brain known as the prefrontal cortex. The prefrontal cortex is often referred to as the rational part or higher brain system which weighs up options, whilst making the most logical choice with the preservation of life at the centre of the decision. In response to these changes a conflict operates between these two brain states.

Therefore, when emotional dysregulation occurs the Jacksonian principle of dissolution occurs – this is defined as when a higher brain system malfunctions then a previous system would be activated and take over (Jackson, 1884; Porges, 2007). When one is struggling with internal or external stresses the higher brain system is overridden by the old brain system



leading to irrational and emotional decisions. However, skills such as mindfulness and compassion which include present moment awareness and psychological flexibility can support a transition back to the higher brain functions (Engstrom & Soderfeldt, 2010; Lazar et al., 2005; Micah et al., 2012). The time period between stimulus and response is known as the refractory period. As Ekman and Cordaro (2011, p.365) states this can be quite challenging as ‘the refractory period filters information available to what supports the emotion’. Therefore, leaving an individual to respond prematurely in a heightened emotional state. Ekman describes three avenues for managing these responses, ‘not becoming emotional at all, shortening the refractory period and to control one’s actions during the refractory period’ (Ekman, 2003, p.148).

The three-affect regulation model includes the drive, threat and soothing systems. The drive system motivates an individual towards resources to support achieving and pursuing goals and purpose. To help propel this drive forward, dopamine is released reinforcing this behaviour or experience such as achieving and pursuing goals and purpose. The threat system is required to assess risk to life in the environment. This system struggles to determine the difference with threat to life and internal fears, which can lead individuals to feel emotionally and physiologically overwhelmed. When this system is aroused, cortisol (stress hormone) and adrenaline are released throughout the body, which can take several hours to disperse. The amygdala is part of the threat-based system which is situated in the old brain system. In contrast, the soothing systems promoting regulation and social connection through experiencing safety and compassion. This is the one system that works with the parasympathetic nervous system as a vessel for the release of oxytocin enabling the system to return to balance. Accessing the soothing systems requires one to combine the practices of being in the present moment, recognising safety, feeling grounded and compassion for the self.

When the threat response is activated there will be a struggle to feel compassion to the self or others as self-criticism is more active within this mode (Longe et al., 2010). Recent research has shown increases of compassion activates the parasympathetic nervous system measured by high HRV (Kim et al., 2020). High HRV indicates a greater stress tolerance and is associated with positive mental health (Thayer & Brosschot, 2005) and physical health (Brändle et al., 2015). Compassion practices could support both the increase in compassion and a reduction in the fears of compassion. Kindness based meditation has also shown to reduce fears of compassion (Jazaieri et al., 2012). In summary, all three of these systems interact with one another and respond to environmental cues and experience. A balance of all three systems is required to maintain optimum human functioning.

### **Mindfulness and Compassion Applications**

The section below highlights the therapeutic modalities that include mindfulness and compassion principles within interventions. These have been included as non-clinical interventions do not always combine the applications of mindfulness and compassion. In this thesis the term 'Mindfulness-Based Compassion Interventions' (MBCI) will be used to include the interventions: Mindfulness-Based Stress Reduction (MBSR); Mindfulness Based Cognitive Therapy (MBCT); Acceptance and Commitment Therapy (ACT); Dialectical Behavioural Therapy (DBT); and Compassion Focused Therapy (CFT). A recent review (Kirby et al., 2017) identified numerous compassion-based interventions including: Mindful Self-Compassion (Neff & Germer, 2013), Compassion Cultivation Training (Jazaieri et al., 2012), Cognitively Based Compassion Training (Ozawa-de Silva & Negi, 2013) and Cultivating Emotional Balance (Kemeny et al., 2012). However, these interventions do not always combine the applications of both mindfulness and compassion practices.

## **Mindfulness-Based Compassion Interventions (MBCI)**

Interest in mindfulness applications have been used within a clinical setting to support the treatment of psychological problems with a movement towards ‘mindfulness-based therapies’ (Pratikta, 2020). Known as the ‘third wave’ of behavioural therapies, mindfulness-based compassion elements have now been integrated into mainstream therapies which look towards empowering the individual and teaching acceptance as a key skill (Churchill et al., 2010). The inclusion of MBCI allows individuals to take back the power of their thoughts through diffusion or equanimity, whilst learning not to fight for control against thoughts or emotions. It has been argued that experiential avoidance of unpleasant experiences can cause emotional dysregulation, which could manifest into a clinical condition (Hayes et al., 1999). Therefore, instead of using energy to fight, avoid or change thoughts, acceptance and kindness can be given to support a more holistic approach. Mindfulness has been recognised as a significant foundation for compassion-based approaches (Tirch, 2010). So far these approaches have been aimed at the clinical population as a treatment intervention for a range of mental health issues including anxiety, depression, eating disorders, bipolar and personality disorders. However, as the skills embedded in these interventions become more flexible, research has increasing using these interventions in a non-clinical population. Recent research using MBCI’s in non-clinical populations have shown to be successful in numerous areas. These include: MBSR for healthy participants (Shapiro 2007); DBT for jail inmates (Moore et al., 2016); ACT for adolescents (Buckhardt et al., 2017); MBCT for mental health care staff (Askey-Jones, 2018), CFT for general population (Sommers-Spijerman et al., 2018).

Dialectical Behavioural Therapy (DBT) (Linehan, 1993) was originally designed to support individuals suffering from psychological issues such as suicidality and borderline personality disorder (BPD). DBT is derived from Buddhism, evolutionary elements and neuroscience. Three states of mind are included in the teachings, these comprise of rational

(thinking), emotion (feeling) and wise mind. DBT encourages the wise mind as the common state which integrates and balances both rational and emotion states. Part of the DBT skills training includes elements of both mindfulness and compassion. DBT includes an integration of mindfulness and compassion exercises. These exercises include: validation; self-respect; taking care of the body; self-soothing; half smile/willing hands exercises; loving kindness meditations.

Acceptance and Commitment Therapy (ACT) was created by Hayes et al. (1986) to encourage clients to accept unpleasant thoughts that arise and use present moment techniques such as mindfulness to diffuse the intensity. Included in the intervention are the six core conditions with the Hexaflex: diffusion; acceptance; contact with the present moment; observing self; values; committed self. According to Hayes et al. (2011) the six components within the Hexaflex model contain both elements of compassion and self compassion. These components include the ability to feel self compassion while experiencing difficult feelings. Secondly, observing the mind without fusing with the thoughts. Finally, to work towards the individual's values with self kindness and validation (Dahl et al., 2009).

Mindfulness-Based Stress Reduction (MBSR) is the inception of the western secular mindfulness-based interventions. MBSR was originally conceived by Jon Kabat Zinn in 1979 as a chronic pain management technique. Kabat-Zinn introduced it as an alternative therapy for patients who lacked medical options for treatment. The intervention includes mindfulness of breathing, body scan, mindful walking/eating and hatha yoga. MBSR is a combination of insight and concentrative meditation taken from Buddhism. Embedded alongside the mindfulness skills are the practices of compassion such as loving kindness meditations.

Mindfulness-Based Cognitive Therapy (MBCT) created by Teasdale et al., (1995), an extension of Cognitive Behavioural Therapy (CBT), aims to rewire 'faulty cognitions' while

integrating acceptance and non-judgement techniques. MBCT combines features from mindfulness, MBSR and CBT (Crane, 2009). MBCT was originally designed to reduce relapse rates among patients with frequent episodes of depression (Teasdale et al., 2000). MBCT is based on an 8-week course, typical comprised of mindfulness-based interventions. Included in the intervention is mindfulness of breathing, body scan, mindful walking/eating, acceptance and compassion. The core principles of CBT include the identification, evaluation and change of unhelpful behaviours which are incorporated into the weekly sessions.

Compassion Focused Therapy (CFT) was developed to cultivate and enhance self-compassion for patients in a clinical setting (Gilbert, 2009). CFT was aimed at those who suffered with chronic shame and self-criticism. Included in this therapy are mindfulness concepts such as mindful acts of kindness and awareness. CFT draws its concepts from Buddhism, evolutionary elements and neuroscience. Gilbert proposed three systems of emotion regulation, these include: 1) threat and self-protection, 2) achieving and drive, 3) safety and soothing. The aim of CFT is to rectify the balance by encouraging a more compassionate mind set by accessing the system of safety. A CFT course includes a combination of compassionate imagery such as the loving-kindness meditation, mindfulness practices, compassionate behaviours including letter writing and chair work, compassion to self and others and how to respond to self-criticism.

To summarise, this review has offered an overview of both mindfulness and compassion. Firstly, the review began by offering an exploration into the history of mindfulness, which included the Buddhist origins and types of meditations. Secondly, compassion and the science behind compassion was reviewed which including western models and concepts. Finally, a brief summary is given of the interventions that combine both mindfulness and compassion into the trainings and teachings.

## **Chapter 3**

Review of Literature

Neurophysiology

## CHAPTER 3 Review of Literature

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### Stress

Recent research has shown that within the UK alone 74% of people struggle with stress to the point they felt unable to cope (Mental Health Foundation 2018) with around 80% of all cases of depression originating from a stressful life event (Bullmore, 2018, p.150). The World Health Organization (WHO) predicts that mental disease, including stress-related illness, will be the second leading cause of disabilities by the year 2020 (Kalia, 2002).

One of the first pioneers of stress physiology was Seyle (1950) who defined stress as 'the non-specific response of the body to any demand'. He found that the body responded to stress in a similar way regardless of the stress stimuli. More importantly he recognised that if stress persisted it could make the individual unwell (Sapolsky, 2004, p.8). Chronic distress is enduring long-term distress that over time begins to have a detrimental impact on one's health and wellbeing. Chronic levels of distress has shown to be detrimental to many areas of the body with links to some of the biggest health concerns including diabetes, cardiovascular disease and mental health issues (Harris et al., 2017; Song et al., 2019; Bullmore, 2018). Chronic distress has also been shown to cause structural changes in the brain, reductions in neurons and synaptic terminals and a reduction in telomere length - a primary psychobiomarker of distress and disease (Reznikov et al 2007; Sapolsky 1990; Epel, 2009). The two main avenues in which distress impacts the body are through the sympathetic nervous system (SNS) specifically the sympathetic adrenomedullary (SAM) which is part of the autonomic nervous system and the Hypothalamus Pituitary Adrenal Axis (HPA).

Seyle (1974) later went on to differentiate between distress and eustress within stress physiology. Distress was defined as a maladaptive response to stress leading to negative emotions. In contrast eustress is a more adaptive beneficial response to stress eliciting an

individual to feel happy and motivated. Recent developments have proposed additional factors that could contribute to distress. Koolhaas et al., (2011) suggests the inclusion of dimensions of controllability and predictability to represent cognitive and perceptual concepts of stress alongside traditional features of physiology and behaviour. An example of predictability would include the foresight of the stressor whilst managing through adaptation. Controllability reflects the time to recover from the stressor, being able to let go and move on.

### **Seyle's General Adaptation Syndrome (GAS)**

According to Seyle (1950) when individuals are exposed to stressors there are three distinct stages of reaction that was initially known as the 'General Adaptation Syndrome', later referred to as the stress response. The first stage is alarm (or shock), when an individual registers the shock and begins to experience physiological effects. This physiological state triggers the second stage known as the countershock when an individual attempts to manage the stressor, and in doing so becomes further influenced by the stressor. The final stage includes resistance and adaptation to the stressor. However, if the stressor continues and adaptation is not feasible, exhaustion will unfold for the individual. Seyle's model helped to identify physiological aspects of the stress response but did not take into account the subjective experience related to stress and coping mechanisms (Krohne, 2002).

In response to stress activation, a regulation system called homeostasis is triggered to bring the body back to a state of optimal functioning. Homeostasis was defined by Cannon (1929) as a regulation system which allows internal conditions to remain stable and relatively constant. It is a process that maintains the stability of the organism's internal environment in response to fluctuations in external environmental conditions (Torday, 2015). Cannon went on to define adrenal gland secretion through external and internal threats to homeostasis as the flight or fight responses (Canon, 1929). Recent developments in the definition of homeostasis



have considered including concepts such as allostasis. Allostasis is defined as promoting efficient regulation by commencing changes before they arise (Sterling, 2012). In contrast, prolonged exposure to stressors can induce allostatic load from too much stress or the inability of the stress response system to respond (McEwen, 1998). One of the homeostatic regulatory processes is the negative feedback system. Negative feedback counteracts anticipation in physiological systems such as body temperature, blood sugar levels and blood pressure. The management of blood pressure uses negative feedback to maintain arterial blood pressure. Baroreceptors are the sensors that measure and initiate the changes. For example, if blood pressure is too high alterations will be made to counteract the imbalance. These include changes in the output from the heart (reduction in heart rate) or adjustment in the size of the vessels (vasodilation) to compensate for the change in blood flow.

### **Psychological Stress: The Transactional Model of Stress**

During the 1970s research began to include the individual's perception of stress, not just the external environmental threats and the impact of the physiological response. The transactional model of stress (Lazarus & Folkman, 1984) states "psychological stress is a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being" (Lazarus and Folkman, 1984, p. 19). The authors went on to define three stages of response, the first stage is when the threat is perceived as irrelevant. The second stage is defined as being benign and positive as it is not harmful and leads to a constructive outcome. The third stage is when the threat is defined as harmful and negative. The model proposed primary and secondary appraisals in which individuals help to distinguish the threat and the ability to cope with the threat. The primary appraisal would include a consideration as to whether the threat is harmful to one's wellbeing, whilst the secondary appraisal would evaluate the ability to cope with the threat.

## **Stress Physiology**

### **The Autonomic Nervous System (ANS)**

The Autonomic Nervous System (ANS) includes two essential but opposing systems – the parasympathetic nervous system (PNS) and the sympathetic nervous system (SNS), which is associated with flight or fight threat responses. Both the PNS and SNS are connected to the physiological mechanisms of heart rate and blood pressure. In response to stress in the body the first physiological indicator is an increase in heart rate (Vrijkotte et al 2000), followed by the second indicator of a rise in blood pressure (Laitinen et al., 1999).

Heart rate is defined as ‘the number of contractions of the ventricles per unit time which fluctuates substantially with variations in systemic demand for oxygen’. Heart rate is defined as the frequency of resting heart beats, which can be measured using a machine such as a blood pressure monitor to indicate the number of beats per minute or an Electrocardiogram (ECG). A healthy average for resting adults is between 60-100 beats per minute (NHS, 2018). Blood pressure is measured in millimetres of mercury (mmHg) and is split into two separate readings of diastolic (DBP) and systolic (SBP). DBP is the smaller number at the bottom of a blood pressure reading and is defined as the pressure exerted when the heart rests between beats. In contrast SBP is the pressure when the heart pumps blood out. A healthy average for blood pressure in most adults is between 80/120 for SBP and 90/60 for DBP (NHS, 2019). SBP is now classed as a better predictor for health concerns (Black, 2004). A healthy range of blood pressure is encouraged for optimum health. This is mainly attributed to SBP offering more data than DBP to support the identification of strokes and coronary heart disease (Lewington et al., 2002).

Physiological responses such as heart rate, heart rate variability and blood pressure are key indicators in the body’s response to stressors. As they are the primary indicators of stress

within the body they are integral to homeostasis. The increases seen in heart rate, heart rate variability and blood pressure are a result of the SNS taking control of the body. When a stressful situation is experienced a surge of hormones such as adrenaline are released into the blood stream. These hormones temporally increase the heart rate and blood pressure which can contribute to the narrowing of the blood vessels. Frequent elevation through stressors and/or the inability to return to resting levels contribute to the development of hypertension (McEwen, 1998). Hypertension is one of the major causes of premature death worldwide along with comorbidity increases the risk of further debilitating diseases (WHO, 2019).

### **Hypothalamic Pituitary Adrenal Axis (HPA)**

The Hypothalamic Pituitary Adrenal Axis (HPA) is the central stress response system combining and integrating both the central nervous system and endocrine system. The HPA axis is responsible for the neuroendocrine adaptation of the stress response and particularly Corticotrophin-Releasing Factor (CRF). CRF binds to the CRF receptors from the hypothalamus to the pituitary, releasing adrenocorticotrophic hormone, which binds to the cortex and releases cortisol into the system (De Kloet et al., 2005).

When an individual becomes stressed, cortisol is released throughout the body for many hours causing the body the activation of the stress response. For the body to return to the PSN and homeostasis, the body has to register the amount of cortisol in the system before this process can begin. Continuous stressors not only release cortisol more frequently but also begin to make the hypothalamus and pituitary glands more sensitive to stimulation causing further emotional instability. During the release of cortisol other hormones register the responses (norepinephrine and epinephrine) prolonging the stress response (Herman et al., 2016).

The HPA axis process is essential in enabling the body to respond to potential threats as effectively as possible. Chronic stress, however, can lead to physical and psychological

difficulties. The frequent elevation of cortisol levels activates the stress regulation systems causing a state of dysregulation. Increased cortisol levels have been linked to physical disorders (e.g. cardiovascular diseases), mood disorders (e.g. major depressive disorder), and cellular damage (e.g. telomere destruction) (Epel et al., 2006; Lob & Steptoe, 2019; Nandam et al., 2019). The immune system is compromised by the increase of pro-inflammatory cytokines causing greater risk of illness and disease (Gouin et al., 2012).

### **Figure 1**

#### *Hypothalamus Pituitary Adrenal Axis (HPA)*

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Note. From “A Modeling Study in the Regulation of Stress on Neuronal Plasticity” by Xiao, 2015, ([https://www.researchgate.net/figure/A-diagram-for-Hypothalamic-Pituitary-Adrenal-HPA-axis-In-response-to-stress-the\\_fig1\\_281995690](https://www.researchgate.net/figure/A-diagram-for-Hypothalamic-Pituitary-Adrenal-HPA-axis-In-response-to-stress-the_fig1_281995690))

## **Mechanisms of Mindfulness**

### **Mechanisms of Mindfulness for Combating Stress**

The mindfulness stress buffering hypothesis (Creswell, 2011) was created as an extension of the stress buffering hypothesis. The mindfulness stress buffering hypothesis states that ‘mindfulness mitigates stress appraisals and reduces stress-reactivity responses, and these

stress reduction effects explain how mindfulness affects health outcomes' (Creswell & Lindsay 2014, p.402). Within the mindfulness stress buffering hypothesis three areas have been identified as playing a role in reducing stress through mindfulness intervention: biological, psychological and health factors (Creswell, 2019).

The biological pathways strengthen the areas of the brain relating to stress regulation (pre-frontal cortex), while reducing the pathway to the areas that heighten stress (amygdala, hypothalamus, anterior cingulate). Psychological pathways include the development of skills around noticing present moment experience along with acceptance, the fundamentals within mindfulness-based interventions. Finally, health factors include the reduction of stress related behaviours which could contribute to further harm. Increased stress can lead to risky health behaviours that can have further detrimental impacts on the physiological systems (Hornstein, 2004). Brown et al. (2012) found that participants with trait mindfulness produced less cortisol in the high stress condition compared to the low stress condition and control group. Therefore, more mindful individuals would be able to manage the stress response by using the skills of acceptance and non-judgement to mitigate the physiological and biological impacts of stressful stimuli.

### **Mechanisms of Mindfulness and Blood Pressure**

The mechanisms of change using mindfulness in relation to improvements in cardiovascular disease (CVD) have been proposed by Loucks et al. (2015). These mechanisms include 1) improved attention control, 2) emotional regulation and 3) self-awareness (Loucks et al., 2015). In conjunction with the above mechanisms of change, a recent theoretical framework called Mindfulness-Based Blood Pressure Reduction (MB-BP) uses key lifestyle factors (diet, physical exercise, medication adherence, stress management and social support) to support the reduction in blood pressure. Following the initial trial of MB-BP an average

reduction in systolic blood pressure of 6.1mmHg and 15.1mmHg for stage 2 uncontrolled hypertensive participants at the one year time point (Loucks et al., 2019). This new framework offers an insight into the use of how mindfulness mechanisms of change can be applied to supporting the reduction of blood pressure.

The S-ART model and psychoneuroimmunology (Ader et al., 1987; Feder et al., 2009) also advocate that mindfulness practice can support and improve physiological autonomic regulation leading to homeostasis in times of stress. The two metaphors that support the effects of stress include the ‘raincoat effect’ which acts a level of protection against the stressors. The ‘towel effect’ aids and supports recovery by moving on from the stressors. These metaphors support the reduction of sympathetic nervous system (SNS) and hypothalamic pituitary adrenal axis (HPA) (Vago & Silbersweig, 2012).

### **Mindfulness, Compassion and Stress**

Mindfulness interventions, more specifically mindfulness-based stress reduction, have been used to target and manage stress. Mindfulness-based stress reduction (MBSR) programmes include techniques to support the reductions in stress whilst making alterations in one’s life to enable a healthy level of stress. Research using self report measures of perceived stress showed strong associations between mindfulness interventions and reductions in distress (Chiesa & Serretti, 2009; Goyal et al., 2014; Khoury et al., 2015). An objective biomarker of stress such as cortisol have shown direct reductions in cortisol following mindfulness interventions. Recent research highlighted a reduction in hair cortisol after a 7-week intensive mindfulness intervention (Goldberg et al., 2014), offering further evidence of the benefits of mindfulness interventions in reducing distress.

Comparable biological markers of stress have been identified during mindfulness retreats. A relationship between telomeres and perceived stress has been identified and many

studies have used telomere length as a measure of psychological stress (Mathur et al., 2016). At a cellular level telomere length has been identified as a suitable psycho-biomarker linking stress and disease. Lower telomerase enzymes are also associated with increased heart rate and blood pressure alongside greater sympathetic arousal (Epel et al., 2006). Research highlighting the damaging impact of stress on the body at a cellular level have shown interventions such as mindfulness mitigates the impact of chronic stress on telomeres. Mindfulness interventions increase the production of telomerase enzymes increasing stability and telomere length (Epel, 2009). Mindfulness retreats have shown to support telomere lengthening in participants after only 3 weeks (Conklin et al., 2018). Mindfulness interventions target the negative impacts of mind wandering which has been attributed to shorter telomeres (Epel, 2009). This suggests that aspects of mindfulness interventions have a beneficial impact at a cellular level.

The vagus nerve is a major component within the neurophysiological flow of compassion with vagal tone (or heart rate variability) representing the biological marker of compassion. Within the Polyvagal theory the vagus nerve is specifically connected to the parasympathetic nervous system - the rest and digest part of the autonomic nervous system. The vagus nerve not only allows a pathway for the PNS to develop, but it can also inhibit the reactivity of the SNS (Porges, 2007). A recent meta-analysis highlighted a strong association between self compassion and low levels of depression, anxiety and stress (Macbeth & Gumley, 2012). Individuals responding to acute stress with suppressed vagal tone (heart rate variability) are more vulnerable to ongoing psychological stress and lower levels of telomerase activity (Epel et al., 2006). This study highlights the important link between the integration of stress physiology and compassion.

Compassion-based meditations have been shown to reduce stress induced immune and behavioural responses (Pace et al., 2008) and influence the stress related brain areas including the anterior cingulate and amygdala (Lutz et al., 2008). Research found that self compassion

was a negative predictor of salivary alpha amylase (biomarker of the SNS) in the activation of the sympathetic nervous system following individual and repeated stressors (Breines et al., 2015). This research goes on to outline the benefits of compassion not only on the physiological systems but also on the functioning of the brain.

### **Mindfulness and Physiological Measures of Stress**

Mindfulness-based interventions have shown reductions in the physiological measures of stress using different types of meditations. Transcendental Meditation (TM) responses showed decreases in blood pressure and respiratory rate which enhanced a sense of wellbeing (Wallace et al., 1971). Benson et al. (1974) went on to propose the Relaxation Response (RR), which included activities such as meditation, chanting, yoga and ta-chi that activate the parasympathetic nervous system. It hypothesised that RR worked by reducing the oxidating effects of the stress response at a cellular level which decreases inflammation and consequently the chances of stress related illness (Benson et al., 1974). Contemporary research has continued to outline the benefits of the relaxation response. Reducing psychological stress through transcendental meditation has shown to reduce blood pressure ultimately reducing the risk of developing hypertension (Nidich et al., 2009).

A recent meta-analysis and systematic review found a range of meditation interventions (examples include: MBSR; MBCT; Primordial Sound Meditation; Mind Orientated Recovery; Buddhism based walking) reduced systolic blood pressure, heart rate and cortisol in a range of populations when compared to active controls of education, exercise and health interventions (Pascoe et al., 2017). The research also included different types of meditation such as focused attention and open monitoring which identified differences in physiological responses. Focused attention found a reduction in cortisol, while open monitoring in contrast also supported a reduction in heart rate. However, in the twenty-eight interventions reviewed none included



compassion or compassion practices as part of the intervention. This result highlights a gap in research for compassion-based practices and physiological measures of heart rate and blood pressure.

Research has shown the benefits of mindfulness-based stress reduction (MBSR) using physiological measures including heart rate (Amutio et al., 2014; Amutio et al., 2015); blood pressure (Amutio et al., 2015; Nyklicek et al., 2013; O'Donnell, 2018). Previous research by Amutio et al., (2015) integrates both heart rate and blood pressure (DBP & SBP). A pre and post RCT design was used for an 8-week MBSR intervention (following Jon Kabat Zinn protocol) to measure psychological and physiological measures. The psychological variables were burnout and mindfulness. The physiological variables were heart rate and blood pressure. Participants were expected to practice mindfulness exercises every day for 45-minutes using CDs, while keeping a record of hours practiced. The post intervention mean score for heart rate was reduced by 6.29bpm (beats per minute). DBP blood pressure was reduced by 10.53mmHG and SBP by 16.06 mmHG. Correlational analyses also indicated a significant positive relationship between hours of home practice and both DBP & SBP blood pressure. Home practice hours was significantly related to decreases in SBP ( $r = 0.68$ ;  $P = 0.03$ ) and DBP ( $r = 0.67$ ;  $P = 0.04$ ). The authors suggest that that the essential component to the long term effectiveness of blood pressure was the continued home practice during the intervention. Previous research has shown that individuals who stop practicing also lose any reductions in BP (Goldstein et al., 2012). Limitations of the research include small size (experimental  $n = 21$ , control  $n = 21$ ) and overlooking certain characteristics of the participants such as those defined as “not particularly stressed”. As the findings focused heavily on home practice it would have been useful for the authors to identify what components of the MBSR were included in the home practice. This would help guide the inclusion of home practice in future

studies on mindfulness. Despite the limitations, the study includes physiological measures with MBSR intervention and highlights the importance of home practice.

In response to the benefits of mindfulness meditation the American Heart Association approved the use of meditative techniques in 2013 to complement traditional forms of support for the management of hypertension. Physiological responses such as heart rate and blood pressure are key indicators of the activation of the sympathetic nervous system in the body's response to stress. As key indicators of stress within the body they are also key to helping regulate the body back to homeostasis. The research previously stated has shown mindfulness and compassion practices to mitigate distress while increasing resilience. In turn, meditative stress management can help to alleviate stress related illness and increase longevity. Therefore, future investigation should include physiological responses to stress when researching mindfulness interventions to add to the current research.

### **Neurology and Frontal $\alpha$ -Asymmetry**

Over the last 50 years neuroscientific research has increased exponentially covering clinical and non-clinical populations (Altimus et al., 2020). The advancement and availability of technology has opened up the many avenues of application of neuroscience. One area of interest to the current research is affective neuroscience which proposes that emotional processes and subjective feelings impact on the actions one takes (Panksepp 1992). The brain processes these emotional responses which have a cascading effect on the body, the ANS, feeling states and motivations (Izard, 2010). Research has shown that frontal regions of the brain specialize in the processing of positive and negative emotions (Davidson and Irwin, 1993). Hemispheric asymmetry or laterality has identified differences in the processing of emotions for each hemisphere in the frontal cortex using frontal  $\alpha$ -asymmetry (FAA) to record the activity in each hemisphere (Davidson et al., 1990). The interrelationship between left and

right PFC activity is known as frontal asymmetry and has shown to relate to both trait and state characteristics in an individual's affect and motivational tendencies (Coan & Allen, 2004). Research using frontal EEG  $\alpha$ -asymmetry has primarily focused on emotion, motivation and psychopathology for areas of exploration (Smith et al., 2017).

Frontal asymmetry is measured using an electroencephalogram (EEG) and calculated from the difference in brain waves between electrodes on the left and right hemispheres. Alpha levels are inversely related to cortical activity, therefore greater left, compared to right, alpha power equates to greater right hemisphere cortical activity (Oakes et al., 2004). Brain asymmetry scores ( $\log \text{Right} - \log \text{Left}$  e.g.  $\text{FAA} = \ln[\text{F4}] - \ln[\text{F3}]$ ) are calculated using the mean alpha power values for the frontal sites (F4-F3/ F8-F7/ FP2-FP1). Brain activation was inferred as the reverse of mean alpha power (less alpha activity the more brain activity) (Davidson et al., 1990, Oakes et al., 2014). Alpha is characterised by a slow brain wave frequency of 8-13hz that is high in amplitude representing a low aroused, relaxed calm state represents a low aroused, relaxed, calm state reflecting a slower brain waves that are higher in amplitude (Posada-Quintero et al., 2019).

### **Models of EEG Asymmetry**

The three main models proposed to explore the processing of emotions in the hemispheres include: the right hemisphere model; the valence hypothesis (emotional valence); the approach/withdrawal model (motivational direction). The right hemisphere model proposes that all emotional processing including perception, expression and experience is processed in the right hemisphere regardless of valance (Heliman and Bowers, 1990; Ross, 1985). In contrast, the valence hypothesis (Hellige, 1993) predicates that emotional states depending on the experience are defined as either positive or negative.

The approach/withdrawal model (Davidson, 1983) proposes that the two hemispheres process emotions differently within the frontal cortex. The left hemisphere specialises in processing positive affect and approach motivation, while in contrast increased frontal EEG  $\alpha$ -asymmetry in the right hemisphere is linked to negative affect and withdrawal or avoidance of an emotional stimulus (Davidson, 1993; for a review see Coan & Allen, 2004). In Davidson's model the motivational behaviour towards the stimulus is the focus, rather than both the approach and avoidance directions of the valence hypothesis (Ahern & Schwartz, 1979). In brief, models of motivational processing include a response to withdraw or approach emotionally evoking stimuli (Elliot & Covington, 2001). In accordance with the approach and withdrawal model the left hemisphere is associated with the experience of positive (affect) emotions and rewards such as enthusiasm and pride, while the right hemisphere relates to the experience of negative (affect) states such as fear, sadness and disgust (Davidson & Irwin, 1999). Research has also shown that the left prefrontal cortex may play a role in impeding the activity in the amygdala including the response recovery following a negative experience (Davidson, 2004). In addition, it has been proposed that frontal asymmetry may be associated with the terms dominance (left frontal activation) and submission (right frontal activation) (Demaree et al., 2005). Research has shown that happiness to be associated with dominance, whereas fear and disgust are associated with submission (Russell & Mehrabian, 1977). Further research is required to explore the links between happiness and fears with the role of each hemisphere.

### **Mindfulness and EEG Frontal Asymmetry**

Over the last 20 years neuroscientific measures such as electroencephalograms (EEG) have been used to enhance our understanding of psychophysiological changes during mindfulness-based interventions. The term neuroplasticity is popular within mindfulness research and has been identified as a mechanism for neural changes, emphasising the

relationship between mindfulness and neuroscience (Davidson & Lutz, 2008; Widdett, 2014). Research using mindfulness interventions have shown to induce neuroplasticity across different brain regions, some examples include greater density in grey matter (Holzel et al., 2011), cortical thickness (Lazar et al., 2005), increases in insula and the somatosensory cortex (Lutz et al., 2014). Mindfulness has shown to facilitate psychological change by strengthening one's ability to regulate emotions (Farb et al., 2013), therefore it would be useful to establish any neural links with this process.

Mindfulness interventions in general support individuals to create a state of mind that deters engagement with maladaptive patterns, thus nurturing a state of mind known as positive affect (Barnhofer et al., 2010). In addition, the more one practices mindfulness the greater the positive affect (Weinrib, 2011). In contrast, negative affect can have a detrimental impact on emotional regulation. Chronic distress for example, has shown to cause numerous negative outcomes including brain asymmetry dysregulation (Bob 2008). Greater left frontal EEG activation has been shown to mitigate the effects of stress (Lopez-Duran et al., 2012). While greater right frontal activation is related to stressors and stressful experiences (Tomarken et al., 1990).

Research combining mindfulness and frontal asymmetry is limited. The main piece of research combining the two is a study by Davidson et al. (2003) who conducted a Randomised Controlled Trial (RCT) to research frontal brain  $\alpha$ -asymmetry using EEG alpha brain wave measures at pre, post and four months following an 8-week MBSR intervention. The study consisted of twenty-five participants in the meditation group alongside sixteen in the control group. The measures included brain electrical activity measures, self-report measure of Positive and Negative Affect Schedule (PANAS), Spielberger Trait Anxiety Inventory, recordings of daily meditation practice and biological measures. Biological measures included an influenza

vaccination to monitor changes antibodies blood tests at 3-5 weeks and 8-9 weeks for the meditation group.

For the electrical brain activity, the study recorded measures at pre, post and follow up (4-months later) and used electrode sites F3/F4, FC7/FC8 (frontal), T3/T4(temporal), and C3/C4 (central). The results indicated at both post and follow-up a greater left sided hemisphere activation at electrode sites T3/T4 and C3/C4 after the intervention compared to the wait-list control group, a change associated with increased positive affect. However, the frontal electrode sites showed no greater left sided activation. It was noted from the self-reported mindfulness practice that a reduction in practice was evidenced from time point 2 (8-weeks) to time point 3 (4-months). The authors advanced no explanation as to the lack of findings relating to the frontal electrode sites. A critique of the findings raised question as to why the electrode sites C4/C3 have been activated when primarily function as motor sites rather than emotional processing sites (Travis & Arenander, 2004). This could have been a contributing factor towards the findings of the left sided frontal activation. A further interesting finding identified a significant increase in antibodies to the influenza vaccine in the meditation group compared to the wait-list control group. This research showed that MBSR had positive impacts on both brain and immune functioning which continued beyond the 8-weeks. However, the study failed to find increases in left prefrontal activation. The authors conclude that future research could include changes to the intensity or duration of the mindfulness intervention to increase both left prefrontal activation and positive affect.

Greater left sided EEG activation has been subsequently linked to mindfulness-based meditations in more recent research. A short 5-week meditation intervention consisting of between 5 to 16-minutes of active focused attention meditation a day showed an increase towards left sided frontal  $\alpha$ -asymmetry activation compared to the wait-list control group (Moyer et al., 2011). Further research using an 8-week MBSR on an elderly community

population over time points from pre to thirty-two weeks found left sided frontal  $\alpha$ -asymmetry activation in frontal regions (F3/F4). However, a notable shift was only found after the 8-week intervention not in the follow up twenty-six-weeks later. This result could be due to a reduction in mindfulness practice following the completion of the intervention causing an impact on the strength of the left sided frontal  $\alpha$ -asymmetry activation in frontal regions (F3/F4). However, mindfulness practice during and following the intervention was not recorded for the research. In contrast, the wait-list control group had a significant shift in right sided  $\alpha$ -asymmetry activation (Moynihan et al., 2013).

Alternative mindfulness-based research has shown increased left side EEG activation including Mindfulness-based Triarchic Body-pathway Relaxation Technique (Chan et al., 2008), MBCT (Barnhofer et al., 2007; Zhou & Liu, 2017) and Theravada meditation (Amihali & Kozhevnikov, 2014). However, similar research has also found decreased activity in left hemispheric  $\alpha$ -asymmetry or failed to find any effect on frontal hemisphere asymmetry from mindfulness training (Keune et al., 2011; Milz, 2014). Research on depressed patients found a stronger shift towards right sided  $\alpha$ -asymmetry activation following an MBCT intervention indicating an opposed result (Keune et al., 2011). Despite mixed research results regarding hemispheric asymmetry, hemispheric shifts from left to right remain a persistent research finding.

All of these studies have added to the alpha asymmetry research on left sided brain activation, highlighting that short-term interventions of mindfulness are also able to cause neural changes in the frontal hemispheres. However, the above studies have mainly targeted mindfulness meditation as the intervention excluding other types of meditation such as compassion-based practices. A recent review on the neurophysiological impact of mindfulness interventions using EEG measures suggests further research on hemispheric asymmetry using different mindfulness and meditation interventions was required (Lomas & Ivtzan, 2015).

Additional studies could also expand on the relationship between brain hemispheres and mindfulness using alternative outcome measures to explore further changes.

### **Compassion-Based Meditations and EEG Frontal Asymmetry**

Compassion-based meditations (CBM) have been researched as part of mindfulness interventions and as a single component. However, it has been identified that compassion meditations such as loving kindness meditations are not part of the manualised MBCT and MBSR, but the inclusion depends on the teacher (Barnhofer et al., 2010). Compassion training could also expand positive affect and reduce negative affect, while helping individuals to strengthen resilience to distress (Klimecki et al., 2013). There is a lack of neuroscientific research using compassion-based meditations, therefore further research in this area would help support identify any links such as positive affect.

A notable study by Barnhofer et al. (2010) included EEG  $\alpha$ -asymmetry measures for two different types of meditation on participants with depression. The first group (N=8) completed a 15-minute mindfulness breathing meditation and the second group (N=7) completed a 15-minute loving kindness meditation, following guided meditations. EEG  $\alpha$ -asymmetry measures were taken at pre and post the 15-minute intervention. After the initial study a third group was included as a control with no intervention and only the EEG measures. The results concluded that both the mindfulness breathing meditation and loving kindness meditation showed an equal increase in  $\alpha$ -asymmetry towards left prefrontal activation compared to a resting control group. This study adds to the small body of research on EEG  $\alpha$ -asymmetry, while also highlighting the equal importance of both the traditional mindfulness breathing meditation and loving kindness meditation. Even though the study had a small participant number it was still able to identify an increase in left prefrontal activation.

### **Mechanisms of Mindfulness**



There has been a small number of suggested mechanisms of mindfulness (Baer, 2003; Baer et al., 2006; Shapiro et al., 2006; Brown et al., 2007; Holzel, 2011; Vago & Silbersweig, 2012). However, the latest model (Vago & Silbersweig, 2012), defined as S-ART, integrates physiological, cognitive, emotional and behavioural components to support the mechanisms of change. The six components within the model included 1) intention and motivation; 2) attention regulation; 3) emotion regulation; 4) memory extinction and reconsolidation; 5) pro-sociality; 6) non-attachment and de-centering. In addition to the six components, further concepts are encompassed which include 'self-specifying and narrative self-networks' through the integration of the fronto-parietal control network (for a review of S-ART see Vago & Silbersweig, 2012).

The component relevant to the current study is intention and motivation. In the review presented by Vago and Silbersweig (2012) the approach and avoidance model was presented alongside the motivation mechanism. Shapiro et al. (2006) also highlighted the importance of intention and motivation within mindfulness and concluded that the intention in practising mindfulness also impacts on the experience and outcomes observed. As previously defined by Davidson and Irwin, (1999), there are two patterns of neural activity within the motivation systems of approach and avoidance. Left prefrontal activation has been connected to positive affect, whereas right prefrontal activation is associated with negative affect. It was also suggested that asymmetric differences may contribute to biological dispositional difference towards motivation and the outcomes of mindfulness training. Therefore, intentions and motivations are determined by individual interactions of affective style and biological dispositions, which predicts subsequent behaviour. Research is limited in this area and warrants further investigation to identify the links between motivation and mindfulness interventions (Vago & Silbersweig, 2012).

Further research is required to identify links between motivation and mindfulness interventions (Vago & Silbersweig, 2012) and only one identified study has integrated the approach and withdrawal model alongside a mindfulness intervention (Davidson et al., 2003). Therefore, the approach and withdrawal model was chosen as the most relevant theory for the current research. A mindfulness and compassion intervention could also add additional support and extend on the existing research using the approach and withdraw model.

To summarise, this review has offered an overview of both stress and the neurological facets in relation to the thesis. Firstly, the review began by offering an insight into theories of stress, stress physiology and lastly the relationship to mindfulness and compassion. The second part of the review begins with an introduction to neurology which leads to an overview of the EEG models, prefrontal  $\alpha$ -asymmetry and the relationship with mindfulness and compassion. A final outline is provided of the mechanisms of mindfulness relating to neurological aspects.

# **Chapter 4**

## Systematic review

## CHAPTER 4

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This chapter presents a systematic review of studies evaluating mindfulness-based and compassion-focused interventions using physiological measures. The results of this review will contribute towards the design and methodology of the studies in this thesis.

### Introduction

Third wave therapies are a combination of first wave (behaviourists) and second wave (cognitive) therapies with an integration of mindfulness-based compassion elements. The aim of the therapies is to empower the individual and teach acceptance. Third wave behavioural therapies are defined as helping a client to flourish rather than focus on symptom reduction, while developing a compassionate approach towards the self (Hayes, 2004). All of the third wave behavioural therapies originate from different approaches and orientations. However, proposed comparable characteristics include rediscovery of emotion by self-soothing, acceptance and compassion with the therapeutic link of mindfulness (Grantham & Cowtan, 2015). In this review the term ‘Mindfulness-Based Compassion Interventions’ (MBCI) will be used to include the interventions: Mindfulness-Based Stress Reduction (MBSR); Mindfulness-Based Cognitive Therapy (MBCT); Acceptance and Commitment Therapy (ACT); Dialectical Behavioural Therapy (DBT); and Compassion Focused Therapy (CFT). A recent meta-analysis and systematic review was conducted using MBSR, MBCT, ACT, DBT to establish the effectiveness at enhancing self-compassion and reduction mental health issues in a clinical and non-clinical population (Wilson et al 2018). However, the authors defined these therapies as ‘self-compassion related therapies’, but did not included CFT due to a recent review focusing on CFT (Kirby et al., 2017). The results from the study indicated that ‘self-compassion related therapies’ did improve self-compassion and reduce mental health issues in both clinical and non-clinical populations but no more than alternative therapies.

These interventions are commonly aimed at a clinical population as part of the treatment for a range of mental health issues including anxiety disorders (Anderson et al 2007), depression (Hayes et al., 2006), parasuicidality and borderline personality disorders (Linehan,1991; Linehan,1993b; Linehan et al., 2006b) and bipolar disorder (Williams et al., 2008). A significant part of MBCI's includes awareness of the body and the responses of the body in times of stress. In all MBCI's recognition of the emotion within the body is part of the experiential practice. One of the key skills utilised when emotion is felt in the body is self-compassion. Self-compassion skills can be identified as an essential component in all of the MBCI's. The mindfulness skills included in MBSR and MBCT are designed to cultivate a mind-set that is non-judgmental, accepting and compassionate (Kabat- Zinn, 1994). ACT includes many theoretical components within hexaflex model that require the skills of self compassion including acceptance, cognitive diffusion and the self in context (Wilson & Dufrene, 2009)). Within DBT, many of the exercises are included to encourage self-compassion (Linehan, 1993). CFT includes a range of compassionate meditations, breathing exercises and visualizations of compassion including self-compassion to support a move towards an experience of being compassionate to the self (Cannon, 2012).

Research using MBCI's in non-clinical populations have shown to be successful in MBSR for healthy participants (Shapiro et al., 2007); DBT for jail inmates (Moore et al., 2016); ACT for adolescents (Buckhardt et al., 2017); MBCT for mental health care staff (Askey-Jones, 2018); CFT for general population (Sommers-Spijerman et al., 2018). Mindfulness skills have been shown to help individuals recognise and become aware of normal physiological sensations such as the heart beat (Khazan, 2015). This awareness coupled with compassion and acceptance could be utilised by individuals in reducing the stress response of an experience that triggers and heightens the sympathetic nervous system.

### **The Autonomic Nervous System (ANS)**

The autonomic nervous system is comprised of two oppositional but essential systems within body. The parasympathetic nervous system (PNS), known as the rest and digest state, and the sympathetic nervous system (SNS), which is commonly associated with flight or fight threat responses. Both of these systems are connected to the physiological mechanisms of heart rate and blood pressure. In response to stress in the body the first physiological indicator is an increase in heart rate (Vrijkotte et al., 2000), followed by the second indicator of a rise in blood pressure (Laitinen et al., 1999).

Heart rate has been defined 'as a reflection of the number of contractions of the ventricles per unit time and fluctuates substantially with variations in systemic demand for oxygen' (Silva et al., 2018, p.1). Heart rate is defined as the frequency of resting heart beats, which can be measured using a machine such as a blood pressure monitor or an Electrocardiogram (ECG). The average HR of a healthy resting adult is between 60-100 beats per minute (NHS, 2018).

Blood pressure is measured in millimetres of mercury (mmHg) and is split into two separate readings of diastolic and systolic. Diastolic is the smaller number at the bottom of a blood pressure reading. Diastolic blood pressure is defined as the pressure exerted when the heart rests between beats. In contrast systolic blood pressure is the pressure when the heart pumps blood out. A healthy average for blood pressure in most adults is between 80/120 for systolic and 90/60 for diastolic (NHS, 2019). Even small decreases in blood pressures (diastolic BP 5-6mmHG and Systolic BP 10-12mmHG) have shown to be clinically relevant to reduce cardiovascular risk (McInnes, 2005). Systolic blood pressure is now classed as a better predictor for health concerns (Black, 2004). Striving towards an individual healthy range for blood pressure and heart rate is encouraged for optimum health.

Physiological responses such as heart rate, heart rate variability (HRV) and blood pressure are key indicators in the body's response to stressors. As they are the primary indicators of stress within the body they are integral to homeostasis. The increases seen in heart rate, heart rate variability and blood pressure are a result of the SNS taking control of the body. When a stressful situation is experienced a surge of hormones are released into the blood stream. These hormones temporally increase the heart rate and blood pressure which can contribute to the narrowing of the blood vessels. Frequent elevation through stressors and/or the inability to return to resting levels contribute to the development of hypertension (McEwen, 1998). Hypertension is one of the major causes of premature death worldwide along with comorbidity increases the risk of further debilitating diseases (WHO, 2019).

### **Physiological Measures, Mindfulness and Compassion**

Heart rate variability (HRV) measures the variation in time between each interval (heart beat). High HRV indicates a great stress tolerance in comparison to a low HRV which is linked to depression (Hartmann et al., 2019; Kemp et al., 2010; Rottenberg, 2007), cancers (Crosswell et al., 2014; Kloter et al., 2020; Zhou et al., 2016;) and cardiovascular diseases (Goldenberg et al., 2019; Sessa et al., 2018). When HRV is high, heart rate and blood pressure will be under the control of the PNS. Heart rate variability is also a physiological marker of the autonomic nervous system (ANS). Within the ANS, the vagus nerve is closely linked to the PNS, which is associated with the neurophysiological flow of compassion through chemicals such as oxytocin (Porges, 2007). The vagus nerve not only allows a pathway for the PNS to flourish, but it can also inhibit the reactivity of the SNS (Porges, 2007). Using MBCI for those with a mental health diagnosis has shown increases in HRV representing an improvement in wellbeing and reduction in a higher aroused system associated with stress (Kleen & Reitsma, 2011; Matos et al., 2017; Howells et al., 2014; Bhatnagar et al., 2013). Research using MBCI

and physiological measures have mainly used heart rate variability (HRV) or heart beats as an outcome measure.

A meta-analysis and systematic review were completed on MBSR and MBCT combined using blood pressure as an outcome measure in a clinical population. The results indicated nine studies relevant for the review (eight being RCT). The review found psychological benefits for both MBSR & MBCT. It was concluded that future research required more of a focus on the physical outcome measures such as blood pressure (Abbott et al., 2014). A recent meta-analysis and systematic review found a range of meditation interventions (examples include - MBSR, MBCT, Primordial Sound Meditation, Mind Orientated Recovery and Buddhism Based Walking) reduced systolic blood pressure, heart rate and cortisol in a range of populations when compared to active controls of education, exercise and health interventions (Pascoe et al., 2017). In the twenty-eight interventions reviewed none included compassion or compassion practices as part of the intervention.

Further research into the area of compassion and how the body responds to stress will allow for further developments within clinical and non-clinical populations towards treatment interventions and general positive wellbeing, both psychologically and physically. Relevant research has been conducted in clinical settings using mindfulness and self-compassion therapies has been included for review. However, there is yet to be a review on the physiological components of stress using the interventions with MBCI. The purpose of this review is to synthesize the data to evaluate the effectiveness of MBCI for improving physiological measures of stress (heart rate and blood pressure) in an adult non-clinical population. These interventions are commonly aimed at a clinical population as a treatment intervention rather than a non-clinical population, as this is primarily the intention of the intervention. The current thesis will be using a MBCI on a non-clinical population. Therefore, this review will allow an exploration of the current research using MBCI in a non-clinical



population to guide the current thesis aims and design. Included in the review are the primary outcome measures of blood pressure and heart rate, followed by relevant secondary psychological outcome measures related to stress, mindfulness and compassion. The secondary measures will be outlined in the results section to highlight the additional measures used within the reviewed research; however, they will not be explored further due to irrelevance of the aim of the review.

## **Methodology**

Ethical approval was granted by a university ethics committee before the research was able to go ahead (P53538). The systematic review protocol was registered with PROSPERO: CRD42018089918.

## **Search Strategy**

The search strategy was designed so that it accesses both published and unpublished work using the below stages:

1. Electronic databases (PsychINFO, MEDLINE, CINAHL, COCHRANE) were searched for studies published in English language reviewed journals from March 2008 to March 2020 using relevant keywords within the title and abstract (see appendix 7).
2. Synonyms were used to complete a more extensive search within the title and abstract.
3. Further searches included within reference lists, grey literature areas, possible data from conferences attended and contacting experts in the field.

The search terms included combinations consisting of MeSH subheadings, word variation for the following terms:

‘Mindfulness Based Stress Reduction’, ‘MBSR’, ‘Mindfulness Based Cognitive Therapy’, ‘MBCT’, ‘Acceptance and Commitment Therapy’, ‘ACT’, ‘Dialectical Behavioural Therapy’,

‘DBT’, ‘Compassion Focused Therapy’ ‘CFT’, ‘Compassion Based Intervention’, ‘Kindness Based Intervention’, ‘Loving Kindness Based Intervention’, ‘Heart Rate’, ‘Blood Pressure’.

### Study Selection

Abstracts were screened by two independent reviewers (LA & CD) to identify any relevant studies. The following codes were added to the studies that were screened - red (unsuitable), amber (undecided, retrieve full copy) and green (suitable, retrieve full copy). Full text versions were screened (LA & CD) alongside the inclusion criteria. Discrepancy was resolved through discussion using the inclusion and exclusion criteria outlined below. An outline of the brief components of the MBCI are presented as a guideline for reviewers (Table 1).

**Table 1**

*Brief components of interventions*

Intervention (group and individual)	Components
MBSR	Formal mindfulness practices (body scan, sitting meditation)  Informal mindfulness practices
MBCT	MBSR and Cognitive Behavioural Therapy combined
ACT	Hexaflex – contacting the present moment, values, committed action, self as context, defusion, acceptance
CFT	New brain vs. old brain, three affect regulation system, mindfulness, compassion based  meditations and visualizations, letter writing
DBT	Emotional regulation, interpersonal skills, distress tolerance, Mindfulness, walking the middle path

## **Eligibility Criteria**

All studies selected for the review must be in full text format. Two reviewers (LA & CD) independently assessed the studies to ensure they meet the inclusion criteria. The inclusion criteria were as follows: (i) participants will be 18 years + and from a non-clinical population (MBSR, MBCT, ACT, DBT, CFT); (ii) all interventions will comprise of the full intervention of the an MBCI, which includes the full course of the intervention containing all components of (iii) must include physiological outcome measures; (iv) methods of assessment must include physiological measurements of heart rate and blood pressure. Exclusion criteria were as follows: (i) exclude if not written in English; (ii) exclude if does not include human participants; (iii) exclude if participants are under 18 years old; (iv) exclude if intervention is from a clinical population as seeking research within a non-clinical population for this review; (v) exclude if only part of a MBCI (only brief or part of the intervention e.g. mindfulness meditation only); (vi) exclude if the outcome measurements do not include the physiological variables blood pressure and/or heart rate; (vii) excluded if reviews or papers do not present original work; (viii) exclude if not an intervention; (ix) exclude if cannot extract data from the above that is not relevant to the review question. Disagreements were determined with discussion and acceptance by both reviewers. Any further disagreements were discussed with the wider team.

## **Quality Assessment**

The studies identified as meeting the eligibility criteria were independently assessed for methodological validity by the two reviewers (LA&CD). Quality assessments were conducted using Cochrane Risk of Bias tool for RCT (see appendix 8). This tool reviewed studies based on selection bias; performance bias; detection bias; attrition bias; reporting bias; other bias. The Critical Appraisal Skills Programme (CASP) was used for non-RCT offering a checklist

specifically for reviewed studies. Reviewers completed the assessments separately and any disagreements were discussed and resolved.

### **Data Extraction**

Following methodological assessment, the Cochrane Public Health data extraction tool (<https://dplp.cochrane.org/data-extraction-forms>) was used for the studies. The information extracted is broken down into two separate sections. Firstly, an outline is given of the participant demographics, which includes sample size; population; age; gender; ethnicity. The following section includes design of study; type of intervention; duration of intervention; outcome measures (physiological); results.

### **Data Analysis**

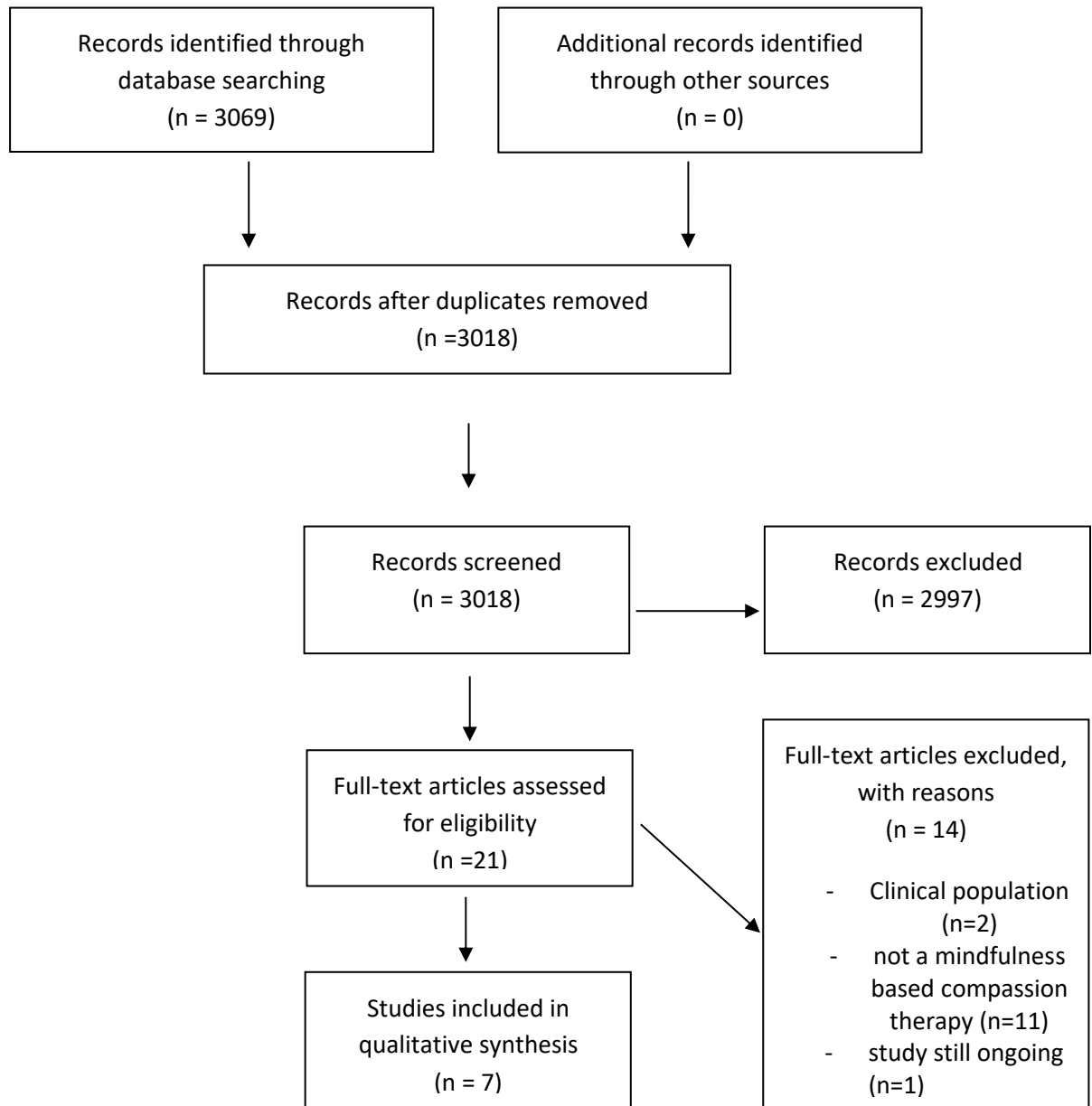
The main outcome measures for this review included heart rate and blood pressure. Other outcome measures, mainly psychological, received exploration separately.

### **Results**

The search resulted in an initial 3069 abstracts with 21 potential papers relevant to the review (see Fig.1). After reading the full text of all the papers only 7 were included (Amutio et al., 2014; Amutio et al., 2015; Gao et al., 2016; Geary & Rosenthal, 2011; Nijjar et al., 2014; Nyklíček et al., 2013; O'Donnell, 2018). The 14 papers not included were deemed irrelevant for the following reasons: clinical population defined as a population with a medical diagnosis (Davies et al., 2015; Hughes et al., 2013); not a MBCI (Ahani et al., 2014; Burton et al., 2009; Kemper et al., 2016; Low et al., 2008; Matos et al., 2017; Mocerri & Cox, 2019; Shaltout et al., 2012; Pace et al., 2009; Palta et al., 2012; Wolever et al., 2012; Zwan et al., 2015); study still ongoing (Durocher, 2018).

**Figure 1**

*PRISMA flowchart detailing the study selection process*



The publication dates ranged from 2008-2020. The geographical location included Spain (Amutio et al., 2014; Amutio et al., 2015); Hong Kong (Gao et al., 2016); Netherlands (Nyklíček et al., 2013); USA (Geary & Rosenthal, 2011; Nijjar et al., 2014; O'Donnell, 2018). The ages ranged from 37.5 years to 52.7 years. Female participants were more heavily represented overall: 57.1 % (Amutio et al., 2014, Amutio et al., 2015); 90% (Gao et al., 2016); 56%( Nijjar et al., 2014); 92.5% (O'Donnell, 2018); 85% (Geary & Rosenthal, 2011); 70% ( Nyklíček et al., 2013). Only two of the studies reported on ethnicity (Geary & Rosenthal, 2011; Gao et al., 2016). Caucasians were the majority group across one study with 75% caucasian for MBSR group and 55% for control group. For the other study Asians were the majority group at 63.6% (Gao et al., 2016) with participant sample size ranging from 11-88.

The population sample was split between the general population (Gao et al., 2016; Nijjar et al., 2014; Nyklíček et al., 2013; O'Donnell, 2018) and health care personnel (Amutio et al., 2014; Amutio et al., 2015; Geary & Rosenthal, 2011). It was also evident that the stated purpose for all of the studies present was stress reduction. Participants were recruited through either a programme or piece of research at work (Amutio et al., 2014; Amutio et al., 2015; Geary & Rosenthal, 2011); or an opportunistic sample of those already taking part in MBCI (Nijjar et al., 2014; Gao et al., 2016); recruited for this specific study (Nyklíček et al., 2013; O'Donnell, 2018).

A range of studies abided by the MBSR standards of practice by including screening and excluding ineligible participants. Participants that were not eligible included those with serious psychopathology or serious cardiovascular disease (Nyklíček et al., 2013); being in psychiatric or psychological treatment (Amutio et al.,2014; Amutio et al., 2015; O'Donnell, 2018); diagnosis of PTSD (O'Donnell, 2018); active suicidal ideation (O'Donnell, 2018); screened as depressed using the Beck Depression Inventory (BDI); diagnosis or reported

symptoms of clinical depression not stabilized with medication (O'Donnell, 2018); recent natural disaster increasing stress (Geary & Rosenthal, 2011); engaging in substance misuse (O'Donnell, 2018); history of cardiovascular disease or uncontrolled hypertension (O'Donnell, 2018). One study described the sample as healthy participants but did not elaborate on exclusion criteria (Nijjar et al., 2014).

The articles included a mixture of randomised controlled trials (RCT) with all participants being assigned to either the intervention or the control group. This included physicians (Amutio et al., 2014; Amutio et al., 2015) employees at University of Texas Medical Branch (Geary & Rosenthal, 2011); community residents (Nyklíček et al., 2013); elderly caregivers (O'Donnell, 2018). Two studies included quasi-experimental studies with participants classed as healthy volunteers (Nijjar et al., 2014) and healthy participants set to attend an MBSR intervention (Gao et al., 2016). Only one study used progressive muscle relaxation as an alternative behavioural intervention (O'Donnell, 2018).

The outcome measures included heart rate, which was measured using a range of physiological instruments. These included the typical OMRON heart rate monitor (Amutio et al., 2014; Amutio et al., 2015); heart rate variability and heart rate measured by ECG (Nijjar et al., 2014; Gao et al., 2016; Nyklíček et al., 2013); pulse rate variability (Geary & Rosenthal, 2011). Blood pressure was measured using OMRON Model M3 (Amutio et al., 2015); digital blood pressure meter with cuff auscultatory (O'Donnell, 2018); Plethymography which includes a cuff around the index finger (Nyklíček et al., 2013). Physiological measurements included single measurements at different time points (Amutio et al., 2014; Amutio et al., 2015; O'Donnell, 2018); recording for a specific time e.g. five minutes (Geary & Rosenthal, 2011; Gao et al., 2016); continuous recording during sessions (Nyklíček et al., 2013; Nijjar et al., 2014).

All of the studies used mindfulness-based stress reduction as the intervention and included pre and post measures as time points. Two studies included a follow-up measurement (Geary & Rosenthal, 2011; O'Donnell, 2018). One study completed the follow-up measurement at 12 months (Geary & Rosenthal, 2011). The other study completed follow-up measurements at two-time points which consisted of six months and then 12-months later after initial intervention (O'Donnell, 2018). Two other studies included a follow-up/maintenance stage (Amutio et al., 2014; Amutio et al., 2015), which included a psychoeducational model called Continuing Medical Education (CME) proposed by Krasner et al., (2009). The CME was designed to improve physicians' wellbeing using reflective practices. The three core components of this intervention include mindfulness meditation; narrative medicine; appreciative inquiry. CME is not part of a MBCI, therefore for this review the results from the maintenance stage were excluded.

Results showed a significant decrease in all studies for blood pressure across the different types of measurements used (Amutio et al., 2015; Nyklíček et al., 2013; O'Donnell, 2018). Significant decreases were found from pre to post measures (Amutio et al., 2015; Nyklíček et al., 2013) and longitudinal time points (Amutio et al., 2015). Significant decreases were found for systolic blood pressure for both MBSR and PMR for pre to post time points. Further decrease continued at 8-weeks and 6-months, when reaching the one year time point systolic blood pressure was beneath the baseline measure for both interventions (O'Donnell, 2018). For blood pressure only one study included the mean averages (Amutio et al., 2015) which indicated for diastolic blood pressure a reduction from 82.12 mmHG (pre) to 71.59 mmHG (post), a reduction of 10.53mmHG. Systolic blood pressure reduced from 140.06 mmHG (pre) to 124.00 mmHG (post), a reduction of 16.06mmHG. The remaining two studies either did not include mean averages in the study (Nyklíček et al., 2013) or combined the means of both intervention groups together (O'Donnell, 2018).



Heart rate was shown to highlight significant decreases after the intervention in only two of the studies (Amutio et al., 2014; Amutio et al., 2015). A significant decrease in heart rate was also shown ten months later in both studies (Amutio et al., 2014; Amutio et al., 2015). In two other studies heart rate was shown to reduce after the intervention, but was not identified as statistically significant (Gao et al., 2016; Nijjar et al., 2014). The reduction included lower heart rate entropy during MBSR training both at the beginning and end of the intervention, compared to the control state (Gao et al., 2016); improvements in sympatho-vagal balance between sympathetic (low frequency) and parasympathetic systems (high frequency) shown using HRV (Nijjar et al., 2014). For heart rate the means were included for both studies for pre to post (Amutio et al., 2014; Amutio et al., 2015). Both studies indicated a reduction in heart rate from 75.40bpm to 69bpm (Amutio et al., 2014) and 75.29bpm to 69.00bpm (Amutio et al., 2015). A non-significant result for heart rate identified using HRV was identified in two studies (Nijjar et al., 2014; Nyklíček et al., 2013). One study highlighted the mean averages from 68.9bpm (pre) to 69.1bpm (post), however improvements were shown in sympatho-vagal balance between sympathetic (low frequency) and parasympathetic systems (high frequency) (Nijjar et al., 2014).

### **Secondary Outcome Measures**

The secondary outcome measures of the reviewed studies were included below as an indicator of other outcomes measure used and the results within the research area. The measures included were those deemed relevant to the aim of the review (see appendix 10 for full outline).

### **Mindfulness**

Mindfulness was included in four studies as an outcome measure. The scales used included Five Facets Mindfulness Questionnaire (FFMQ) (Baer et al., 2006) (Gao et al., 2016)

a validated Spanish equivalent of the FFMQ by Amutio et al. (2014) and Amutio et al. (2015) (Cebolla et al., 2012) and The Mindful Attention Awareness Scale (MAAS) (O'Donnell, 2018). Three of the studies found mindfulness to significantly increase from pre to post intervention in the experimental group (Amutio et al., 2014; Amutio et al., 2015). One study found no increase in mindfulness from pre to post time points in both MBSR and the alternative intervention (PMR). By the six months and one year time points results were just above baseline measures. One study did not find a significant result for mindfulness pre to post time points, except on the facet on non-reacting (Gao et al., 2016).

### **Perceived Stress**

The Perceived Stress Scale (PSS) (Cohen et al., 1983) was used in four studies (Geary & Rosenthal, 2011; Geary & Rosenthal, 2011; Nyklíček et al., 2013; O'Donnell, 2018; Nijjar et al., 2014). A 14 scale equivalent Dutch validated measure of Perceived Stress was used in one study by Nyklíček et al. 2013 (Nyklíček & Kuijpers, 2008). Perceived stress significantly decreased from pre to post MBSR intervention (Nijjar et al., 2014) compared to the control group (Geary & Rosenthal, 2011; Nyklíček et al., 2013). One study showed reductions in perceived stress from pre to post time points similar to alternative intervention (PMR) (O'Donnell, 2018). At the one-year time point the PMR had a reduction in stress in comparison to the MBSR which highlighted an increase (O'Donnell, 2018). A reduction in perceived stress was also maintained at twelve months (Geary & Rosenthal, 2011).

### **Self-Compassion**

The Self-Compassion Scale (SCS; Neff, 2003) was used by one study to measure self-compassion (O'Donnell, 2018). The study found no increases in self-compassion from pre to post intervention in the experimental group and alternative intervention (PMR). While it was

also observed that self-compassion increased remained just above baseline for both groups for six months and one-year time points.

### **Salivary Cortisol**

Salivary cortisol was included in two studies (O'Donnell, 2018; Nyklíček et al., 2013). In one study similar significant decreases in cortisol were found for both the MBSR group and PMR intervention from pre to post intervention. Further decreases were found in the MBSR group at 8 weeks and 6-months' time points; however, the PMR group-maintained decreases from the 8-week time point (O'Donnell, 2018). The second study showed a significant decrease in cortisol from pre to post time points but there was no difference between the intervention and control group (Nyklíček et al., 2013).

### **Intervention Details**

As all reviewed articles were identified as MBSR and the standard MBSR protocol (Kabat-Zinn et al., 2017) was followed. Therefore, similar characteristics were identified across the studies (see appendix 11). These included eight weekly sessions averaging between 2.5-3.5hrs; a 1-day retreat; homework tasks during the 8-week course. The only differences noted was that some authors were more descriptive regarding the characteristics of the intervention and teacher qualifications/experience. Characteristics of the intervention included psychoeducation; mindfulness exercises – breathing, body scan, walking; Hatha Yoga (Amutio et al., 2014; Amutio et al., 2015; Nyklíček et al., 2013; O'Donnell, 2018; Gao et al., 2016). Teacher experience included training and years of practice, but only some authors felt this necessary to include (Amutio et al., 2014; Amutio et al., 2015; Nyklíček et al., 2013). There were no differences highlighted between the MBSR interventions; however, some authors outlined a breakdown of the course.

## Discussion

The current review investigated the effectiveness of MBCI at improving the physiological measures heart rate and blood pressure. MBSR was identified as the dominant therapy to include physiological measures of heart rate and blood pressure in a non-clinical population. Results showed a statistically significant decrease in physiological measurements for blood pressure across the different types of measurements used (Amutio et al., 2015; Nyklíček et al., 2013; O'Donnell, 2018). The study that included mean averages (Amutio et al., 2015) was statistically significant and clinically relevant. Heart rate was shown to decrease after the intervention in only two of the studies (Amutio et al., 2014; Amutio et al., 2015). The remainder of the studies indicated a reduction in heart rate following the intervention, but was not identified as statistically significant (Gao et al., 2016; Nijjar et al., 2014).

It is clear from this review that MBSR was the dominant intervention which included the physiological measures of heart rate and blood pressure in a non-clinical population. One of the reasons for this finding could be the flexible nature of MBSR courses. MBSR can be rolled out to a wider audience within the general population compared to other interventions such as dialectical behaviour therapy that are designed primarily for a clinical population.

It is also evident from this review that other than MBSR interventions the remaining MBCI are still focused primarily on a clinical environment. However, there is a shift in the application to non-clinical populations (Moore et al., 2018; Buckhardt et al., 2017; Askey-Jones, 2018; Shapiro et al., 2007; Sommers-Spijerman et al., 2018). Various programmes that offer compassion and self-compassion practices and skills to support the general population are becoming more profuse. These include, but not limited, to: Compassionate Mind Training (Gilbert, 2009); The Mindful Self-Compassion programme (Neff & Germer, 2013); Compassion Cultivation training programme (Jinpa, 2010). As stated at the beginning of this

review, supporting a non-clinical population to learn essential skills within the MBCI framework could work towards minimising clinical referrals and offering skills towards positive wellbeing.

In the studies reviewed heart rate was measured using different instruments. Measuring resting heart beats is the traditional and easiest way to access a physiological measurement of heart rate. However, heart rate variability measured by electrocardiograph (ECG) has been shown to offer a more robust outcome measure that reports the variability between heart beats. This is interpreted as either low or high frequency. High frequency indicates a healthy balance between the parasympathetic and sympathetic nervous system. Pulse rate variability provides an accurate reading but is limited by the fact that it cannot measure the impact on the autonomic nervous system. The most frequent method of measurement used in the studies reviewed was ECG, followed by the OMRON heart rate monitor. Significant results for heart rate were mixed, which could be due to the variation in measurements used.

Blood pressure machines are the most common instrument used by medical practitioners for measuring blood pressure. Fortunately, for research this is a measurement that is accurate and accessible. The Plethysmography (cuff around middle finger), which features a continuous reading function, can also be used to provide a measurement over a pre-specified timescale. A function that would be of significant value during meditation sessions. The Plethysmography can also be measured using a heart math system which outlines a low, medium or high reading. In the studies reviewed the most frequent method of measurement was the OMRON Model M3. The results from this review indicates that blood pressure showed significant decreases between studies that were reviewed, despite a small variation in measurements devices.

## **Limitations**

The characteristics of the teachers including their experience and skills, and the duration and content of the MBSR interventions, indicate consistency between the studies, adding to the credibility of the research and MBSR as an intervention for non-clinical populations. However, not all studies went into detail to breakdown the MBSR intervention, which would have offered a greater insight into the programme of each course.

One of the limitations of this systematic review included the range of the measurements used to assess the physiological measure. In the reviewed studies heart rate was measured using heart rate monitors, ECG and pulse rate variability. Blood pressure was measured using blood pressure machines and a Plethysmography. Physiological measurements were also measured at different points during the intervention. This ranged from single measurements; measurements over a set time period; continuous recording during the intervention sessions. The studies also included a range of testing at different time points, however there was consistency with the time points throughout the studies. All of the reviewed studies included a pre and post intervention time point.

From the review highlighted only a small number of studies were eligible for evaluation indicating a gap for future research in MBCI alongside the inclusion of the physiological measures of stress (heart rate and blood pressure). Future research could also include additional biological measures of stress such as cortisol testing to support the physiological measures of stress.

## **Conclusion**

This review investigated the effectiveness of MBCI for improving the physiological measures heart rate and blood pressure in an adult non-clinical population. The results from the review indicate that research is required to augment further knowledge within this area as only a small number of studies were eligible for review. However, out of the seven, though a

relatively small participant size, the majority displayed significant results for the physiological measures of heart rate and blood pressure. This review contributes to part of the rationale for the following research outlined in this thesis. Part of this thesis uses a mindfulness and compassion-based intervention to identify changes in physiological measurements of heart rate and blood pressure at pre, post time points. This review adds and extends to current research on the connection between mindfulness, compassion and physiological measures of heart rate and blood pressure.

# **Chapter 5**

## Research Design



## CHAPTER 5

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This research aimed to evaluate a mindfulness and compassion intervention using a mixed methods design. This chapter explains the rationale and provides justification for the methods employed in this thesis, including ethical considerations, recruitment and research process. The results from the systematic review are taken into consideration and provide validation of the instruments used for measurements.

### Methodology

#### Epistemological Paradigms

For any piece of research, the philosophical viewpoint needs to be taken into consideration to ‘secure the quality of the research produced’ (Snape & Spencer, 2003, p.1). When research encompasses both quantitative and qualitative components the rationale needs to discuss the reasons for both approaches. Using both quantitative and qualitative methods can be advantageous to the research conducted. Quantitative methods indicate whether an intervention was effective using numerical measurements, whereas qualitative informs of the reasons why using meanings and experience. A mixed methods approach provides a more complex understanding of an experience that would have not been available using a single approach (Creswell & Clark, 2011).

Epistemology is known as the study of knowledge. More specifically how we know what we know. Considering the epistemological underpinnings of a hypothesis requires a deeper exploration of the research approach. A paradigm is a shared world view that represents the beliefs and values in a discipline and that guides how problems are solved (Schwandt, 2001). Philosophical assumptions are based on the nature of reality, values and knowledge which support and guide paradigms. The philosophical assumptions are broken down into three components: Ontology; Epistemology; Axiology. Ontology is defined as the characteristics of

what it means to exist; epistemology defines our ways of knowing and consequently justifies our methodological approach; axiology establishes values and ethical principles based on what we believe (Patton, 2002).

Within mixed methods research there are four paradigm perspectives that could be applicable to the research. These include positivist/post positivist, constructivism, transformative and pragmatism. Of the four-paradigm perspective only pragmatism and transformative are relevant for a mixed methods approach. Pragmatism (Morgan, 2007) offers a strong emphasis on connecting the theory and data which allows the researcher to integrate the mixed methods approach (Shannon-Baker, 2016). One of the main features of this perspective is for the research question to be answered using what approach is required to enhance the quality of research.

The transformative paradigm uses both quantitative and qualitative techniques to destroy false knowledge and empower individuals. This paradigm also actively involves the participants within the research from identifying the problem to using the findings (Chilisa & Kawulich, 2012). An additional methodology included with mixed methodologies is dialectics, originally a Socratic technique using discourse between opposing ideas with the intention of reaching the truth. Going back and forth between quantitative and qualitative analysis can also be seen as gaining greater depths and insights (Rocco et al., 2003).

The current research employs a range of different measures and techniques to answer the overarching research question(s). Therefore, the pragmatist paradigm has been chosen as the most appropriate as the approach looks at answering the research question(s) directly with a mixed methods approach.

### **Rationale for using mixed methods approach**

Mixed methodologies are now classed as a third paradigm where both quantitative and qualitative approaches can be integrated successfully (Tashakkari & Teddlie, 2003). Quantitative and qualitative approaches combined provides a better understanding of the research problem that either approach alone cannot answer (Creswell and Plano-Clark 2003), allowing each design to compensate for each other's strengths and weaknesses. Within quantitative approaches, causality and relationships within the data are the purpose of the design, allowing the data to be applied to the general population. Whereas qualitative designs explore the lived subjective experience that quantitative methods cannot capture through numerical measurements. Greene et al. (1989) outlined five types of mixed methodologies. Triangulation uses more than one method to seek the results: complementarity seeks clarification from results from mixed methods; development is the use of results to support and develop other methods; initiation, explores inconsistencies between the results from the methods; expansion seeks to use mixed methods through enquiry. Within this research both triangulation and complementarity were used as the typologies. Triangulation identified correspondence of results through the use of both quantitative and qualitative methods providing greater validity, whilst a complementarity design allowed the qualitative research to explore what the quantitative could not through expansion of the research questions.

When deciding on a mixed methods piece of research it is important to explain the purpose of a mixed methods approach and how the research will benefit from a mixed methods approach. Six mixed methods design strategies were developed by Creswell (2003) to support an overall mixed methods strategy, using guidelines to help the researcher identify the more appropriate design. These designs include sequential explanatory, sequential exploratory, sequential transformative, concurrent triangulation, concurrent nested (embedded) and concurrent transformative. The concurrent nested (embedded) design strategy was used for this

research. This strategy obtains different data that can answer a complementary research question alongside the main research question.

Further research suggests that Randomised Controlled Trials (RCT) as a single method do not sufficiently address how or why psychological interventions are effective, whereas qualitative methods can outline the mechanisms of change (Gilroy et al., 2006). Van Dam et al. (2018) suggests that mixed methods are suitable for mindfulness research due to the many dimensions such as the experiences and mechanisms that require more than one method of investigation. Previous research using a mindfulness intervention within a mixed methods approach in clinical and non-clinical populations has analysed the data using Thematic Analysis (Birtwell et al., 2017; Keyworth et al., 2013), Phenomenological Analysis (Barker, 2005) and Grounded Theory (Kerr et al., 2011). Within mindfulness research interviewing techniques are the most frequent method of data collection (Banerjee et al., 2017; Crowder & Sears, 2017; Muller-Englemann, 2017) with a small amount of data collected through diary/journal entries (Kerr et al., 2011, Ramasubramanian, 2016).

### **Quantitative Methods**

Quantitative approaches are inclined towards positivist epistemologies which state that from a realist view the world is knowledgeable and to seek this knowledge the use of objective measurements are required (Antwi & Hamza, 2015). The quantitative research paradigm includes a range of research designs that have been the leading and only design approach. Quantitative approaches have been at the forefront of design as it is the only paradigm to include ontological, epistemological, axiological, rhetorical and methodological assumptions (Leech & Onwuegbuzie, 2007).

The quantitative approach includes variables, measurement and a level of control using a defined sample. Quantitative research is associated with numbers as the unit of analysis with the aim of measuring or describing phenomena (Denscombe 2007, p.248).

For the current research quantitative measures included self report measures (more detail of measures in chapter 7). The advantages of self report measures include the ease of administration, familiarity for participants use, relatively inexpensive to produce and usually easy to score. Self reports do have limitations which include the subjective responses from participants, alongside the inability for participants to understand or assess themselves correctly in response to the questions.

Measures of neurophysiology were included in the research (chapter 6) which offered the advantage of a more objective measure of brain activity alongside current processes that are occurring. Disadvantages of neurological measures include the time required for testing, funding difficulties and the willingness and capacity for the researcher to train in the safe implementation of the procedure. A typical EEG can range from an 1hr to 1.5hrs per participant, in contrast a self-report questionnaire can take between 5-15mins without researcher participation. Therefore, neurological measures can limit the number of participants able to access the research due to time constraints for both participant and researcher.

With the expansion of social and behavioural sciences no major area is studied using one method due to the further exploration requiring greater depth of understanding around behaviour (Brewer and Hunter 1989). Quantitative can only explore so far within variables for measurement, whereas qualitative can enhance this exploration with an alternative design methodology.

## Qualitative Methods

Qualitative approaches are associated with constructionist/interpretivist epistemologies from a relativist view stating that the world is viewable from our own subjective perspective. Qualitative researchers' study within natural settings attempting to 'make sense of, or to interpret the meanings people bring to them' (Denzin and Lincoln, 2005). Qualitative data collection can be gathered through interviews, observations, pictorials, diaries, texts or focus groups using smaller sample sizes than quantitative approaches. The qualitative process includes describing, explaining and interpreting the collected data. Qualitative approaches, unlike quantitative approaches, can be criticised for subjectivity as the researcher is heavily involved in all stages of data collection and analysis. The objective of qualitative approaches is to generate hypotheses as opposed to testing, which is the intention of quantitative approaches. In quantitative research the researcher is measuring a particular variable, therefore missing out on the experience of what it feels like for the participant. This could narrow or limit the research data around the experience. However, qualitative methods allow the social context to be included in the analysis of the research. Within the context of mindfulness, the environment including the social group that attend alongside plays a pivotal role in the experience, along with interactions outside of the course such as friends, family and work colleagues.

To provide a more holistic overview of the research, qualitative approaches were used to give a picture of the lived experience of a mindfulness and compassion course. In keeping with mindfulness, exploration of reflection and introspection are important components within the journey of practice. William James first coined the term "introspection" which he described as "looking into our minds and reporting what we there discover" (1890, p. 185). Similarly, in mindfulness, being aware and observing the mind and body is encouraged through introspection practices such as the body scan and using the senses.

Qualitative research gives the participant a voice and an opportunity to express what is important to them, while allowing the participant to emotionally process the experience, enabling a type of catharsis (Dickson-Swift et al., 2006). As mindfulness meditation is an intervention used to increase skills such as awareness, introspection and reflection, this may be evident in the richness of data collected within the study. First person accounts allow for a deeper understanding representing the stream of consciousness, which is a direct introspection of experience. Empowering the participants engenders a deeper self-analysis and consequently a real and intimate response.

First person accounts such as reflective diaries also require the participants to use their own words rather than be guided by options predetermined by the researcher, allowing reflection on thoughts, feelings and behaviours during the course. Diaries outline a first person account over multiple time points that not only provide the processes of change for practitioners of mindfulness, but support the generation of hypotheses for quantitative research and theories (Kerr et al., 2011). Diaries as a method of data collection reduce retrospection, recall and reframing errors, while eliminating demand characteristics typically found with the presence of the researcher (Shelble & Witdemuth, 2009). Diary entries also supported the reduction of the Hawthorne effect as participants were able to complete entries in one's own time without the pressure to complete with researcher presence. Diary limitations include the reliance on the participant to not only convey one's experience accurately but also to complete the diary entries in legible handwriting. The analysis process for diary entries can also be time consuming and require many steps of analysis before completion.

## Research Design

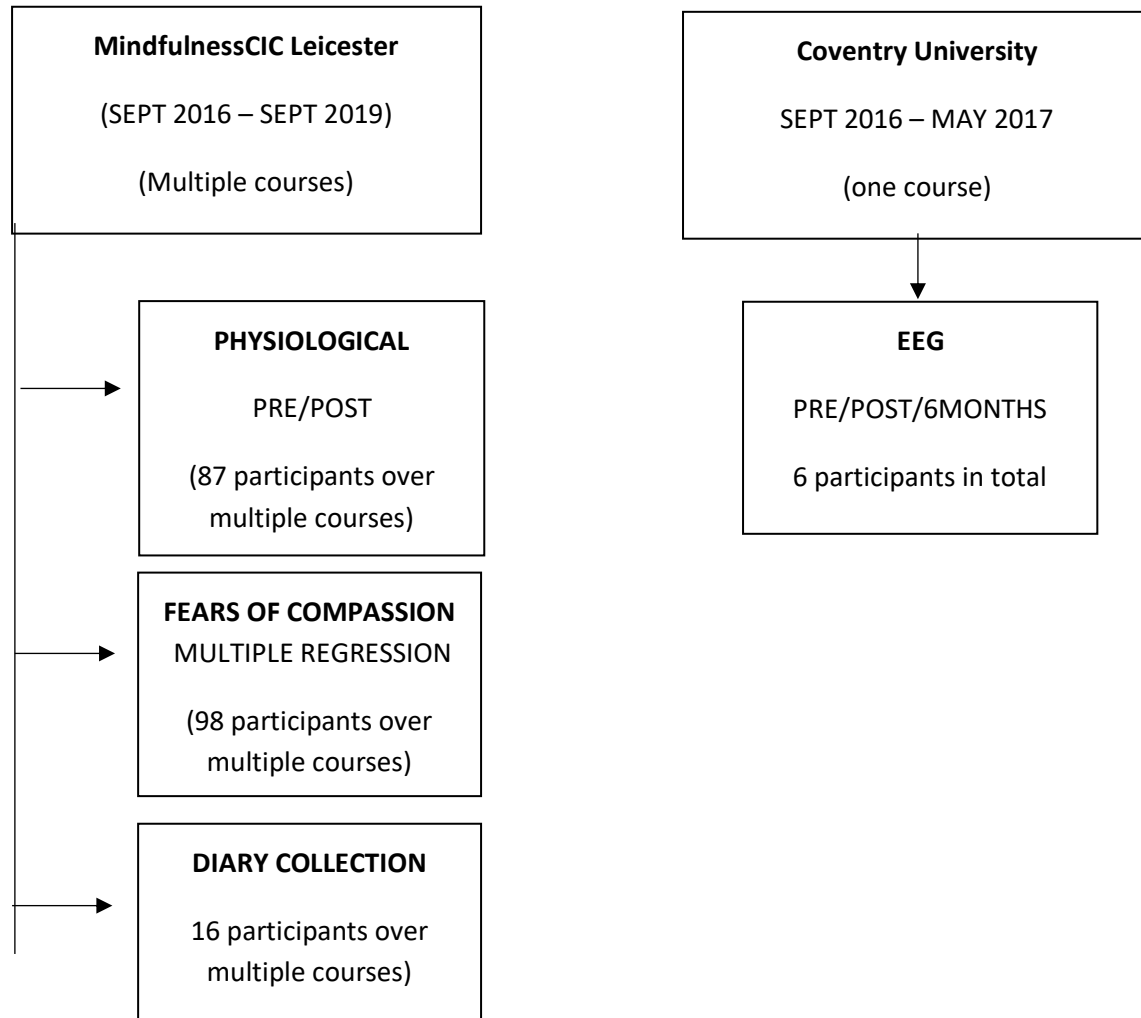
Overall research aim:

To evaluate a mindfulness and compassion course using a mixed methods design.

Aims and Objectives

- 1) To identify changes in the physiological measures of stress heart rate and blood pressure (DBP and SBP) during an 8-week Mindfulness and Compassion course at pre and points time points (chapter 6);
- 2) To identify the impact of an 8-week Mindfulness and Compassion course on prefrontal hemispheric  $\alpha$ -asymmetry at pre, post and follow-up time points (chapter 6);
- 3) To explore the relationship between fears of compassion and perceived stress following an 8-week mindfulness and compassion course (chapter 7);
- 4) To explore the lived experience of completing a Mindfulness and Compassion course using Interpretative Phenomenological Analysis (IPA) (chapter 8).



**Figure 1***Research Timeline*

## **The Mindfulness and Compassion Course**

The mindfulness and compassion course used for data collection in the current research was sourced through MindfulnessCIC, a non-profit company that runs mindfulness courses for the public and private settings. Mindfulness CIC offers an 8-week or an alternative intensive 3-4 day course. Both courses encompass the same content, but the mode of delivery differs. The mindfulness and compassion course combined breathing practices, compassion, body scans, and psychoeducation. The inclusion of both focused attention meditation (FAM) and open monitoring meditation (OMM). In addition, participants were expected to commit to homework set out by the teacher, which included formal and informal practices of mindfulness.

The key components of the course include the development of self-awareness, self-care and compassion. Included in these concepts is the importance of not only addressing and giving compassion to one's own suffering but the ability to put this suffering into context alongside others – the common humanity of suffering. This shared space allows participants to not only recognise their own suffering but also the suffering of others around them. To support these concepts the course incorporates Buddhist concepts and metaphors such as 'Kisa Gotami and the Mustard Seed', the story of a suffering mother in the wake of the death of her child. These stories are interspersed throughout the course to help participants understand the concepts from a story telling perspective.

MindfulnessCIC developed the course as a positive psychology course to promote movement towards increasing positive wellbeing alongside the traditional aims of reducing negative variables such as stress and anxiety. The concept of positive psychology was defined by Seligman (1999) to support optimal human functioning and the development of human strengths and characteristics. Positive psychology highlights the positive facets of human functioning which also supports the prevention of individuals developing mental health issues

(Seligman & Csikszentmihalyi, 2000). Optimal human functioning includes the growth of an individual's ability to flourish within a particular experience (Ngu et al., 2019). Flourishing was originally postulated by Keyes (2005, p. 7) who defined it as 'a syndrome of subjective well-being which combines feeling good (emotional well-being) with positive functioning (psychological and social well-being)'. Seligman (2011) added to this area by including PERMA (positive emotion, engagement, relationships, meaning and accomplishments). Mindfulness has been identified as a skill that could optimise an individual's state of functioning (Phan et al., 2019). As mindfulness encourages a movement towards positive wellbeing, it has been suggested that the experience of mindfulness may support a step towards more meaningful experiences such as an increase in positive emotions, personal performance and a reduction in negative emotions (Phan et al., 2019).

### **Facilitator Training**

The facilitator Suryacitta co-designed the mindfulness and compassion course alongside Gaynor Quilter in 2013. Suryacitta's practice of mindfulness began in 1989 which led to a short time living in a meditation retreat centre. Suryacitta is registered with the UK network of mindfulness teachers and follows the good practice guidelines.

### **Study Location**

The mindfulness and compassion courses took place across two locations which included Leicester and Coventry University. Coventry University only accommodated the 8-week version, whilst Leicester offered both the 8-week and alternative intensive 3-4 day course. For the 8-week course the teacher (Suryacitta) would deliver a 1.5hr section of the course on a weekly basis following the traditional format. The short course would typically be completed over a long weekend.

## Content of Sessions

The themes covered in the sessions were as follows (Table 1):

Theme 1: Jewel in the ICE

Theme 2: The Feeling Body

Theme 3: Living in the Present

Theme 4: Calming the Chattering Mind

Theme 5: Dancing with Dragons

Theme 6: Compassion – Loving Kindness Meditations

Theme 7: ABC of Mindfulness

Theme 8: Bringing Mindfulness to Life/ Next Steps

### Table 1

*Mindfulness and Compassion Course - Vision and Transformation*

<b>Mindfulness and Compassion - Vision and Transformation</b>
<p>Theme - <b>The Jewel in the Ice (week 1)</b></p> <p>Setting the scene</p> <p>Mindful pauses in every session and 10-minute break</p> <p>Class Content</p> <ul style="list-style-type: none"> <li>❖ The jewel - our natural joy, the ice is the barrier. How to melt the ice through mindfulness. Approx. 20-minutes</li> <li>❖ Intro to mindfulness of breath and body (B &amp; B) then 15-minute practice followed by discussion</li> </ul>

- ❖ Discussion mindful pause(s) - pausing throughout class
- ❖ Talk about vision and transformation
- ❖ Teaching on pain and suffering...using the two-dagger metaphor
- ❖ 15-minute mindfulness of B&B

#### Home Practice

- ❖ One 15-minute daily mindfulness of B&B (all meditations are on mp3 for home practice)
- ❖ Mindfulness of two daily activities
- ❖ Notice when using the second dagger
- ❖ Option of filling in practice sheet

#### Theme - **The Feeling Body (week 2)**

- ❖ Home practice review
- ❖ Mindfulness of B&B 15-minutes - enquiry
- ❖ Teaching on being at 'home' in the body - discussion
- ❖ Mindful pauses/breaks throughout
- ❖ Thought labelling - working with the 'voices' of criticism and judgement etc - beginning of self - compassion
- ❖ Exploring obstacles, feeling stuck in meditation
- ❖ Guided body awareness (BA) meditation 20-minutes - enquiry

#### Home Practice

- ❖ Alternate mindfulness of B&B with BA during week
- ❖ Practice thought labelling
- ❖ More on second dagger
- ❖ Mindful activities

#### Theme - **Living in the present (week 3)**

- ❖ Home practice review

- ❖ Mindful movement, followed by guided mindfulness of B&B with sounds - enquiry
- ❖ Teaching on (not trying to be mindful/present) but noticing what takes us away from being mindful/present - discussion
- ❖ Pauses
- ❖ 3 step breathing space
- ❖ The roots of mindfulness - the four truths and how they apply to each moment of our lives - discussion
- ❖ A few words on right effort in meditation
- ❖ BA meditation and being compassionate to discomfort and/or pain - enquiry

#### Home Practice

- ❖ Mindfulness of B&B daily
- ❖ Bringing pauses into daily life
- ❖ Mindful activities
- ❖ Mindful movement or walking

#### Theme - **Calming the Chattering mind (week 4)**

- ❖ Home practice review and recap on previous sessions
- ❖ Guided meditation B&B and looking for pleasant experience - enquiry
- ❖ A little on why we have busy minds and what we can do to help ourselves
- ❖ More on thought labelling
- ❖ Tools for calming the mind in everyday life
- ❖ Pauses and breaks

#### Halfway reflection. Do I need to recommit?

- ❖ Teaching on kindness/compassion being essence of mindfulness - discussion

#### Home Practice

- ❖ Mindfulness of B&B and BA
- ❖ Practice thought labelling

- ❖ Mindful activities

Theme - **Dancing with Dragons/Self Compassion (week 5)**

- ❖ Home practice review
- ❖ Meditation - enquiry
- ❖ How we live matters - guidelines for living
- ❖ Pauses and breaks
- ❖ 3 step breathing space
- ❖ Acceptance - what it really is and how to do it
- ❖ Qualities we bring to meditation practice
- ❖ Meditation on self-compassion. How to embrace difficult feelings  
- discussion

Home practice

- ❖ Mindfulness of B&B and short self-compassion practice during the week
- ❖ New mindful activities
- ❖ Revisiting the second dagger metaphor

Theme - **Compassion (loving kindness meditation) (week 6)**

- ❖ Home practice review
- ❖ Mindful movement/walking
- ❖ BA meditation - enquiry
- ❖ Teaching on compassion - what it is and what it isn't - discussion
- ❖ Pauses and breaks
- ❖ Short teaching on moving from self-compassion to compassion for others
- ❖ Loving kindness meditation practice (25-minutes) - enquiry
- ❖ Teaching on the difference between true and false emotion

Home Practice

- ❖ Mindfulness of B&B and compassion meditation alternate days
- ❖ Notice people's little acts of kindness
- ❖ Notice own acts of kindness and unkindness

**Theme - ABC of mindfulness - it's not what you think it is (week 7)**

- ❖ Home practice review
  - ❖ BA meditation - enquiry
  - ❖ The ABC of mindfulness teaching  
(the contents and the container)
- This is done partly via visual demonstration with props - discussion
- ❖ Pauses and breaks
  - ❖ Contents and container meditation - building on ABC teaching - enquiry
  - ❖ Teaching - difference between concentration and mindfulness
  - ❖ Home practice
  - ❖ Mindfulness of B&B or compassion meditation
  - ❖ More on thought labelling
  - ❖ Being aware of the 'in between' times. For example, when walking upstairs, when waiting for something.

**Theme - Bringing mindfulness to life and what next (week 8)**

- ❖ Home practice review
- ❖ Meditation - Enquiry
- ❖ Mindfulness in daily life - story of two chicken farmers or similar
- ❖ Discussion
- ❖ Pause/Break
- ❖ Review of course material
- ❖ Option for students to comment on course



- ❖ How to maintain a practice
  - ❖ Give them the eight-session online course to help this maintain practice
  - ❖ Discussion on what next...free practice evenings once a month. Sesshin (intensive meditation days) weekend retreats, seven-day retreats with silence, train to teach
- Vision and Transformation

Goodbyes

### **Short Alternative Course (3-4 day)**

The short alternative course was developed to offer those unable to attend an 8-week period to complete the necessary skills over a short period of time. Research has shown the benefits of shorter meditation interventions. Short-term meditation retreats have also shown to offer the same positive outcomes which include enhancing attention networks (Kwak et al., 2020); increasing white matter while promoting self-regulation (Tang et al., 2010). Tang et al. (2007) used a short-term mindfulness intervention (integrative body–mind training) over 5 days with a daily 20-minutes mindfulness session. A separate control group was given an alternative relaxation session. The intervention group compared to the control showed greater improvements in attention and immunoreactivity with decreases in anxiety, depression, anger, fatigue and stress related cortisol. This research supports the many benefits mindfulness can offer using short intervention time scales. Future research is required to investigate the ‘active ingredients’ and right ‘dosage’ of mindfulness interventions to shorten courses for individuals with accessibility difficulties (Burton et al 2017).

### **Compassion Teachings**

The teachings on the MindfulnessCIC course support a path towards positive wellbeing which include trainings such as creating ‘a bigger container’. This concept highlights the importance of using the skills of mindfulness to make one’s container bigger to reduce the

chances of the container overflowing when difficulties arise. A further concept taken from Buddhism includes the idea of giving compassion to discomfort rather than pushing it away. This helps to strengthen the ability to move towards embracing difficult feelings. To support this process, compassion is the main theme running through the course. Five out of the eight-weeks explored compassion or compassion-based meditations. When reviewing the course components it is clear that compassion features early in the course at week two ‘The feeling body’. The teachings in this week begin to bring awareness to ‘voices’ of criticism and judgement, while offering techniques to support change such as thought labelling. Week three ‘Living in the present’ continues the theme of compassion by dedicating a section to enquiry and how we can begin to be compassionate to pain or discomfort. Week 4 ‘Calming the chattering mind’ includes discussions on kindness and compassion being the centre of mindfulness. Week five termed as ‘Dancing with dragons’ is solely dedicated to compassion teachings and meditations. Alongside these teachings’ students learn to embrace and work with difficult feelings. Week six ‘Compassion– lovingkindness meditations’ begins by including a teaching on compassion and how this leads from self–compassion to compassion for others. The session ends with a guided loving kindness meditation. Week 7 ‘ABC of mindfulness’ includes a compassion meditation for the home practice. As week 8 ‘Bringing mindfulness to life/ next steps’ is the final week the only areas covered are a review of skills learnt and next steps.

### **British Psychological Society (BPS) Code of Ethics and Conduct**

Being a member of the BPS requires certain considerations when engaging with research interventions and members of the public. Therefore, the BPS code of ethics and conduct (BPS, 2018) (outlined below) were considered during the planning and data collection stages of the research.

- 1) Respect - psychologists must value the dignity and worth of all individuals, regarding individual rights, privacy and respect. The ethical review process confirmed that the proposed research would do no harm to the participants, whilst acting with compassionate care. All participants were taken through an informed consent process, where they were able to ask any questions. The participants were also informed of the option to withdraw from the study at any time should they wish to do so.
- 2) Competence - recognise the importance of continued development, ability to function optimally within recognised limits of knowledge, skill, training, experience and education. Competence was guaranteed by the support of four PhD supervisors, skills developed during the PhD journey and knowledge of carrying out research previously acquired during an MSc in Health Psychology. Competency in work experience in health care settings including mental health. During the PhD additional training for EEG testing was completed to ensure competency and safety for participants.
- 3) Responsibility-ensuring responsibility to participants, the public and other professionals, to avoid harm and prevent any misuse or abuse.
- 4) Integrity - to ensure unbiased fair representation, maintaining personal and professional boundaries, whilst addressing any misconduct.

How this translates to the mindfulness and compassion course

Certain measures were put in place to ensure the safety of participants was a priority during the course:

- Contact with MindfulnessCIC before course commences to discuss any concerns was ensured for each participant
- A clear outline of how the days will unfold with a follow up for questions

- An inclusion of the themes covered for each session during the course (booklet format)
- Participants are encouraged not to push beyond limits of safety or tolerance, whilst adapting to alternative types of practice.
- Able to use break out rooms when experiencing discomfort
- Additional support from teacher if required

In summary, this chapter describes and justifies the methods and approaches used to answer the research aims and objectives. In addition, it offers an outline of the mindfulness and compassion course alongside BPS ethics and conduct. This research aimed to evaluate a mindfulness and compassion course using a mixed methods design.

## **Chapter 6 Quantitative Studies**

### **Study 1. Heart rate and Blood pressure**

### **Abstract**

The systematic review (chapter 4) showed that research on mindfulness-based compassion interventions measuring heart rate and blood pressure frequently used mindfulness-based stress reduction as the primary intervention of choice. The aim of the study 1 was to identify changes in the physiological measures of stress including heart rate and blood pressure (systolic (SBP) and diastolic (DBP)) at pre and post time points during an 8 week mindfulness and compassion course.

A total of eighty-seven participants ( $n = 62$  females,  $n = 25$  males;  $M_{\text{age group}} = 35\text{-}44$  years old) participated in an 8-week mindfulness and compassion course ran by MindfulnessCIC. The results from a t-test indicated a marginal positive change (reduction) in scores from pre to post time points for all physiological measures, however this change was not significant.

The present study attempts to identify changes in physiological measures of stress (heart rate and blood pressure) at pre and post time points during a mindfulness and compassion course. In summary, the current study did not find a statistically significant result, but did highlight a reduction in all three measures, with SBP recording the greatest reduction. The findings are discussed in relation to previous research, limitations of design and future applications including advice for practitioners.

## CHAPTER 6

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Following on from the systematic review this chapter sought to address the areas requiring additional exploration. The systematic review showed that research on mindfulness-based compassion interventions (MBCI) measuring heart rate and blood pressure frequently used MBSR as the primary intervention of choice. This chapter will use the 8-week mindfulness and compassion course to identify changes in the physiological measures of stress heart rate and blood pressure (systolic (SBP) and diastolic (DBP)) at pre and post course.

### **Study 2: A longitudinal study of Heart Rate and Blood Pressure (DBP and SBP) before and after a Mindfulness and Compassion Course**

#### **Introduction**

Mindfulness interventions, in particular mindfulness-based stress reduction (MBSR), have been used to alleviate distress. MBSR programmes include techniques to support reductions in stress while making alterations in one's life to enable a healthy level of stress. The first physiological indicator of a response to stress is an increase in heart rate (Vrijkotte et al., 2000), the second indicator is a rise in blood pressure (Laitinen et al., 1999). As primary indicators of distress HR and BP are integral for homeostasis. The increases seen in heart rate and blood pressure are a result of the Sympathetic Nervous System (SNS) taking control of the body. When a stressful situation is experienced a surge of hormones such as adrenaline are released into the blood stream. These hormones temporally increase the heart rate and blood pressure which can contribute to the narrowing of the blood vessels. Frequent elevation through

stressors and/or the inability to return to resting levels contribute to the development of hypertension (McEwen, 1998). In addition, hypertension has recently been classed as one of the major causes of premature death worldwide along with comorbidity increasing the risk of further debilitating diseases (WHO, 2019). To help mitigate chronic stress and increase longevity the American Heart Association approved the use of meditative techniques in 2013 to complement traditional forms of support for hypertension.

In support the S-ART model and the research within psychoneuroimmunology (Ader et al., 1987; Feder et al., 2009) advocates the practice of mindfulness to support and improve physiological autonomic regulation leading to homeostasis in times of distress. The two metaphors that support the effects in distress include the ‘raincoat effect’ which acts a level of protection against the stressors. The ‘towel effect’ aids and supports recovery by reducing the focus on the stressors and moving on back to homeostasis. These metaphors give an example of how to reduce the activation of the sympathetic nervous system (SNS) and hypothalamic pituitary adrenal axis (HPA) (Vago & Silbersweig, 2012).

Further mechanisms of mindfulness have been proposed in relation to supporting a reduction in blood pressure. The mechanisms of change have used mindfulness to support improvements in cardiovascular disease (CVD) (Loucks et al., 2015). The mechanisms include 1) improved attention control, 2) emotional regulation 3) self-awareness and 4) self-compassion (Loucks et al., 2015). Using the above mechanisms of change a recent theoretical framework called Mindfulness-Based Blood Pressure Reduction (MB-BP) uses key areas (diet, physical exercise, medication adherence, stress management and social support) to support the reduction in blood pressure. Following the initial trial of MB-BP an average reduction in systolic blood pressure of 6.1mmHg and 15.1mmHg for stage 2 uncontrolled hypertensive participants was found at the one year time point (Loucks et al., 2019). This new framework



offers an insight into the mechanisms of mindfulness can be applied to supporting the reduction of blood pressure.

## **Previous Research**

### **Mindfulness & Physiological Measures**

The systematic review showed that research on Mindfulness-Based Compassion Interventions (MBCI) measuring heart rate and blood pressure frequently used MBSR as the primary intervention of choice. MBSR interventions have shown reductions in heart rate, (Amutio et al., 2014; Amutio et al., 2015; Gao et al., 2016; Nijjar et al., 2014) and blood pressure (Amutio et al., 2015; Nyklicek et al., 2013; O'Donnell, 2018) from pre to post intervention.

Research by Amutio et al. (2015) integrates both heart rate and blood pressure (DBP AND SBP). A pre and post RCT design was used for an 8-week MBSR intervention to measure psychological and physiological measures. The psychological variables were burnout and mindfulness. The physiological variables were heart rate and blood pressure. Participants were expected to practice mindfulness exercises every day for 45-minutes using CDs, while keeping a record of hours practiced. The post intervention mean score for heart rate was reduced by 6.29bpm (beats per minute). DBP showed a significant decrease from 82.12 mmHG (pre) to 71.59 mmHG (post) a reduction of 10.53mmHG. SBP was decreased from 140.06 mmHG (pre) to 124.00 mmHG (post), a reduction of 16.06mmHG. Correlational analyses also indicated a significant positive relationship between hours of home practice and both DBP and SBP blood pressure. Home practice hours was significantly related to decreases in SBP ( $r = 0.68$ ;  $P = 0.03$ ) and DBP ( $r = 0.67$ ;  $P = 0.04$ ). The authors suggest that that the essential component to the long-term effectiveness of lowered blood pressure was the continued home practice during the

intervention. Home practice hours were significantly related to decreases in SBP ( $r = 0.68$ ;  $P = 0.03$ ) and DBP ( $r = 0.67$ ;  $P = 0.04$ ).

Previous research has shown that individuals who stop practicing also lose any reductions in BP (Goldstein et al., 2012). Limitations of the research include a small sample size (experimental  $n = 21$ , control  $n = 21$ ) and overlooked certain characteristics of participants such as those defined as “not particularly stressed”. As the findings focused heavily on home practice it would have been useful for the authors to identify what components of the MBSR were included in the home practice. This would help guide the inclusion of home practice for future studies on mindfulness.

A recent meta-analysis and systematic review also found a range of meditation interventions, which included MBSR, MBCT, Primordial Sound Meditation, Mind Orientated Recovery and Buddhism based walking reduced systolic blood pressure, heart rate and cortisol. These reductions were found in an array of populations when compared to active controls of education, exercise and health interventions (Pascoe et al., 2017). The research also included different types of meditation such as focused attention and open monitoring which identified differences in physiological responses. Focused attention found a reduction in cortisol, while open monitoring also supported a reduction in heart rate. However, in the twenty-eight interventions reviewed none included compassion or compassion practices. This highlights a gap in research for compassion-based practices and physiological measures such as heart rate and blood pressure.

### **Compassion and Physiological Measures**

Compassion and the physiological systems work together in a bidirectional way to support and maintain optimum functioning. The vagus nerve is a major component within the neurophysiological flow of compassion with vagal tone or heart rate variability representing

the biological marker of compassion. Within the Polyvagal theory the vagus nerve is specifically connected to the PNS - the rest and digest part of the autonomic nervous system. The vagus nerve not only allows a pathway for the PNS to develop but also inhibits the reactivity of the SNS (Porges, 2007).

Compassion-based meditations included Loving Kindness Meditation (LKM), Tonglen and other compassion meditations aim to increase self-compassion, compassion to others and beyond. The loving kindness practice typically includes four components in which a mantra can be repeated 'May you be well, May you be healthy, May you be happy'. This mantra is internally directed towards a neutral person, the self, a person one loves and individual you are having difficulties with. Compassion meditations such as Tonglen, translated in Tibetan as sending and taking (Chodron, 2001), offers the individual an opportunity to use visualizations to take in the suffering of others while returning compassion. Other compassion meditations include increasing self-compassion such as soften, soothe and allow (working with emotions in the body) and affectionate breathing (Germer & Neff, 2013).

Research using compassion-based meditations has mainly identified psychological and neurological changes (Lutz et al., 2008; Pace et al., 2008; Shapiro et al, 2005). A recent systematic review and meta-analysis has highlighted the effects of Kindness Based Meditations (KBM) on health and wellbeing showing decreases in depression; increases in mindfulness, compassion, and self-compassion against passive controls (Galante et al., 2014). Research has shown the psychological benefits of Compassion-Based Meditation (CBM), however due to the link between compassion, the vagus nerve and ANS, physiological measures could provide further understanding on these potential relationships.

Compassion-based meditation research is limited and mainly identifies heart rate as the common physiological measurement. A recent study completed by Lumma et al. (2015)

compared physiological measures of heart rate between different types of meditations. The meditations included breathing meditation, lovingkindness meditation and observing thoughts meditation. One hundred and sixty participants completed each meditation on a daily basis for three months with measures of heart rate completed at week three and week thirteen. The results indicated an increase in heart rate from week three to week thirteen with a mean rise from 71.24bpm to 75.96bpm. An initial observation includes the chosen time points for the recording of heart rate. The first heart rate measure was taken at week three rather than at baseline before the intervention began could have influenced the results. Secondly, the authors predicted LKM would show an increase in heart rate due to the challenging nature of generating thoughts and feelings of compassion and prosociality. LKM also requires an individual to give compassion to the self-alongside giving compassion to others which may be challenging for some individuals. Difficulties evoking compassion and compassionate feelings towards the self and others have been defined as fears of compassion (Gilbert et al., 2011). Research has shown that individuals suffering with shame or traumatic memories have a positive relationship with fears of compassion to the self and with others (Matos et al., 2017). Further research is required to explore the physiological impacts of LKM and identify reasons why compassion-based meditations such as LKM offers a different meditation experience.

A smaller study, using a pre to post design investigated violent stimuli before and after a 12-week loving kindness meditation along with a measures of heart rate (Garcia, 2016). The research aimed to identify any changes in physiological responses following a loving kindness intervention. The research included an intervention group (n = 8) and control group (n =7). The results indicated a non-significant result for heart rate from pre to post intervention. The results were also based on a small sample of participants therefore an increased number of participants could offer significant findings. The research for compassion-based practices using heart rate

is limited and shows mixed results. Therefore, further research is required to support any physiological links with compassion-based practices.

### **Present Study**

From the systematic review, research focusing solely on heart rate and blood pressure using pre and post measures predominately uses MBSR as the primary programme (see chapter 4 for full overview). Previous research using MBSR interventions has shown reductions in heart rate (Amutio et al., 2014; Amutio et al., 2015; Gao et al., 2016; Nijjar et al., 2014) and blood pressure (Amutio et al., 2015; Nyklicek et al., 2013; O'Donnell., 2018) from pre to post intervention. Studies including compassion-based meditation using psychological or neurological measures have identified beneficial changes (Lutz et al., 2008; Pace et al., 2008; Shapiro et al., 2005). However, compassion-based practices have limited research using physiological measures with only heart rate as the main outcome measure; results from these studies were also mixed (Garcia, 2016; Lumma et al., 2015). The studies that included heart rate also focused on LKM rather than compassion-based meditations such as Tonglen and alternative compassion-based meditations.

Research has yet to show changes in the physiological measures of heart rate and blood pressure (DBP and SBP) during an 8-week mindfulness and compassion course. A course that includes both mindfulness and compassion practices would be of interest to explore the integration using physiological measurements. The mindfulness and compassion course also include LKM. Therefore, this study extends previous research by including physiological measures of heart rate and blood pressure at pre and post during an 8-week mindfulness and compassion course.

### **Hypotheses**

It was hypothesised that an 8-week mindfulness and compassion course would show a reduction in heart rate from pre to post (8-weeks later) time points.

Secondly, it was hypothesised that an 8-week mindfulness and compassion course would show a reduction in blood pressure (DBP and SBP) from pre to post time points.

## **Methodology**

### **Design**

A 2 way (pre and post) within subject factorial design was used to predict physiological changes in heart rate, SBP and DBP at pre and post course (8-weeks). The independent variable (IV) was time (pre to post) with heart rate (BPM) and blood pressure mmHG (millimetres of mercury) as the dependent variables.

### **Participants**

A total of eighty-seven participants participated in an 8-week mindfulness and compassion course ran by MindfulnessCIC. The participants were mainly from the MindfulnessCIC retreat based in Leicester. The remaining 6 participants were university staff who took part in a course ran at Coventry University. The participants included males ( $n = 25$ ) and females ( $n = 62$ ) with a mean age group of 35-44 years old. The ethnicity of the group was mostly white British ( $n=76$ ), white European ( $n=2$ ), British Asian ( $n= 6$ ) and other races ( $n = 3$ ).

### **Course**

The Mindfulness and Compassion course was developed by MindfulnessCIC to offer the necessary skills for participants to develop self-awareness, self-care, and compassion to bring meaning to people's lives (see chapter 5 for full course). The teacher delivered a 1.5hr

section of the course on a weekly basis following the traditional format. The mindfulness and compassion course combined breathing practices, compassion, body scans, and psychoeducation. In addition, participants were expected to commit to homework set out by the teacher, which included formal and informal practices of mindfulness.

The themes covered in the sessions were as follows:

Theme 1: Jewel in the ICE

Theme 2: The Feeling Body

Theme 3: Living in the Present

Theme 4: Calming the Chattering Mind

Theme 5: Dancing with Dragons

Theme 6: Compassion – Loving Kindness Meditations

Theme 7: ABC of Mindfulness

Theme 8: Bringing Mindfulness to Life/ Next Steps

## **Procedure**

Ethical approval was granted by a university ethics committee before undertaking the research (P44199). Before the course commenced participants were sent an email via MindfulnessCIC to request consent. It was made clear to the participants that this was optional and not a prerequisite for attendance on the course. If participants consented to take part they were sent a participant information sheet, informed consent and brief demographics. Before the course commenced an hour timeslot was arranged to discuss any issues or questions the

participants had before starting the study. Participants consenting on the day of the course were given the documentation by hand to voluntarily complete before the course commenced.

After consent the physiological measures were taken. Both heart rate and blood pressure were taken by ONSON blood pressure machine recorder. Guidance was followed from the handbook received with the blood pressure machine on taking blood pressure measurements prior to initiation. Recommendations included: measurements should be taken in a quiet place; removing tight-fitting clothing from the arm; sitting on a chair with feet flat on the floor; resting arm on a table so that the cuff is at the same level as your heart; remain still and do not talk during the measurement; avoid taking measures during stressful times. All recommendations were followed and to address the final point participants were requested to rest in the seated position for 5 minutes prior to taking measurements. Considerations were given on the time of day measurements were taken. BP increases on waking and drops during sleep, but varies throughout the day (Kawano, 2011). The physiological measures were roughly taken at the same time (late morning 9-10am) and took between 2-3 minutes to complete. Post measurements were taken later on in the day due to coinciding with the course completion (2pm).

## **Results**

### **Preliminary Diagnostics**

A paired sample t-test was conducted to compare physiological measures of stress (heart rate and blood pressure) over two time points. Data was screened and met all assumptions to perform the paired sample t-test. The assumptions include observations to be independent of one another; dependent variable normally distributed; dependent variable not to include any outliers. To identify normal distribution a histogram was completed for all dependent measures



which identified normal distribution of data. A box plot indicated no significant outliers. A breakdown for each physiological measure is given separately.

### **Heart Rate**

The descriptive statistics show the mean score for heart rate was slightly greater at pre-course compared to post course, indicating a slight decrease of 0.4 bpm over the two time points. A paired samples t-test indicated there was not a significant decrease in heart rate following the mindfulness and compassion course ( $M=73.0$ ,  $SD=10.2$ ) compared to baseline measures pre-course ( $M=73.4$ ,  $SD=10.5$ );  $t(86) = .33$ ,  $p = .74$ .

### **Diastolic Blood Pressure (DBP)**

The descriptive statistics show the mean score for DBP was slightly greater at pre-course compared to post course, indicating a decrease of 1.3mmHG (millimetres of mercury). A paired samples t-test indicated there was not a significant decrease in DBP following the mindfulness and compassion course ( $M=76.7$ ,  $SD=8.7$ ) compared to pre course ( $M=78.0$ ,  $SD=9.7$ );  $t(86) = 1.46$ ,  $p = .15$ .

### **Systolic Blood Pressure (SBP)**

The descriptive statistics show the mean score for SBP was slightly greater at pre-course compared to post course, indicating a decrease of 2.1mmHG. A paired samples t-test indicated there was not a significant decrease in DBP following the mindfulness and compassion course ( $M=126.6$ ,  $SD=13.3$ ) compared to pre course ( $M=128.7$ ,  $SD=15.2$ );  $t(86)=1.81$ ,  $p = .07$ .

### **Discussion**

The aim of this study will investigate potential changes in heart rate and blood pressure (DBP & SBP) at pre and post an 8-week mindfulness and compassion course. It is hypothesised that the 8-week mindfulness and compassion course would lead to a reduction in heart rate from pre to post (8-weeks later) course. Secondly, it is hypothesised that an 8-week mindfulness and compassion course would show a reduction in blood pressure (DBP & SBP) from pre to post time points.

The results indicated no significant changes in any of the physiological measures from pre to post time points. Although this study did not highlight any significant findings it does show a pattern of change in a positive direction for all the physiological measures, particularly systolic blood pressure. The results indicate that systolic blood pressure had the biggest drop when compared to diastolic blood pressure and heart rate. SBP is classed as a better predictor for health concerns (Black, 2004). This is mainly attributed to SBP offering more accurate biological data than DBP to support the identification of strokes and coronary heart disease (Lewington et al., 2002).

### **Previous Research**

Previous research identified significant reduction in diastolic, systolic and heart rate (Amutio et al., 2015). Although the present study did not find a statistically significant change it does support the previous research with SBP showing the biggest reduction in physiological measures or physiological outcomes were the main measure used in the research (Amutio et al., 2015, Pascoe et al., 2017). However, as the current mindfulness course is a combination of mindfulness and compassion it is beyond the design of this study to establish their relative effects on the outcome variables.

Previous research identified a relationship between home practice and mindfulness and a reduction in blood pressure (Amutio et al., 2015). Home practice hours was significantly

related to decreases in SBP ( $r = 0.68$ ;  $P = 0.03$ ) and DBP ( $r = 0.67$ ;  $P = 0.04$ ). The home practice of mindfulness exercises was 45-minutes per day, amounting to a total of 42-hours additional practice. In the present study, home practice was part of the course, however it was not recorded. The weekly timetable of themes from the course indicates that the maximum amount of time completing formal meditations was a daily 20-minutes body scan. However, this does not include other exercises advised for home practice. Given the significant correlation between home practice hours and reduced blood pressure it would have been ideal to control for home practice in the current research.

Any changes made over an 8-week period are reliant on participant engagement to fully benefit from the course. As home practice was not measured as part of this study it is unknown how much commitment was given outside of the sessions to mindfulness practice. If home practice was not a regular occurrence this could have contributed to the findings of the current study. Also, engagement on a mindfulness and compassion course may have encouraged participants to make healthy changes in other areas of their lives that contributed to the physiological changes observed in the current study. However, as this was not observed in the current research, further exploration is required in future research.

Previous research using physiological measures of stress includes longitudinal measures, either at 10-months or a 12-month time point (Amutio et al., 2014, Amutio et al., 2015). The current research intended to complete a further measurement at the 6-months' time point, however due to attrition rates this was not possible. To support and aid this final measure, participants were offered free monthly meditation evenings, not only to support practice but to offer accessibility for the final testing. As attendance was low only the pre and post measures were retained.

## **Limitations**

The limitations of the current study include the lack of control measures, particularly around home practice and the absence of follow up measures. Further limitations of the current study include the measure used for heart rate. In the current study heart rate was the chosen outcome measure, however heart rate variability (HRV) is considered a more direct measure of the parasympathetic nervous system and the vagus nerve. Therefore, HRV may have been more appropriate for the current study.

Even though the current research did not reveal any significant findings, it is worth noting potential confounding variables that could influence heart rate and blood pressure. These include variables such as caffeine consumption, smoking, exercise and medication that could change heart rate and blood pressure. Further consideration needs to be given to the potential increases in participant's anxiety when attending a new course as well as having measurements taken for research, all which increase heart rate and blood pressure. Given that mindfulness interventions attract and encourage individuals to attend for a reduction in stress and anxiety it seems logical to assume that some participants would be suffering with these difficulties prior to attendance. These were not measured in the current study, however it is pertinent for research undertaking measures of physiological stress.

Readings can differ depending on time of day for blood pressure. Measurements were time sensitive taking place before the course commenced (9-10am) and were captured at the end of the course (around 2pm). Blood pressure is usually higher in the morning, peaks during midday and begins to fall during later afternoon. Therefore, depending on the time of day the readings may have been slightly different. Participants at pre-course testing may have been eager to begin the course, whereas those at post course may have been eager to travel back home after the completion of the course, both having an impact on the readings. To accommodate this issue the design of the study could have been altered to take measurements earlier on during the final day.

## **Future Research**

Taking into consideration previous research and the current study it is clear that further work is required on studying the effects of mindfulness interventions and physiological measures of distress. As stated earlier individuals who stop practicing also lose the reductions in BP they have gained (Goldstein et al., 2012). Future research should include measures of homework practice, both quantitatively and qualitatively alongside physiological measures of distress over the course of the intervention and at a follow up.

A further consideration is for more extensive research on compassion-based meditations. Research is limited using compassion-based meditations with physiological measures. In the studies including physiological measures, heart rate was the dominant measure with results yet to indicate physiological significance (Garcia, 2016). Therefore, further work is required in this area, along with additional studies on alternative compassion- based meditations.

Future mindfulness interventions should also consider alternative positive changes that participants are making to gain a full understand of potential confounding variables such as beginning or increasing exercise or other alterations to lifestyle that could impact on physiological measuring. To the authors knowledge there is no evidence to support this contention, however mindfulness interventions have been shown to support alternative health behaviours (Carrière et al., 2017; Oikonomou et al., 2017) while reducing harmful health behaviours (Salmoirago-Blotcher et al., 2013).

## **Conclusion**

The present study attempts to identify changes in physiological measures of stress (heart rate and blood pressure) at pre and post time points during an 8-week mindfulness and compassion course. The current study did not find a statistically significant result, but did highlight a reduction in all three measures, with SBP recording the greatest reduction. Future research is advised to include measures of homework practices, alongside follow up measures to examine the impacts of sustained practice using quantitative and qualitative studies.

## **Study 1 (part 2)**

### Frontal Asymmetry

### Abstract

To further support to the physiological findings an additional study using EEG (Electroencephalogram) measures was undertaken to determine prefrontal hemispheric  $\alpha$ -asymmetry during and after an 8-week mindfulness and compassion course at three time points (pre, post and 6-months after).

A total of six participants ( $n = 4$  females,  $n = 2$  males;  $M_{\text{age group}} = 25\text{-}34$  years old) participated in an 8-week mindfulness and compassion course through MindfulnessCIC. A 3x3 repeated measure ANOVA was used to compare frontal  $\alpha$ -asymmetry (F3/F4, F7/F8, FP1/FP2) over three points (pre, post and six months later). The electrode placements represent particular areas of the frontal cortex: FP1-FP2 (Prefrontal cortex), F3-F4 (Dorsolateral prefrontal cortex) and F7-F8 (Ventrolateral prefrontal cortex).

The results indicated a pattern of change from right hemispheric activation to left hemispheric activation over the time points in all frontal electrode sites (F3/4, F7/F8, PF1/PF2),

however the results were not statistically significant. The results also highlighted the biggest increase towards left hemispheric activation was from post to follow-up, 6-months later.

The current study provides an understanding of frontal hemispheric asymmetry trends during and following an 8-week mindfulness and compassion course. The findings are discussed in relation to previous research, limitations of design and future applications including advice for practitioners.

The previous chapter outlined the findings from the physiological measures of stress during an 8-week mindfulness and compassion course at pre and post time points. To offer further support for the physiological study, a pilot study using EEG (Electroencephalogram) measures was conducted to determine prefrontal hemispheric  $\alpha$ -asymmetry during and after an 8-week mindfulness and compassion course at three time points (pre, post and 6-months).

## **Study 1 (Part 2) – A longitudinal study of prefrontal hemispheric $\alpha$ -asymmetry at pre, post and 6-months following an 8-week Mindfulness and Compassion Course**

### **Introduction**

#### **Frontal Hemispheric $\alpha$ -Asymmetry**

Over the last 20 years neuroscientific measures such as electroencephalograms (EEG) have been used to enhance our understanding of psychophysiological changes during



mindfulness-based interventions. The term neuroplasticity is popular within mindfulness research and has been identified as a mechanism for neural changes, emphasising the relationship between mindfulness and neuroscience (Davidson & Lutz, 2008; Widdett, 2014). Research has shown that the frontal regions of the brain specialize in the processing of positive and negative emotions (Davidson & Irwin, 1993). Hemispheric asymmetry or ‘laterality’ has identified differences in the processing of emotions for each hemisphere in the frontal cortex using frontal  $\alpha$ -asymmetry (FAA) to record the activity in each hemisphere (Davidson et al., 1990). The approach/withdrawal model (Davidson, 1983) proposes that the two hemispheres process emotions differently within the frontal cortex. The left hemisphere specialises in processing positive affect and approach motivation, while in contrast increased frontal EEG  $\alpha$ -asymmetry in the right hemisphere is linked to negative affect and withdrawal or avoidance of an emotional stimulus (Davidson, 1993; for a review see Coan & Allen, 2004). Therefore, interventions that include experiences or activities relating to the motivational valance would support further research in this area.

### **Mindfulness and Compassion**

Mindfulness interventions typically support individuals to create a state of mind that deters engagement with maladaptive patterns, and nurtures a state of mind known as positive affect (Barnhofer et al., 2010). Mindfulness interventions have been associated with increased positive affect (Chambers et al., 2007; Erisman & Roemer, 2010) that is positively associated with time spent practicing (Weinrib, 2011). In contrast, negative affect can have a detrimental impact on emotional regulation. Chronic distress for example has shown to cause negative outcomes including brain asymmetry dysregulation (Bob, 2008). Greater left frontal EEG activation has been shown to moderate the effects of stress (Lopez-Duran et al., 2012) with left frontal cortical activation linked to lower levels of the stress hormone cortisol (Baeken et al., 2014). In contrast greater right frontal activation is related to stressors and stressful experiences

(Tomarken et al., 1990). Research has highlighted the association between mindfulness and increasing positive affect alongside the detrimental influence of negative affect on the brain dysregulation.

Research combining mindfulness and frontal asymmetry is limited. The main piece of research combining the two is a study by Davidson et al. (2003) who conducted a Randomised Controlled Trial (RCT) to research frontal brain  $\alpha$ -asymmetry using EEG alpha brain wave measures at pre, post and 4-months following an 8-week MBSR intervention. The study consisted of twenty-five participants in the meditation group and sixteen in a waitlist control group. The measures included brain electrical activity, self-report measure of Positive and Negative Affect Schedule (PANAS), the Spielberger Trait Anxiety Inventory, recordings of daily meditation practice and biological measures. The biological measures included an influenza vaccination to monitor changes in antibodies using blood tests at 3-5 weeks and 8-9 weeks for the meditation group.

For the electrical brain activity, the study recorded measures at pre, post and follow-up (4- months later) and used electrode sites F3/F4, FC7/FC8 (frontal), T3/T4(temporal), and C3/C4 (central). The results indicated at both post and follow-up a greater left sided hemisphere activation at electrode sites T3/T4 and C3/C4 after the intervention compared to the control group, a change associated with increased positive affect. However, the frontal electrode sites showed no greater left sided activation. It was noted from the self-reported mindfulness practice that a reduction in practice was evidenced from time point 2 (8-weeks) to time point 3 (4-months). However, no explanation by the authors was given around the lack of findings relating to the frontal electrode sites. Previous critics of the findings have also sought for answers as to why the electrode sites C4/C3 have been activated when the primary function is as motor sites rather than emotional processing sites (Travis & Arenander, 2004). This could have been a contributing factor towards the findings of the left sided frontal activation. A

further finding was the significant increases in antibodies to the influenza vaccine in the meditation group compared to the control group. This research showed that MBSR had positive impacts on both brain and immune functioning which continued beyond the 8-weeks, however, the study failed to find increases in left prefrontal activation. The authors conclude that future research could include changes to the intensity or duration of the mindfulness intervention to increase both left prefrontal activation and positive affect.

Greater left sided EEG activation has been subsequently linked to mindfulness-based meditations in more recent research. A short 5-week meditation intervention consisting of between 5 to 16-minutes of active focused attention meditation a day highlighted an increase towards left sided frontal  $\alpha$ -asymmetry activation compared to a wait-list control group (Moyer et al., 2011). Further research using an 8-week MBSR on an elderly population over time points from pre to thirty-two-weeks found left sided frontal  $\alpha$ -asymmetry activation in frontal regions (F3/F4). However, a notable shift was only found after the 8-week intervention not in the follow-up at thirty-two-weeks. This result could be due to a reduction in mindfulness practice following the completion of the course causing an impact on the strength of the left sided frontal  $\alpha$ -asymmetry activation in frontal regions (F3/F4). However, mindfulness practice during and following the intervention was not recorded for the research. In contrast the wait-list control group had a significant shift in right sided  $\alpha$ -asymmetry activation (Moynihan et al., 2013). Alternative mindfulness-based research has also shown increased left side EEG activation including Mindfulness-based Triarchic Body-pathway Relaxation Technique (Chan et al., 2008); MBCT (Barnhofer et al., 2007; Zhou & Liu, 2017) and Theravada meditation (Amihali & Kozhevnikov, 2014). However, similar research has also found decreased activity in left hemispheric  $\alpha$ -asymmetry or failed to find any effect on frontal hemisphere asymmetry from mindfulness training (Keune et al., 2011; Milz, 2014). Research on depressed patients found a stronger shift towards right sided  $\alpha$ -asymmetry activation following an MBCT intervention

indicating a conflicting result (Keune et al., 2011). Frontal hemispheric asymmetry research is mixed, however, hemispheric shifts from right to left are the prevalent finding.

Compassion-based meditations have been researched as part of mindfulness interventions and as a single component. However, it has been identified that compassion meditations such as loving kindness meditations are not part of the manualised MBCT and MBSR, but the inclusion of the practice depends on the teacher (Barnhofer et al., 2010). Compassion training could also expand positive affect and reduce negative affect, while helping individuals to strengthen resilience to distress (Klimecki et al., 2013). There is a lack of neuroscientific research using compassion-based meditations, therefore further research in this area would help support identifying any links such as positive affect or hemispheric change.

A notable study by Barnhofer et al. (2010) included EEG  $\alpha$ -asymmetry measures for two different types of meditation on participants with depression. The first group (N=8) completed a 15-minute mindfulness breathing meditation and the second group (N=7) completed a 15-minute loving kindness meditation, following guided meditations. EEG  $\alpha$ -asymmetry measures were taken at pre and post the 15-minute intervention. After the initial study a third group was included as a control with no intervention and only the EEG measures. The results concluded that both the mindfulness breathing meditation and loving kindness meditation showed an equal increase in  $\alpha$ -asymmetry towards left prefrontal activation compared to a resting control group. This study adds to the scant research on EEG  $\alpha$ -asymmetry, highlighting equal importance of both the traditional mindfulness breathing meditation and loving kindness meditation. Despite the study having a small participant number it was still able to identify an increase in left prefrontal activation.

### **Mechanisms of Mindfulness**

There has been a small number of suggested mechanisms of mindfulness (Baer, 2003, Baer et al., 2006; Shapiro et al., 2006; Brown et al., 2007; Hölzel et al., 2011; Vago & Silbersweig, 2012). However, the latest model (Vago & Silbersweig, 2012) defined as S-ART integrates physiological, cognitive, emotional and behavioural facets to support the mechanisms of change. The six components within the model included 1) intention and motivation; 2) attention regulation; 3) emotion regulation; 4) memory extinction and reconsolidation; 5) pro-sociality; 6) non-attachment and de-centering. In addition to the six components further concepts include ‘self-specifying and narrative self-networks’ through the integration of the fronto-parietal control network (for a review of S-ART see Vago & Silbersweig, 2012).

The component relevant to the current study is intention and motivation. In the review presented by Vago and Silbersweig (2012) the approach and avoidance model was presented alongside the motivation mechanism. Shapiro et al. (2006) also highlighted the importance of intention and motivation within mindfulness and concluded that the intention in practising mindfulness also impacts on the experience and outcomes observed. As previously defined by Davidson and Irwin (1999) there are two patterns of neural activity within the motivation systems of approach and avoidance. Left prefrontal activation has been connected to positive affect, whereas right prefrontal activation is associated with negative affect. It was also suggested that asymmetric differences may contribute to biological dispositional difference towards motivation and the outcomes of mindfulness training. Therefore, intentions and motivations are determined by individual interactions of affective style and biological dispositions, which predicts subsequent behaviour. Research is limited in this area and warrants further investigation to identify the links between motivation and mindfulness interventions (Vago & Silbersweig, 2012).

Further research is required to identify links between motivation and mindfulness interventions (Vago & Silbersweig, 2012) and only one identified study has integrated the approach and withdrawal model alongside a mindfulness intervention (Davidson et al., 2003). Therefore, the approach and withdrawal model was chosen as the most relevant theory for the current research. A mindfulness and compassion intervention could also add support and extend on the existing research using the approach and withdraw model.

### **Present Study**

Previous research has shown left sided activation for both an 8-week MBSR (Davidson et al., 2003; Moynihan et al., 2013) and a 15-minute mindful breathing/ loving kindness meditation (Barnhofer et al., 2010). Mindfulness aims to increase positive affect (Barnhofer et al., 2010), therefore a shift towards the left hemisphere would be expected based on theory and previous research (Davidson et al., 2003; Barnhofer et al., 2007; Chan et al., 2008; Moyer et al., 2011; Moynihan et al., 2013; Amihali & Kozhevnikov 2014; Zhou & Liu, 2017). However, research is yet to show the changes in EEG frontal  $\alpha$ -asymmetry using an 8-week mindfulness and compassion course at pre, post and follow-up. Two further contributions of this study include an extended follow-up test from 4 (Davidson et al., 2003), to 6-months. In addition, the electrode points of FP1 & FP2 (prefrontal cortex or PFC) were included in the current research. Previous research included the electrode sites F3/F4, F7/8 (frontal), T3/T4 (temporal), and C3/C4 (central) (Davidson et al., 2003) and F3/F4 (Moynihan et al., 2013). Previous research has related the PFC as a key area involved in the processing of emotions with the dorsolateral PFC most likely involved with directed goal states towards either positive or negative affect (Davidson, 2004). Research using film induced negative affect has shown increased activation

in right prefrontal asymmetry. In contrast when the film induced positive affect increases were identified in the left prefrontal asymmetry (Davidson et al., 1990). This study highlights the important role the PFC has in processing emotion and goal states.

Traditionally compassion-based meditation practices are not formally included in MBSR training (Barnhofer et al., 2010) therefore it would be of interest to explore the integration on frontal  $\alpha$ -asymmetry following an 8-week mindfulness and compassion course. The only identified study that integrated compassion meditations showed a loving kindness meditation to increase  $\alpha$ -asymmetry towards left prefrontal activation compared to a resting control group (Barnhofer et al., 2010). Therefore, further research is required to identify any further findings when integrating compassion meditations into a traditional length meditation intervention. The aim of this study will identify EEG frontal  $\alpha$ -asymmetry changes at pre, post and follow-up (6-months) following an 8-week mindfulness and compassion course. Previous research has included a follow-up time points after the mindfulness intervention 4-months; (Davidson et al., 2003) 32-weeks (Moynihan et al., 2013). However, none to date have found changes in EEG frontal  $\alpha$ -asymmetry. Therefore, the final hypothesis will include a 6-months' time point to identify any longitudinal changes.

## **Hypotheses**

It is hypothesised that following an 8-week mindfulness and compassion course there will be an increase in frontal left sided activation compared to baseline.

It is hypothesised that 6-months after the 8-week mindfulness and compassion course there will be an increase in frontal left sided activation compared to baseline and post course.

## **Methodology**

### **Design**

A 3x3 (electrode x time) repeated measures design was used to predict brainwave changes in EEG prefrontal hemispheric activity at pre, post (8-weeks) and 6 months following the mindfulness course. The independent variable was time with asymmetry index as the dependent variable.

### **Participants**

A total of six university staff at Coventry University volunteered to participate in an 8-week mindfulness and compassion course ran by MindfulnessCIC. The participant characteristics include both males ( $n = 2$ ) and females ( $n = 4$ ) with a mean age group of 25-34 years old. The ethnicities of the group were white British ( $n = 5$ ) and white European ( $n = 1$ ).

### **Course**

The Mindfulness and Compassion course was developed by MindfulnessCIC to offer the necessary skills for participants to develop self-awareness, self-care, and compassion to bring meaning to people's lives. The teacher delivered a 1.5hr section of the course on a weekly basis following the traditional format. The mindfulness and compassion course combined breathing practices, compassion, body scans, and psychoeducation. In addition, participants were expected to commit to homework set out by the teacher, which included formal and informal practices of mindfulness (see chapter 5 for full course).

The themes covered in the sessions were as follows:

Theme 1: Jewel in the ICE

Theme 2: The Feeling Body

Theme 3: Living in the Present

Theme 4: Calming the Chattering Mind



Theme 5: Dancing with Dragons

Theme 6: Compassion – Loving Kindness Meditations

Theme 7: ABC of Mindfulness

Theme 8: Bringing Mindfulness to Life/ Next Steps

## **Procedure**

Ethical approval was granted by a university ethics committee before the research was able to go ahead (P44199). Participants set to attend the 8-week mindfulness and compassion course were invited to participate in EEG testing. Participants were given information outlining the EEG process and consent was received from those willing to take part in the research (see appendix 3 & 12). Participants were briefed on the nature of the study including details about the mindfulness course. On arrival at the laboratory the vertical electro-oculographies (VEOGs) were measured over the supra- and sub-orbital ridge of left eye and horizontal electro-oculographies (HEOGs) were measured over the lateral canthus of each eye. The participant's head was then measured for the right size cap to ensure electrode placement accuracy. Once the correct sized was allocated the cap was placed on the participant's head using the Cz electrode as the reference point. A syringe with conductive gel was then inserted into the electrode holes allowing hair to be moved and the gel to be correctly placed on the head. This procedure was completed until all electrodes were fitted. Brain wave activity was monitored with eight 1-minute trials (four eyes closed and four eyes open), the order randomised for each participant. The procedure took between 45-minutes to an hour and was completed before the course, 8-weeks later and finally 6-months later. Participants were debriefed after the final measuring test point of 6-months (see appendix 4).

## **EEG Recording**

Baseline EEG was recorded using the international 10-20 EEG system (BioSemi, Amsterdam, The Netherlands). Recording of electrical activity was completed from all electrode sites but only certain areas of the frontal cortex were used for analysis, these included prefrontal (FP1, FP2), frontal (F7, F3, F4, F8) (see appendix 14). The electrode placements represent particular areas of the frontal cortex: FP2-FP1 (Prefrontal cortex), F4-F3 (Dorsolateral prefrontal cortex) and F8-F7 (Ventrolateral prefrontal cortex).

### **EEG Analysis Process**

EEG data was processed using BESA 6.0 software. No epochs with excessive artefacts were detected. EEG data from all channels were bandpass filtered using Fast Fourier Transformation (FFT) with 1 Hz low cut-off (6 dB/octave attenuation) and 30 Hz high cut-off (12 dB/octave attenuation). Estimates of spectral power ( $\mu\text{V}$ ) were spaced at 0.5 Hz intervals. Artefact-free segments were extrapolated into 1-sec epochs in the alpha band spectrum (8-13 Hz) at a sampling rate of 256 Hz. For the final part of the analysis brain asymmetry scores ( $\log \text{Right} - \log \text{Left}$  e.g.  $\text{FAA} = \ln[\text{F4}] - \ln[\text{F3}]$ ) were calculated using the mean alpha power values for the frontal sites (F4-F3/ F8-F7/ FP2-FP1). Brain activation was inferred as the reverse of mean alpha power (less alpha activity the more brain activity) (Davidson et al., 1990, Oakes et al., 2004). Scores indicating a negative value represent greater right hemisphere dominance, a positive score represents greater left hemisphere dominance.

### **Results**

#### **Preliminary Diagnostics**

A 3x3 repeated measure ANOVA was conducted to compare frontal  $\alpha$ -asymmetry (F4-F3, F8/F7, FP2/FP1) over three points (pre, post and 6-months later). Data was screened and met the assumptions of the repeated measure ANOVA. The assumptions included normality of residuals and sphericity. The Shapiro-Wilk test confirmed that data was normally distributed.

Follow-up analyses tested the assumptions of sphericity. Violations of sphericity were identified, therefore a Greenhouse-Geisser correction was applied.

### Frontal Alpha Asymmetry

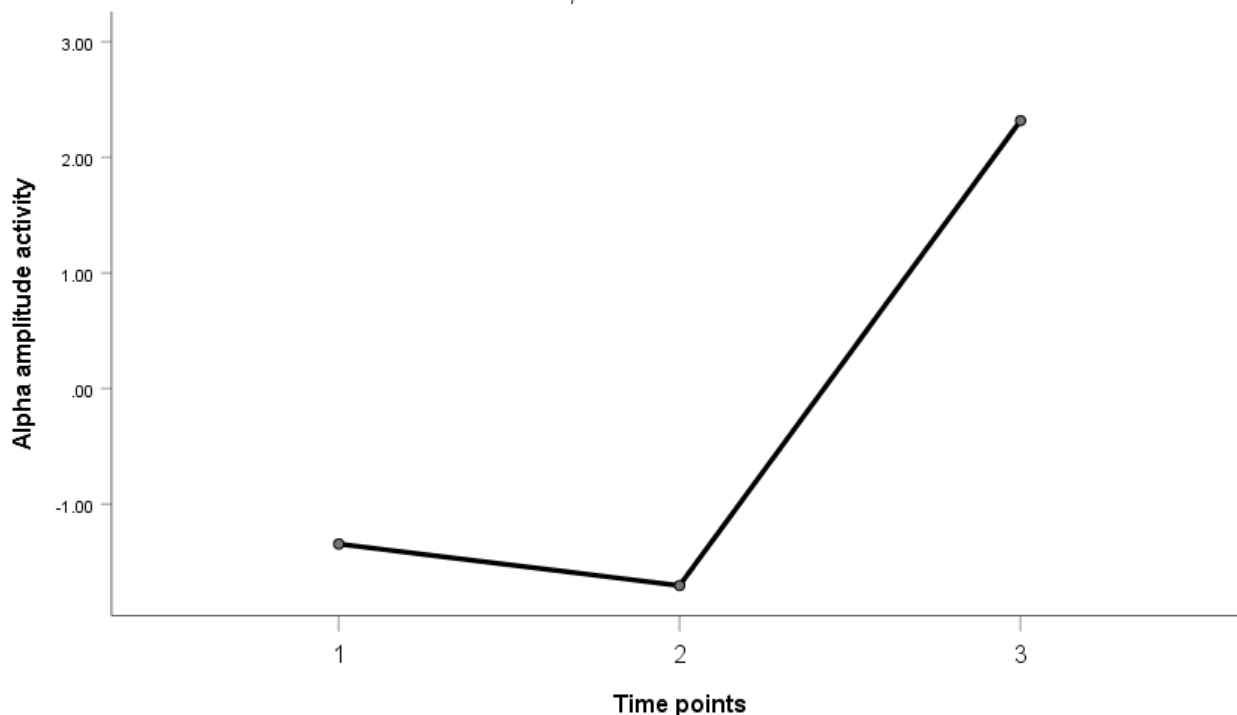
The descriptive statistics indicated a pattern of change in frontal hemispheric activity over the three time points from right to left side brain activation. For all three electrode sites (F4-F3, F8/F7, FP2/FP1) pre and post values were negative indicating greater power in the right hemisphere. However, at the follow-up (6-months) all three electrode sites had shifted to greater left hemispheric power (Table 1).

**Table 1**

*Mean brain asymmetry scores for pre, post and follow-up measures (N=6)*

	<b>F4 – F3</b>	<b>F8-F7</b>	<b>FP2 – FP1</b>	<b>Total</b>
Pre	-1.2	-2.6	-0.2	-4.0
Post	-0.1	-2.4	-2.6	-5.1
Follow up	5.1	1.4	0.4	7.0

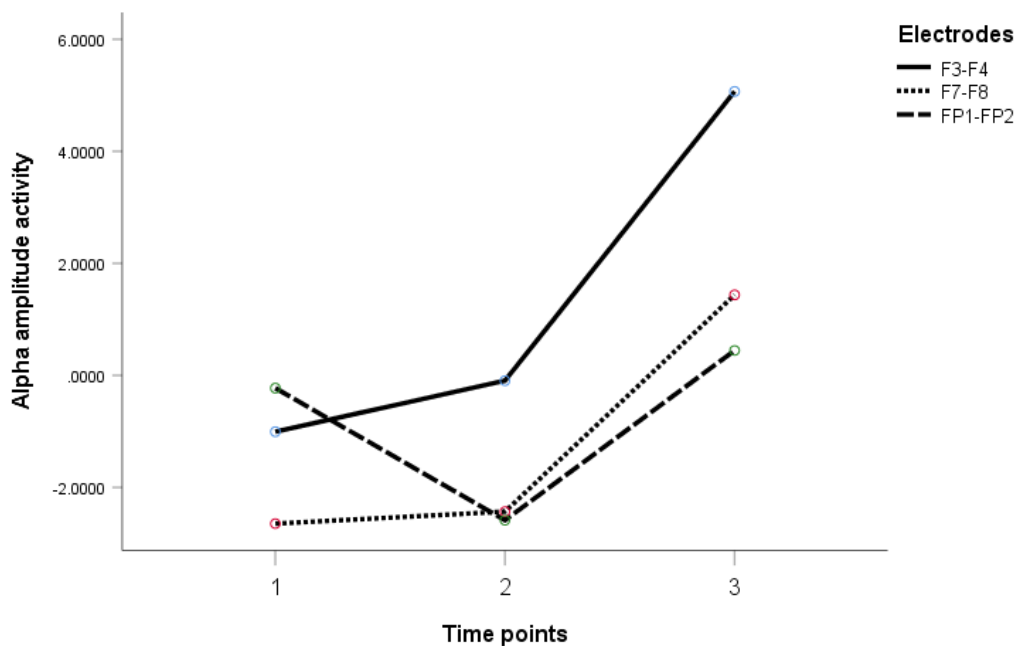
A 3x3 repeated measures ANOVA was completed to analyse the interaction of  $\alpha$ -asymmetry and time. The results indicated a marginally non-significant result that approached significance  $F(1.910,9.551)=2.73$ ,  $p=.11$ . The results show a pattern of change in brain asymmetry activation over the time points (Figure 1).

**Figure 1***Mean Totals of all Three Electrodes at each Timepoint*

The mean averages for all electrodes combined indicates a slight drop towards right hemispheric activation from pre to post mindfulness course. However, from post to follow -up, 6-months later, there is an increase towards left hemispheric activation. The biggest shift is from post to follow-up which is also the largest period of elapsed time. The individual breakdown for each electrode site (Figure 2) outlines a similar pattern for the frontal sites (F4/F3 and F8/F7) from pre to follow-up time points. At pre-course both are right side dominant, by post course there is a marginal pattern of increase towards the left hemisphere. However, at follow-up there is left hemispheric dominance. In contrast for the prefrontal electrodes (FP2/FP1) there are similarities in alpha activity for pre and follow-up time points, however time point two decreases considerably.

**Figure 2**

*EEG Frontal Electrodes at Pre, Post (8 weeks) and Follow up (6 months)*



## Discussion

The aim of this study was to investigate frontal hemispheric asymmetry changes before and after an 8-week mindfulness and compassion course to support physiological findings. It was hypothesised that following an 8-week mindfulness and compassion course there would be a shift towards left hemisphere frontal activation. The results indicated a pattern of change from right hemispheric activation to left hemispheric activation over the time points in all frontal electrode sites (F4/F3, F8/F7, PF2/PF1) apart from post course (FP2/FP1); however, the results were not statistically significant. Negligible change was observed at 8-weeks compared to baseline, but there was a slight increase in left frontal EEG activation at 6-months follow-up relative to both baseline and post 8-weeks testing. For the current research the approach/withdrawal model (Davidson et al., 2003) indicated a possible shift towards left hemisphere dominance, indicating an activation of approach motivation which has been linked with associated with positive affect. As mindfulness aims to increase positive affect the

resulting shift towards an increase in left hemispheric activation are consistent with the proposed model.

### **Previous Research**

The EEG findings partially support and extend previous research that indicated an increase in activation from right to left frontal asymmetry following an 8-week MBSR intervention (Davidson et al., 2003; Moynihan et al., 2013). However, previous research only located changes in the following electrodes F3/F4 (Moynihan et al., 2013) T3/4 and C3/4 (Davidson et al., 2003). The current study indicated a shift from right to left hemisphere in all frontal electrodes (F4/F3, F8/F7, PF2/PF1) offering not only novel findings but an extension on previous research. The frontal areas that showed left sided activation were dorsolateral prefrontal cortex (F4/F3), ventrolateral prefrontal cortex (F8/F7) and prefrontal cortex (FP/FP1). The current study extended previous research by including compassion meditations and also partially supports previous research that has shown an increase in  $\alpha$ -asymmetry towards left prefrontal activation following interventions of either a mindfulness breathing meditation or loving kindness meditation (Barnhofer et al., 2010).

The current study found a slight trend towards an increase in left sided frontal activation that was only evident at the follow-up time of 6-months. However, in contrast to previous research left sided hemispheric activation was present at post and follow-up (4-months) time points (Davidson et al., 2003) and a short 15-minutes intervention over 5-weeks (Barnhofer et al., 2010). However, further research only found a left sided activation after the intervention but failed to find permanency in left frontal alpha asymmetry during the twenty-six-weeks follow-up after the 8-week intervention (Moynihan et al., 2013). This may indicate that MBSR and a short intervention of a 15-minute meditation is enough to shift activation from right to left hemisphere in a shorter time period. Whereas the 8-week mindfulness and compassion

intervention required a longer time period to cultivate any neurological adaptations reflected by changes in brain asymmetry. To summarise, the current research found changes in all electrode sites (F4/F3, F8/F7, PF2/PF1) shifting from right to left hemisphere.

### **Limitations of the Study**

Two of the main limitations of this study include the low statistical power due to low participant numbers. Only a small number of participants opted to participate because of time commitments. A second study was implemented in the hope of more participants, however no further participants volunteered for the EEG testing. Future research should look to expand this pilot study to recruit a larger sample of participants to add to the findings of the current research. Recruitment of participants was difficult even when a free mindfulness course was offered. The majority of those who declined admitted to time constraints within the working environment.

In addition, participants who completed the mindfulness course had to do so within the working environments and during work hours, therefore not offering the most suitable environment for new skill building. Davidson et al. (2003) also experienced this limitation with the MBSR intervention. To overcome this limitation, offering the course outside of the working environment would offer participants a clear boundary or divide between work and life, while supporting a better learning environment.

Another limitation included the recording of home practice during the course. Recording of home practice may have enabled a link between particular meditations and the time spent practicing with hemispheric brain activation. One study reported daily practice but found no significant relationship between practice time and the biological or self-reported measures (Davidson et al., 2003). Other previous research did not include a measure of home practice (Barnhofer et al., 2010; Moynihan et al., 2013).

Finally, it remains unclear why the current findings were limited to a tendency for an increased activation in the frontal (but not as much in the prefrontal) regions. The electrode areas F4/F3 and F8/F7 are associated with the posterior region rather than the prefrontal which has been associated with positive and negative affect in previous studies (Davidson, 2004b; Sutton & Davidson., 2000). As future research continues answers may emerge for the above findings.

### **Applications for Future Research**

Future research should continue to explore the impacts of the combination of mindfulness and compassion interventions on brain activation. The current research completed a final measure at the six months, however further time points could identify any long-term benefits of continued practice. Alongside these additional time points, a recording of home practice would enable a link to particular meditations and the time spent practicing. This would also support the identification of how much time is required to support any shifts in hemispheric asymmetry. Previous research has shown as little as 15-minutes of mindfulness breathing meditation or loving kindness meditation was required to cause a neurological change (Barnhofer et al., 2010). Therefore, future research could explore neurological changes during shorter compassion meditations.

An expansion for future research should include the neurological applications of mindfulness to add to the mechanisms of change proposed by Vago and Silbersweig (2012). Neurophenomenological approaches are also an area of interest within mindfulness research. Valera (1996) proposed a neurophenomenological programme which aimed to bring together first- and third-person accounts to understand the conscious mind (Valera, 1996). The neurophenomenological programme is “a model that accounts for both phenomenology and neurobiology of consciousness in an integrated and coherent way” (Thompson et al., 2005,



P.87). Part of the requirements for the neurophenomenological approach is the inclusion of training participants to reflect on their experience, therefore a mindfulness intervention would offer an excellent experiential opportunity to gather data. The expansion and integration of neurology and phenomenology is a growing area of application within mindfulness interventions that requires further investigation.

## **Conclusion**

The present study attempts to identify changes in frontal alpha asymmetry using an 8-week mindfulness and compassion course at pre, post (8-weeks) and follow-up (6-months) time points. The current study did not find a statistically significant change in frontal EEG asymmetry over time; however, it did identify a pattern of change towards greater left hemisphere activation from pre to follow-up time points. The greatest shift in left sided hemispheric activation was recorded at the 6-months follow-up time point after course completion. Future research could include the integration of mindfulness and compassion interventions, while considering applications such as the neurobiological mechanisms of change and neurophenomenological approaches.

**Chapter 7**  
Multiple Regression  
Fears of Compassion & Stress

### Abstract

To support the previous neurophysiological findings, research was completed to ascertain the relationship between fears of compassion and perceived stress for participants attending an 8-week mindfulness and compassion course.

A total of ninety-eight participants (n=69 females, n=29 males;  $M_{\text{age group}} = 35\text{-}44$  years old) participated in an 8-week mindfulness and compassion course. All participants were given self report measures of perceived stress (Cohen et al, 1983) and fears of compassion (Gilbert et al., 2011) which included three subscales: fears of expressing compassion for others; fears of responding to compassion from others; fears of expressing compassion and kindness towards oneself. A multiple regression analysis was used to predict stress from the three subscales of fears of compassion.

Stress was significantly predicted by fear of expressing kindness and fear of compassion to oneself. Fears of responding to compassion from others was shown to have a strong correlation to fears of expressing kindness and compassion to oneself but no significance to stress and was therefore identified as a potential suppressor variable.

The current study provides an understanding of the relationship between fears of expressing kindness and compassion to oneself and stress. In addition, the study highlighted the amplification effects of the suppressor variable which could impact on the ability to recognise the need and necessity of compassion from others and to the self. The findings are discussed in relation to previous research, limitations of design and future applications including advice for practitioners.

The previous chapter outlined the findings from the neurophysiological measures of heart rate, blood pressure and frontal alpha asymmetry following an 8-week mindfulness and compassion course. To add additional support to the neurophysiological study and further knowledge to our understanding of compassion a multiple regression was completed to explore the influence of fears of compassion on stress.

## **Study 2: An exploration of the relationship between Fears of Compassion and Perceived Stress following an 8-week Mindfulness and Compassion Course.**

### **Introduction**

#### **Mindfulness and Compassion**

Mindfulness has been defined as ‘paying attention on purpose, in the present moment, non-judgementally’ (Kabat-Zinn, 1994). Mindfulness and/or compassion courses include a range of techniques (introspection, present moment awareness, meditations and compassion practices) to enhance skills within these areas. Mindfulness meditation typically encompasses three different practices: focused attention meditation (FAM), open monitoring meditation (OMM) and compassion-based practices (including loving kindness). In biofeedback, mindfulness training has shown to help individuals become aware of how to regulate physiological and neurological outcomes, while self-compassion practices allow gentle, encouraging self-talk and acceptance during feelings of failure (Khazan, 2015).

Compassion has been defined as including five fundamental areas: recognizing suffering, understanding the universality of human suffering, feeling for the person suffering, tolerating uncomfortable feelings, and motivation to act/acting to alleviate suffering (Strauss et al., 2016). In relations to stress responses, research has shown self-compassion to be a negative predictor of salivary alpha amylase biomarker of the sympathetic nervous system

(SNS) in the activation of the SNS following individual and repeated stressors. However, when an individual gives oneself compassion this can offer a level of protection against stress (Breines et al., 2015). In contrast deficiencies in compassion have been shown to make one more vulnerable to threat responses and therefore more likely to be unable to cope with stressful events (Matos et al., 2017). It has also been suggested within the flow of compassion that both fears of self compassion and fears of receiving compassion have the greatest impact on mental health due to similar activation systems (Kirby et al., 2019). In sum, a lack of compassion or a notable fear in compassion can have an impact on one's ability to cope with stressful experiences, while increasing the chance of mental health difficulties.

### **Neurophysiology and Fears of Compassion**

The vagus nerve is a major component within the neurophysiological flow of compassion with vagal tone (or heart rate variability) representing the biological marker of compassion (Porges, 2007). Compassion is linked to the neurophysiological system by working bi-directional from the mind to the body. The process of compassion heavily relies on the link with the body, therefore learning compassion skills is achieved using the body. In order for compassion to be experienced, neuroception is activated to ensure the body recognises safety through sensory perception, to assess the environment for risk and then communicating this to the rest of the body (Porges, 2017). Once safety has been confirmed, the parasympathetic nervous system will be activated, regulating the body with oxytocin (neuropeptide) and opiates.

Oxytocin has been shown to play an important role in 'calming and connection' as opposed to the 'flight or fight' response (Uvnäs-Moberg & Magnussen, 2005). Oxytocin has also shown a reduction in the activation of the amygdala leading to a reduction in fear (Macdonald & Macdonald, 2010). Individuals with a lower baseline of oxytocin have also shown to have higher levels of distrust (Zak et al., 2005). This research highlights the

importance of oxytocin for building connection, trust and feelings of safety. Research not only shows the relationship between distress and compassion but also the impact distress has on numerous areas within the body.

Affective neuroscience, also known as the study of emotions (Pankseep, 1991;1992) has identified the frontal regions of the brain as specialising in the processing of positive and negative emotions (Davidson & Irwin, 1993). Within the research on frontal asymmetry the approach/withdrawal model (Davidson, 1983) proposes that the two hemispheres process emotions differently within the frontal cortex. The left hemisphere specialises in processing positive affect and approach motivation, while in contrast increased frontal EEG  $\alpha$ -asymmetry in the right hemisphere is linked to negative affect and withdrawal or avoidance of an emotional stimulus (Davidson, 1993; for a review see Coan & Allen, 2004). Mindfulness interventions have not only been associated with increased positive affect (Chambers et al., 2007; Erisman & Roemer, 2010) but in addition the more one practices mindfulness the greater the positive affect (Weinrib, 2011). Research using mindfulness interventions and frontal hemispheric activation identified a shift from right to left frontal hemispheres following a MBSR intervention (Davidson et al., 2003). Therefore, it is predicted that individuals with fears of compassion for the self or others would likely be activating the right frontal hemisphere. Whereas mindfulness interventions could support a shift from the right to the left frontal hemisphere.

Reducing fears of compassion through new skills and experiences on mindfulness and/or compassion interventions allow changes to be made at a physiological level. Learning how to activate the parasympathetic nervous system facilitates a decrease in heart rate and blood pressure. If this system is regularly activated the Hypothalamic Pituitary Adrenal Axis (HPA) will receive feedback allowing a balance to be regained. Research including fears of compassion for the self and others have been shown to be positively related to stress and

negatively correlated with mindfulness (Gilbert et al., 2012). This highlights the importance of mindfulness practice for the reduction of stress. Alongside the links with mindfulness negative thoughts brought about by fears have been shown to increase levels of resting stress hormones (Engert et al., 2014). Therefore, the negativity experienced during fears of compassion would increase or accentuate the stress hormones within the body.

Compassion practices have also been shown to support a reduction in fears of compassion. Kindness Based Meditation (KBM) has been identified as a practice that could reduce fears of compassion (Jazaieri et al., 2012). In support of the benefits of KBM, a recent review on the effects of KBM on health and wellbeing showed decreases in depression, increases in mindfulness, compassion, and self-compassion against passive controls (Galante et al., 2014). Research has shown using mindfulness and compassion supports the regulation of the physiological systems while reducing the negative impact of increased stress.

Previous research has offered an insight into the relationship between fears of compassion and stress measures using a mixture of students ( $n=222$ ) and therapists ( $n=59$ ) (Gilbert et al., 2011). The self-reported scales included the Fears of Compassion questionnaire (Gilbert et al., 2011) which comprises three sub scales: fears of expressing compassion for others; fears of responding to compassion from others; fears of expressing compassion and kindness towards oneself. The Depression, Anxiety, and Stress Scale (DASS-42) (Lovibond & Lovibond, 1995) includes three subscales measuring depression, anxiety and stress. The results showed that fears of compassion for self and from others were linked to stress in students only ( $r = .31$ ). In therapists, only fears of compassion from others was linked to stress ( $r = .31$ ). Fears of compassion for self was also shown to be highly correlated with fears of compassion from others in students ( $r = .67$ ) and therapists ( $r = .51$ ). This research highlighted a link between fears of expressing kindness and compassion towards oneself and others with stress, alongside a relationship between fears of expressing kindness and compassion towards oneself and fears

of responding to compassion from others. However, further research is required to extend on the area of fears of compassion and stress using different population groups aside from therapists and students.

### **Present Study**

Previous research has identified a relationship between fears of compassion and stress as well as a relationship between the subscales of fears of compassion (Gilbert et al., 2011). Fears of compassion for the self and others has also been shown to be positively related to stress and negatively correlated with mindfulness (Gilbert et al., 2012). Highlighting the beneficial impacts of mindfulness on fears of compassion. In support, negative thoughts brought about by fears increase levels of resting stress hormones (Engert et al., 2014). Therefore, as mindfulness is negatively correlated with fears of compassion a mindfulness intervention should reduce fears of compassion and consequently decrease distress. Mindfulness interventions have not only been associated with increased positive affect (Chambers et al., 2007; Erisman & Roemer, 2010) but in addition the more one practices mindfulness the greater the positive affect (Weinrib, 2011). Consequently, a shift from right to left frontal hemispheric asymmetry should coincide with a reduction in fears of compassion. Compassion-based practices such as KBM have also shown to reduce fears in compassion (Jazaieri et al., 2012). Therefore, a mindfulness and compassion intervention is likely to increase positive affect while reducing negative affect leading to an impacts on fears of compassion and stress.

The current research expands on previous findings by investigating the relationship between fears of compassion and stress following an 8-week mindfulness and compassion intervention. This is the first study using a mindfulness and compassion course with the outcome variables of fears of compassion and stress. Research on fears of compassion this is



limited and still requires evidence around the origins and vulnerabilities associated with fears of compassion to support and extend knowledge in this area (Duarte et al., 2015).

### **Hypothesis**

It is hypothesised that following an 8-week mindfulness and compassion course perceived stress will be positively predicted by fears of expressing compassion for others, responding to compassion from others, and expressing compassion to oneself.

### **Methodology**

#### **Design**

A repeated measures design was used to explore the relationship between stress and fears of compassion following an 8-week mindfulness and compassion course. The study included three predictor variables and one criterion variable. The predictor variables included: (1) Fears of expressing compassion for others; (2) Fears of responding to compassion from others; (3) Fears of expressing compassion and kindness towards oneself. The criterion variable was the relationship with stress.

#### **Participants**

The mindfulness and compassion course used for data collection in the current research was sourced through MindfulnessCIC, a non-profit company that runs mindfulness courses for the general public and for clinical settings. A total of ninety-eight participants consented to take part in the research from a general public course running in Leicester. The participant characteristics included both females ( $n=69$ ) and males ( $n=29$ ). The participants were all above 18 years old with the most common age group between 35-44 years old. The ethnicity of the group was majority white British ( $n=82$ ), white European ( $n=8$ ), British Asian ( $n=6$ ) and other races ( $n=2$ ).

## Measures

### *Self report questionnaires*

*Fears of Compassion Questionnaire.* The Fears of Compassion questionnaire (Gilbert et al., 2011) comprises three sub scales on a Likert scale ranging from 0 (do not agree at all) to 5 (completely agree). Expressing compassion for others is the first sub scale with ten items; responding to compassion from others comprised thirteen items; expressing compassion and kindness towards oneself comprised fifteen items. A higher score indicates a higher propensity towards that scale. The Cronbach's alphas for expressing compassion for others have been reported at 0.78; 0.87 for responding to compassion from others and 0.85 for expressing compassion and kindness towards oneself (Gilbert et al., 2011).

*Perceived Stress Scale (PSS).* The PSS (Cohen et al., 1983) was used to measure the perceived stress of the respondent. The 10-item scale was used for this research due to its improved psychometric properties compared to the 4 and 14-item scales. The responses were measured using a Likert scale ranging from 0 (never) to 4 (very often). Items 4,5,7,8 were reversed. The higher the score the higher the level of perceived stress by the respondent. The Cronbach's alpha for the PSS-10 reported to be 0.70. A minimum measure of internal consistency is considered  $>.70$  (Nunnally & Bernstein, 1994).

## Course

The Mindfulness and Compassion course was developed by MindfulnessCIC to offer the necessary skills for participants to develop self-awareness, self-care, and compassion to bring meaning to people's lives. The teacher would deliver a 1.5hr section of the course on a weekly basis following the traditional format. The mindfulness and compassion course combined breathing practices, compassion, body scans, and psychoeducation. In addition, participants were expected to commit to homework set out by the teacher, which included

formal and informal practices of mindfulness (see chapter 5 for full course). The themes covered in the sessions were as follows.

Theme 1: Jewel in the ICE

Theme 2: The Feeling Body

Theme 3: Living in the Present

Theme 4: Calming the Chattering Mind

Theme 5: Dancing with Dragons

Theme 6: Compassion – Loving Kindness Meditations

Theme 7: ABC of Mindfulness

Theme 8: Bringing Mindfulness to Life/ Next Steps

## **Results**

### **Preliminary Diagnostics**

To perform a multiple regression certain assumptions need to be met. Scatterplots were used to check for linearity and heteroscedasticity. Preliminary analyses were conducted to identify multicollinearity in the data and violations of normality. Multicollinearity was reviewed using the Variance Inflation Factor (VIF) values with guidelines suggesting a regression bias if the largest variance inflation factor is greater than 10 and if the average variance inflation factor is substantially greater than 1 (Bowerman & O'Connell, 1990). If tolerance is  $<0.2$  this can also cause problems in the regression (Bowerman & O'Connell, 1990). The analyses suggested that there was no violation of normality with histograms, demonstrating normal distribution.

A multiple regression analysis was performed after all assumptions were met to identify the prediction of stress from fears of expressing compassion for others; fears of responding to compassion from others; and fears of expressing kindness and compassion towards oneself. The descriptive statistics indicate that the mean score for fears of expressing compassion to others (M=11.0, SD= 6.8) was greater than fears of responding to compassion from others (M=10.6, SD= 7.8) and fears of expressing kindness and compassion to oneself (M=10.7, SD=8.2).

### Regression Analysis 1

The Pearson correlation analysis (Table 1) indicated a significant bivariate correlation between stress and fears of expressing kindness and compassion to oneself (self-compassion) ( $r(98)=.28, p=.003$ ). Both responding to and expressing fears of compassion and stress had a small correlation ( $r(98)=.16, n.s$ ;  $r(98)=.11, n.s$ ). The Pearson correlation also indicated that all three fears of compassion variables have significant bivariate correlations with each other; with  $r$ -squared ranging from .30 through to .44 they are therefore moderately correlated with each other.

**Table 1**

*Pearson Correlation for Fears of Compassion and Stress*

<b>Pearson Correlations</b>	<b>Stress</b>	<b>Expressing Compassion</b>	<b>Respond to Compassion</b>	<b>Self-Compassion</b>
<b>"r" (p-value)</b>				
Stress	1	<b>.111</b> (.138)	<b>.162</b> (.056)	<b>.280*</b> (.003)
Expressing Compassion	-	1	<b>.555*</b> (<.05)	<b>.612*</b> (<.05)
Respond to Compassion	-	-	1	<b>.661*</b> (<.05)
Self-Compassion	-	-	-	1

\*Significance at or below the .05 level

Using the enter method for the regression it was found that there was a significant relationship between fears of compassion and stress  $F(3,94) = 2.88, p=.040$ , with an  $R^2 = .08$ ,  $R^2$  adjusted  $=.06$  and standard error of estimate of 5.91. Standardized coefficients (Table 2) were reviewed indicating that only fears of expressing kindness and compassion to oneself had a significant relationship and was a predictor of stress ( $\beta=.347, t= (98)=2.43, p=.02$ ). The Beta in this regression for fears of expressing kindness and compassion to oneself (.35) is noticeably higher in comparison to its original Pearson bivariate correlation with stress (.28). This strongly implies that the regression solution is subject to a suppressor variable.

Both fears of expressing compassion for others and fears of responding to compassion from others did not significantly predict stress ( $\beta= -.092, t(98) = -.71, ns$ ) ( $\beta= -.17, t= (98)= -.12, ns$ ). The  $R^2$  value (0.84) in the regression model suggests that fears of expressing kindness and compassion to oneself accounts for a weak effect of 8.4% of the variation in stress. This suggests that 91.6% of the model is not accounted for from the independent variables used in this regression model.

**Table 2**

*Regression Analysis 1 Coefficients*

	Unstandardized		Standardized		Collinearity	Statistics	
	B	Coefficients	Coefficients	T			
Model		Std. error	Beta	T	Sig.	Tolerance	VIF
<i>Constant</i>	15.265	1.189		12.839	.000		
Express	-.082	.115	-.092	-.714	.477	.585	1.708
Respond	-.013	.107	-.017	-.122	.903	.527	1.898
Self	.257	.106	.347	2.428	0.17	.477	2.098

During the analysis of the results it was identified that fears of responding to compassion from others could be acting as a suppressor variable for fears of expressing kindness and compassion to oneself. Identification of a suppressor variable must include the

independent variable having little to no positive significant correlation with the dependent variable, but a significant positive correlation with another independent variable that is significant with the dependent variable.

### **Regression Analysis 2**

The identification of a curvilinear trend between fears of expressing kindness and compassion to oneself and fears of responding to compassion from others with stress required a second regression analysis for further confirmation of the relationship. The second analysis included the centred-squared variables for fears of expressing kindness and compassion to oneself and fears of responding to compassion from others to evidence a symmetric curvilinear trend. The new variables were squared to reduce multicollinearity with the original unsquared variables in the data. The second analysis also offers a further exploration and potential evidence of the suspected suppressor variable.

In this analysis the model was marginally significant  $F(5,92) = 2.31, p = 0.05$ , with an  $R^2 = .11$ ,  $R^2$  adjusted = .06 with a standard variance of estimate of 5.87. The coefficients from the additional findings showed that when squared fears of expressing kindness and compassion to oneself correlated with stress ( $r(98) = .20, p = .03$ ). Squared fears of responding to compassion from others was shown not to correlate with stress ( $r(98) = .02, n.s$ ) indicating a significant bivariate correlation with both the linear and curvilinear components of fears of expressing kindness and compassion to oneself in the Pearson matrix. However, fears of expressing kindness and compassion to oneself and responding to compassion from others still correlated highly ( $r(98) = .64, p < .000$ ).

For the Standardized Beta coefficients (Table 3) fears of expressing kindness and compassion to oneself was the only outcome measure to have a strong positive relationship with stress  $\beta = .25, t = 1.60, n.s$ . Fears of responding to compassion from others was marginally positive  $\beta = .08, t = .54, n.s$ , while expressing compassion to others suggested a negative

relationship with stress  $\beta = -.09$ ,  $t = -.70$ , n.s. The centre-squared variable for fears of expressing kindness and compassion to oneself gave a reading of  $\beta = .22$ ,  $t = 1.52$ , n.s again showing a positive relationship with stress. However, centre-squared fears of responding to compassion from others indicated an equally negative coefficient ( $\beta = -.21$ ,  $t = -1.50$ , n.s) suggesting a negative relationship with stress.

**Table 3***Regression Analysis 2 Coefficients*

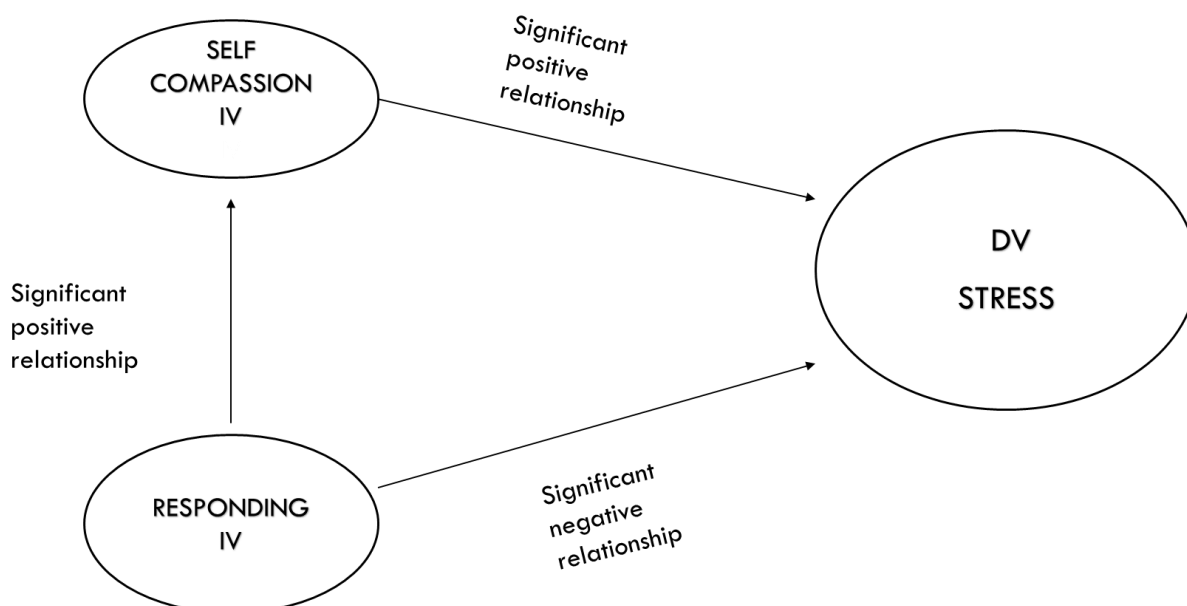
Model	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
	B	Std. error	Beta	T	Sig.	Tolerance	VIF
Constant	15.410	1.198		12.860	.000		
Express	-.081	.116	-.091	-.702	.485	.570	1.753
Respond Self	.063	.118	.081	.536	.593	.424	2.357
Centredsqr	.257	.117	.252	1.604	.112	.390	2.561
Centredsqr RESPOND	-.017	.011	-.214	-1.504	.136	.477	2.096
Centredsqr SELF	.012	.008	.215	1.520	.132	.483	2.072

**Identification of the Suppressor Variable**

Suppressor variables were first defined as a predictor that has zero correlation with the dependent variable but does contribute to the predictive validity of the dependent variable through another independent variable (Horst, 1941). Advancing this further, Lancaster (1991) highlights that these variables suppress irrelevant variance in other predictor variable(s), giving a more accurate estimate of the predictor-criterion relationship.

Identification of a suppressor variable must include the independent variable having little to no positive significant correlation with the dependent variable, but a significant positive correlation with another independent variable that is significant with the dependent variable (Figure 1). The two primary indicators that are used to confirm a suppressor variable are analysing beta weights and correlations between predictors and the dependent variable. The Pearson's correlation indicates whether there is a strong relationship between not only the predictors and the dependent variables but also amongst the predictors. A strong correlation between predictors is one indication of a suppressor variable. The second indicator is analysing the beta weights which reviews the relationship between the predictors and dependent variables. The suppressor variable should be negatively related to the dependent variable, however the predictor it suppresses should be positively correlated to the dependent variable. From the above regression models both of these indicators are satisfied to state that a suppressor variable is present in the data.



**Figure 1***Identification of a Suppressor Variable*

For additional confirmation of the suppressor variable a second analysis was completed using Velicer's (1978) latest criteria for the identification of suppressor variables. This included squaring both semi partials for fears of expressing kindness and compassion to oneself and fears of responding to compassion from others. The variables were centred to avoid multicollinearity. To identify a suppressor variable the squared and totalled semi partials would need to be greater than the original  $R^2$ . The squaring and totalling of the semi partials equalled to 0.062 while in comparison the  $R^2$  was identified as 0.084. Suppressor identification, therefore, could not be confirmed by the latest criteria (Velicer, 1978); however, it could be confirmed by the measures proposed by Horst (1941). This result indicates that there is a pattern towards a suppressor variable but further research and identification is required. Suppressor variables have been shown to elicit positive outcomes including increasing the accuracy of the independent variables, thus improving the predictive power of the model and theory building (Pandey & Elliott, 2010).

## **Discussion**

The results indicated a significant relationship between fears of expressing kindness and compassion to oneself, and stress. The coefficients indicated a significant relationship between the two independent variables: fears of expressing kindness and compassion to oneself and fears of responding to compassion from others. This outlined a significant bivariate correlation with both the linear and curvilinear components of fears of expressing kindness and compassion to oneself in the Pearson matrix. From these results identification of fears of responding to compassion from others was partially shown to be acting as a suppressor variable on fears of expressing kindness and compassion to oneself. The original hypothesis stated that fears of compassion would have a relationship with stress. This hypothesis can be partially accepted as only one of the three subscales (fears of expressing kindness and compassion to oneself) was shown to have a positive relationship with stress.

## **Previous Research**

The findings do support previous research by Gilbert et al. (2011) who found that fears of expressing kindness and compassion towards oneself and from others were linked to stress in students only. In therapists, by contrast only fears of compassion from others was linked to stress. One of the notable results relevant to this research found by the above researchers was that there was a pattern where if individuals were fearful of one dimension of compassion they were likely to be so of others. The second notable result was that those who were fearful of responding to or receiving compassion from others were more likely to struggle with self-compassion (Gilbert & Choden, 2013, p.217). Following these results, it was postulated that if compassion is blocked then effectively the soothing system is not utilised and therefore becomes redundant when one requires it (Gilbert & Choden, 2013, p.217). As with any skill a pathway is required to activate and maintain a system and once this pathway is diminished the link is no longer available for ease of activation.

The attachment theory (Bowlby, 1980) states that infants who do not get their needs met by primary caregivers are at risk of not forming secure attachments and trusting relationships, which continue on into future adulthood relationships. Support in developing compassion and in particular self-compassion for individuals with insecure attachments, such as anxiousness or avoidance, could reduce emotional distress (Joeng & Turner, 2015). However, it has been suggested that those with insecure attachments struggle receiving compassion from others due to historic experiences of poor relationships (Gilbert et al., 2011). Findings from a recent meta-analysis identified a strong link between responding to compassion from others and self-compassion with mental health issues. In light of these findings the authors concluded that both dimensions may be operating on the same activation system (Kirby et al., 2019). Research has also shown that being open to receiving compassion from others helps to shield individuals from depression (Hermanto et al., 2016).

The implications of the current findings support previous research, and add additional findings. Firstly, to the author's knowledge, this is the only study to use participants from a non-clinical population on a mindfulness and compassion course to explore the relationship between the outcome measures of fears of compassion and stress. Secondly, a significant correlation between fears of expressing kindness and compassion to oneself and stress was established. Thirdly, within the current study a potential suppressor variable was identified as playing a role in expressing kindness and compassion to oneself and stress which opens up an avenue for theory building and exploration. Finally, the study highlights the importance of reducing fears of compassion, alongside improving compassion. For without a reduction in fears of compassion, improvements in compassion will be difficult to obtain.

The current findings also indicate that fears of expressing compassion to others did not have a significant relationship with stress following a mindfulness and compassion course indicating that expressing compassion to others does not have an impact on the stress levels of

the individual. Expressing compassion to others could allow a level of protection from stress that responding to compassion from others and expressing kindness and compassion to oneself does not fulfil. This could result in expressing compassion for others offering a positive relationship not only with stress but with compassion. Expressing compassion to others has been shown to have significant benefits to the benefactor (Breines & Chon, 2012).

### **Outline of the Partial Effect of Suppressor Variable**

A suppressor variable strengthens the overall predictability of the regression model which explains a closer relationship between the sub scales of fears of expressing kindness and compassion to oneself and fears of responding to compassion from others. An important concept this relationship highlights is if fears of responding to compassion from others was not in the model then there would be a weaker relationship between fears of expressing kindness and compassion to oneself with perceived stress. Therefore, responding to compassion from others has an important role that supports the relationship between expressing kindness and compassion to oneself and perceived stress.

When reviewing the fears of compassion scales there is an overlap of themes for both expressing kindness and compassion to oneself and responding to compassion from others. Being seen as 'weak' or as feeling 'weak' by others has been highlighted across both scales with the questions from expressing kindness and compassion to oneself as 'I fear that if I am self-compassionate I will become a weak person'. In responding to compassion from others 'wanting others to be kind to oneself' as a weakness. Another theme included 'dependency' which was highlighted as becoming fearful of the dependency on compassion that may develop from others or to oneself. From expressing kindness and compassion to oneself 'I worry that if I start to develop compassion for myself I will become dependent on it'. In fears of responding to compassion from others 'I am fearful of becoming dependent on the care from others because they might not always be available or willing to give it'.

A final theme includes 'rejection' which indicates not only a fear of rejection from others when one may need others to offer and give compassion, but also the fear of change and possible rejection of the change in the self. From fear of expressing kindness and compassion to oneself 'I worry that if I start to develop compassion for myself, I will become someone I do not want to be'. In responding to compassion from others 'I fear that when I need people to be kind and understanding they won't be'. Reviewing the results from the regression and the scale questions it was identified that there is a crossover between the themes weaknesses, dependency and rejection. These themes could indicate reasons behind why fears of expressing kindness and compassion to oneself and fears of responding to compassion from others had a significant relationship to each other in the current study. The correlative association between the increase of fears of kindness and compassion to oneself and concomitant increase in stress, indicates that a reduction in fears of kindness and compassion to oneself could also lead to a reduction in stress.

In order to respond to compassion, one must first recognise that compassion from others is needed and justified. This is also similar for self-compassion as part of self-compassion involves internally becoming aware that one needs one's own capacity for compassion. If an individual is unable to recognise these needs then compassionate action is unlikely to be taken. The second notable result was that those who were fearful of responding to or receiving compassion from others were more likely to struggle with self-compassion (Gilbert & Choden, 2013, p.217). Following these results, it was postulated that if compassion is blocked then effectively the soothing system is not utilised and therefore becomes redundant when one requires it (Gilbert & Choden, 2013, p.217). As with any skill a pathway is required to activate and maintain a system and once this pathway is diminished the link is no longer available to stimulate for ease of activation.

As responding to compassion from others strengthens expressing kindness and compassion to oneself, individuals responding to compassion need to recognise and accept compassion from others in order to give themselves compassion. If someone doesn't recognise or respond to compassion from others it is likely that the person is denying or ignoring those stressors which give rise to the need to take compassionate action (either from others or self). Therefore, responding to compassion from others blocks our ability for kindness and compassion to ourselves. Responding to compassion from others is more closely aligned with expressing kindness and compassion to oneself as both of these require not only recognition but also some kind of response involving the self. From the analysis of the scales and the crossover themes it is clear that there is a level of vulnerability exposed in both fears of responding to compassion from others and fears of expressing kindness and compassion to oneself.

### **Limitations and Future Research**

The limitations of this study include a lack of a control group which would have offered a comparison of the suppressor variable and possible impact. The multiple regression only focused on the fears of compassion scale and did not include alternative variables that could have been a contributing factor in stress. Further research is required to continue researching fears of responding to compassion and the link to expressing kindness and compassion to oneself along with research reviewing the fears of compassion within the general population, as a preventative measure before clinical presentations. Future advancement on the patterns of suppressor variables through further research and identification is required around fears of compassion.

### **Conclusion**

The present study attempts to identify the relationship between fears of compassion and perceived stress following an 8-week mindfulness and compassion course. The results

indicated a relationship between fears of expressing kindness and compassion to oneself and stress. While in addition highlighting the potential amplification effects of the suppressor variable which could impact on the ability to recognise the need and necessity of compassion from others and to the self. This research highlights and adds to the necessity of not only addressing an improvement in compassion but also the fears, blocks and resistances that do not allow compassion to be experienced and actioned.

\* Chapter was subsequently published in an amended form in the European Journal Of Positive Psychology <https://www.nationalwellbeingsservice.org/volumes/volume-5-2021/volume-5-article-11/>

## **Chapter 8 Qualitative Study**

### **Lived Experience of a Mindfulness and Compassion Course**



## Abstract

The aim of the current chapter is to examine the lived experience of an 8 week or equivalent 3-4 day mindfulness and compassion course using participant diary entries to explore participant's thoughts, feelings and emotions during the course. This study seeks to complement the quantitative findings by exploring the phenomenological experience of attending a mindfulness and compassion course.

A total of sixteen participants ( $n = 14$  females,  $n = 2$  males;  $M_{\text{age group}} = 45\text{-}54$  years old) participated in research during a mindfulness and compassion course through MindfulnessCIC. Interpretative Phenomenological Analysis (IPA) was used to create themes to represent the experience of the participants.

Twelve themes were identified in the analysis: expectations a person brings to mindfulness training; the social awkwardness of practising in a group; meditation for beginners is hard work; the importance of the teacher in making it okay to experience uncertainty; the importance of metaphors/stories in making sense of mindfulness concepts; compassion: important but challenging; shifting awareness of body, place and mind; epiphanies/turning points/game changers: when it just makes sense; noticing suffering in everyday life; responding differently to suffering in everyday life; knowing the self better: in a non-judgemental way; simple class vs. cluttered life: practising in class is different to practising in everyday life.

The current study provides an understanding of the lived experience of participating in a mindfulness and compassion course. The findings may contribute and offer both future participants and practitioners an insight into the experiences of previous participants. The findings are discussed in relation to previous research, limitations of design and future applications including advice for practitioners.

## CHAPTER 8

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This chapter follows on from the previous quantitative chapter that explored the neuropsychophysiological changes during a mindfulness and compassion course using heart rate, blood pressure, EEG measures of frontal asymmetry, fears of compassion and stress. The aim of the current chapter is to examine the lived experience of completing a mindfulness and compassion course using participant diary entries. This chapter seeks to complement the quantitative findings by exploring the phenomenological experience of attending a mindfulness and compassion course.

### **Study 3 – To Explore the Lived Experience of completing a Mindfulness and Compassion Course using Interpretative Phenomenological Analysis (IPA).**

#### **Introduction**

The lived experience of attending a mindfulness course tends to receive less attention than the quantitative evaluations measured from the course. This is evident with the high volume of quantitative research that focuses on numerical outcome measures. However, exploring the lived experience could inform us of how these changes take place, giving a deeper understanding of the mechanisms of change.

To give a more holistic overview of the research, qualitative approaches were used to give a picture of the lived experience of a mindfulness and compassion course. In keeping with mindfulness, exploration of reflection and introspection are important components within the journey of practice. William James first coined the term “introspection” which is described as “looking into our minds and reporting what we there discover” (1890, p.185). Similarly, in

mindfulness, being aware and observing the mind and body is encouraged through introspection practices such as the body scan and using the senses.

Qualitative research gives the participant a voice and an opportunity to express what is important to them, while allowing the participant to emotionally process the experience, enabling a type of catharsis (Dickson-Swift et al., 2006). As mindfulness meditation is an intervention used to increase skills such as awareness, introspection and reflection, this may be evident in the richness of data collected within the study. First person accounts allow for a deeper understanding representing the stream of consciousness, which is a direct introspection of experience. Empowering the participants allows for deeper self-analysis and consequently a real and intimate response. First person accounts such as reflective diaries also require the participants to use their own words rather than be guided by options predetermined by the researcher, allowing reflection on thoughts, feelings and behaviours during the course. Diaries outline a first person account over multiple time points that not only provide the processes of change for practitioners of mindfulness, but support the generation of hypotheses for quantitative research and theories (Kerr et al., 2011). Diaries as a method of data collection reduce retrospection, recall and reframing errors, whilst eliminating demand characteristics typically found with the presence of the researcher (Shelble & Witdemuth, 2009).

### **Informal Mindfulness**

Another important aspect of mindfulness that could be captured by diary entries is the informal practices. Informal practices could support participants to become aware of the applications of mindfulness and the changes they experience. These include everyday activities to enhance the skills and applications of mindfulness outside of the intended formal practice. Examples of these activities include mindfully drinking a cup of tea, having a shower and completing domestic chores. For example, mindfully drinking tea would include full awareness

on solely that experience using mainly the senses. This would include the contact between one's mouth and the cup, the warmth and feel of the liquid, the taste of the liquid, the warmth of the cup of your hands. The application of informal practice in the real world may have effects of equal or greater importance in the mindfulness journey compared to that which occurs in the formal practice sessions (Davidson, 2010). Therefore, experience sampling methods can be used to capture the informal practice of mindfulness in daily life. Diary entries are a way of bringing intention and awareness to the skills of mindfulness, which in turn would activate the feedback loop which helps to embed the skills.

### **Previous Research**

Previous studies using quantitative measures have identified changes through pre and post outcome measures in a range of different areas (Carmody & Baer, 2008; Bergen-Cico et al., 2013; Gouda et al., 2016; Shapiro et al., 2011). However, few studies have explored changes during a mindfulness intervention using qualitative methods in particular diary methods (Kerr et al., 2011; Stelter, 2009). Stelter (2009) used diary entries to examine three clinical client perspectives of a mindfulness meditation course which included 2-3 hours a week ran over 6 to 8-weeks. The intervention included the components of informal meditation: breathing exercises; body scanning; mountain meditations; sitting meditations; guided practices for homework. The diaries were completed on a weekly basis to offer an insight into experience and changes made during the course.

Interviews were also completed at the beginning, middle and end of the course. The first interview consisted of questions about illness history, reasons for joining and expectations of the course. The details of the second set of interview questions were not provided by the author. The third interview included questions on the evaluation of the course instructor and teaching environment. A thematic analysis was used to analyse the interview transcripts. The

results from the thematic analysis included the following themes: experience of mindfulness; words or metaphors describing mindfulness; thoughts, feelings or reflections; illness stories; effects or learning in relation to the training; life dreams or ambitions; possible difficulties. The diary entries were analysed using narrative analysis, an approach that allows individuals to narrate one's experiences as they live them. For the narrative analysis the author summarised the results into sections. Firstly, all participants found the experience of a mindfulness meditation course a good alternative path towards supporting one's health and wellbeing. Secondly, a common feature identified for all three participants were difficulties around rumination and worry. Thirdly, mindfulness supported a transition from the ruminative to perceptual self focus. Lastly, embodied cognition supports the change in the relationship with one's thoughts and becoming more present moment focused.

However, this research does have a range of limitations (Stelter, 2009). The referrer for the course was also the client/participants' active Psychologist and participants were expected to complete final interviews on the evaluation of the teacher. This could have contributed to bias in the responses due to the relationship with the Psychologist. Stelter (2009) also did not include the results of the interviews, although there was mention that all participants had high expectations of the course but this was not discussed any further in the literature. Participants were from a clinical population and out of sixteen potential participants only three were selected. However, the selection criteria was based on those deemed to have the most serious life challenges e.g. stress/sleeplessness, depression and agoraphobia.

Another study by Kerr et al. (2011) used diary methods pre and post an 8-week MBSR intervention exploring home practice. The MBSR included 2-2.5-hour weekly sessions beginning with the body scan (weeks 1-2), mixture of the body scan and yoga (weeks 3-4), longer sitting meditation (weeks 5-6) and without the guidance of tapes a combination of the body scan and sitting meditation (weeks 7-8). Five participants completed daily diary entries

which included practice logs and time spent dedicated to the practice. The design was split into two parts, the first included grounded theory to analyse the diary entries. The results from this section highlighted that participants identified with moments of distress that related to the practice including improved affect and increased abilities of the observing self.

The second part to the analysis used Observational Coding Scheme to identify a potential cognitive mechanism within mindfulness defined as *reperceiving* (Shapiro et al., 2006). *Reperceiving* has been identified as the ability to disengage from one's own experiences and observe them without judgement (Shapiro et al., 2006). The results from the Observational Coding Scheme highlighted three main results. Firstly, for all participants there was an increase in *reperceiving* during the course. Secondly, the increase in *reperceiving* was attributed to a reduction in negativity or increases in meta-awareness. Thirdly, spikes in reactivity were identified midway. Both of the results were shown to be in support of the perspective shift 'reperceiving' proposed by Shapiro et al. (2006). The limitations of this course include a small participant number and the lack of completed diary entries for week 8. This research also only targeted home practice rather than the whole experience of the course. However, both studies (Kerr et al., 2011; Stelter, 2009) recognised that participants were able to identify with the observing self and work towards improvement by the end of the course. Both of the mindfulness interventions were different in both structure and content, nevertheless both highlight the change in the observing self-relating to non-attachment and de-centering from the self.

For both studies there were limitations, firstly, both studies included a small sample size which limits the range of experiences collected from participants on a mindfulness course. Kerr et al. (2011) noted that a bigger sample size could have added to the mechanism of 'reperceiving'. Secondly, Kerr et al. (2011) only collected experiences related to home practice rather than the whole course experience. Lastly, in the study by Stelter (2009), three

participants from a clinical population were chosen based on those to be experiencing the most serious life challenges. The experience of those facing or who were deemed to be facing less serious life challenges were not explored.

The current research seeks to add and extend on the previous findings by:

- Including a larger sample of participants from the general population
- Collecting diary entries related to the whole course experience rather than a selected part
- Exploring the lived experience

The aim of this study will explore the lived experience of attending a mindfulness and compassion course offering an insight into the participants' experience using diary entries.

## **Methodology**

### **Participants**

A total of sixteen participants consented to participate in the research during an 8-week or 3-4-day equivalent mindfulness and compassion course through MindfulnessCIC. The participant characteristics included both females (n = 14) and males (n = 2). Participants were all above 18 years old with the most common age group between 45-54 years old. The ethnicity of the group was majority white British (n=12), white European (n=2), and British Asian (n=2). One participant completed the reflection in a blog format which was also used for publication (by the participant). A review of IPA sample sizes highlighted the average number of participants was between 1 to 35 within most studies (Brocki & Wearden, 2006). Therefore, for the current research sixteen was in the average range for IPA.

### **Instrument and Procedure**

Ethical approval was granted by a university ethics committee before the research was able to go ahead (P44199). Diaries were given to participants to allow reflection on one's practice and journey of mindfulness. The diaries were given to the participant at the start of the course to complete throughout the course. An additional option of completing the diary online was given; however, participants verbally stated that writing as reflection during the course was an activity enjoyed. The participants were given the diary which included a page outlining a guideline for entries, along with an example for each area thoughts, feelings and behaviours (see appendix 15). This was included to help and guide participants towards self-reflection. The diaries were structured allowing at least a page for each day which was left blank for the participants to complete. However, paper diaries were the only format used during the research. The majority of diaries completed were from the shorter courses. Paper diaries were kept locked until analysis and were manually analysed due to a software issue with Vivo. Participant diary entry totals ranged from 500-1,500 words offering a deep and rich data set. The diary entries though comparatively short were a dense account focusing on the lived experience under investigation, with no interview interventions or conversations of topic.

## **Course**

The Mindfulness and Compassion course was developed by MindfulnessCIC to offer the necessary skills for participants to develop self-awareness, self-care, compassion, and to bring meaning to people's lives (see chapter 5 for full course). The teacher would deliver a 1.5hr section of the course on a weekly basis following the traditional format. The mindfulness and compassion course combined breathing practices, compassion, body scans, and psychoeducation. In addition, participants were expected to commit to homework set out by the teacher, which included formal and informal practices of mindfulness.

The topics covered in the sessions were as follows:



Theme 1: Jewel in the ICE

Theme 2: The Feeling Body

Theme 3: Living in the Present

Theme 4: Calming the Chattering Mind

Theme 5: Dancing with Dragons

Theme 6: Compassion – Loving Kindness Meditations

Theme 7: ABC of Mindfulness

Theme 8: Bringing Mindfulness to Life/ Next Steps

## **Analysis**

### **Philosophical Positioning**

Philosophical assumptions are based on the nature of reality, values and knowledge which support and guide paradigms. The philosophical assumptions are broken down into three components - Ontology, Epistemology and Axiology. For the purpose of this research only ontology and epistemology will be discussed. Ontology is defined as the characteristics of what it means to exist. Epistemology is known as the study of knowledge and how we know what we know. Axiology establishes values and ethical principles based on what we believe (Patton, 2002).

Interpretative Phenomenological Analysis (IPA) is a qualitative inductive approach that supports an ontological interpretative position which attempts to uncover the meanings and the essence of experiences. *‘Qualitative paradigms offer the researcher the opportunity to develop an understanding of participants, and what it means to them, within their social reality,*

*to live with a particular condition or be in a particular situation*' (Bryman, 1988 as cited in Biggerstaff & Thompson, 2008, p.4).

A particular focus in IPA research is the perceptions and views of the participants, how they make sense of their experience. Within the epistemological stance IPA is subjectivist as the meaning exists within the subject, as opposed to an objectivist stance that views meaning within the object. These reflect the phenomenological and interpretative aspects of IPA.

### **Interpretative Phenomenological Analysis**

IPA was the chosen methodology for this piece of research as the main focus is on the meaning essence of the lived experience, which is an imperative standpoint for the research question. The term 'Interpretative Phenomenological Analysis' consists of two parts to the approach. Firstly, phenomenology is not only the understanding but also the exploration of the participant event. Secondly, the interpretative nature includes the 'making sense' of these experiences (Smith et al., 2009). The interpretative nature and the central role of the analyst within IPA is what sets it aside from other phenomenological approaches.

IPA is defined as an approach that examines 'how people make sense of their major life experiences' (Smith et al., 2009, p. 32). When individuals are engrossed in a new experience, usually of importance, they bring awareness and reflection to that event. This allows the individual to process their experience of the event. IPA aims to capture and explore the meanings that participants assign to their experiences (Reid, 2005). Larkin et al. (2006) advises the IPA researcher to firstly understand the participant's world and to describe what this is like for the participant, bringing together the participant and researcher. The second part is the interpretative analysis which includes commentary on how and what this experience means for the participant. Therefore, the researcher plays an important role in constructing the expression of participant's experiences.

## **Theoretical Foundations of IPA**

IPA was born out of a combination of three areas, Phenomenology, Hermeneutics (interpretation), Idiography. The first key theoretical area was phenomenology and the study of experience. Phenomenology is a philosophical approach that reviews the study of experience and how individuals understand their lived experiences. One of the first phenomenological philosophers was Husserl who argued the importance of intentionality and the relationship between our consciousness and the object of focus. This included the ability for an individual to know their own experience and what made up the parts of this experience. Husserl believed that we should 'focus on each and every little thing' rather than our pre-existing grouping of 'things' (Smith et al., 2009, p.12). Husserl proposed the idea of 'bracketing' or 'phenomenological reduction', stating that one needs to put aside the taken-for-granted world to enable a focus on the perception of the world (Smith et al., 2009, p.13). This concept was used to set aside researcher bias, personal experiences and any preconceived ideas regarding the results of the analysis. Gearing (2004) defines this technique as a 'scientific process in which a researcher suspends or holds in abeyance his or her presuppositions, biases, assumptions, theories, or previous experiences to see and describe the phenomenon' (Gearing 2004, p.1430).

The second key area is Hermeneutics and the theory of interpretation, more specifically methods and interpretation (Smith & Osborn, 2008). Heidegger (1962) disagreed and rejected Husserl's phenomenological reduction or bracketing stating that to be able to fully comprehending the lived experience was essentially an interpretative process and that bracketing out preconceptions was neither possible nor desirable (LeVasseur, 2003). Heidegger advanced with the integration of hermeneutic phenomenology which focuses on the subjective experience as lived by individuals in their lifeworld. An additional hermeneutic concept is that of the 'hermeneutic circle' or 'double hermeneutic' which proposes the circular nature of the

analyst making sense of the participants experience, while the participant attempts to make sense of their own experience (Smith & Osborne, 2003). Therefore, the final version of the experience will be the account of how the analyst perceives what the participant is thinking (Smith et al., 2009, p.80).

Heidegger (1962) also defined the term 'dasein' translated to 'always ready', meaning that individuals are 'thrown in' to a pre-existing world of people, objects, language and culture in which one engages with and cannot entirely disconnect from (Smith et al., 2009, p.17). The final theoretical area is Idiography which is defined as the depth of analysis. Idiography reviews the detailed experience of each participant before moving to the group as a whole. This approach involves the researcher being full immersed on singular individuals as they experience specific situations or events (Robson, 2002).

### **Rationale for IPA**

In order to ensure that the chosen method is the best fit for the current research there are certain questions that need consideration. Firstly, the research aims and objectives of the study need to be taken into account. Secondly, the importance of the researchers' epistemological and ontological approach. The following section will review the role of the aims and objectives, researcher stance and alternative methodologies.

The aim of this research was not simply to describe the experiences of participants attending a mindfulness and compassion course, but also to explore and capture what this experience meant to them. Dilthey (1976) described IPA as targeting the 'constructive unit of experience' which in turn means the experiences in life that are of significance in one's life (Dilthey, 1976 cited in Smith et al., 2009, p.2). Attending a mindfulness and compassion course for some individuals could be a significant life experience. Some examples could include integrating new skills, learning about introspection and stress reduction.

The second consideration is the theoretical stance of the researcher and the use of bracketing. The researcher would approach the research from a non-judgemental stance, putting aside any preconceptions from experience or knowledge. Any issues that do arise are to be noted and reflected on during the process. This is particularly relevant for this research as the researcher/analyst practices meditation and has completed a mindfulness course. In the current study the researcher made analytical notes when they found themselves imposing assumptions onto the data. However, this can also be beneficial for the interpretation stage of the research. Tufford and Newman (2010) suggested that levels of self-awareness differs within individuals, therefore only some researchers will have the skill set to be able to assess certain emotions and cognitions more easily than others.

The role of the researcher and the research aims provide further support as to why IPA is the most relevant methodology to use for approaching this research. IPA is attractive to many areas in Psychology including social, clinical and counselling (Smith, 2004). Future developments include a new branch in IPA that is even more 'experience close'. This includes the integration of experiential and mindful methods including those with a 'focus on their experiences' (Smith et al., 2009, p.204). IPA also has the ability to help support links with theoretical frameworks (Smith et al., 2009). In the current thesis a neurophysiological study is included to review changes using the same mindfulness and compassion course. The IPA study could offer insights into the processes of change, whilst offering support alongside quantitative findings.

Alternative qualitative methodologies taken into consideration were Grounded Theory (Glaser & Strauss, 1967) and Narrative Analysis (Bruner, 1985). Grounded Theory originates from Sociology and was developed to enable the researcher to collect data without any preconceived hypotheses, but allows these to be conceptualised from the findings (Blumer, 1986). The process of Grounded Theory is similar to IPA in that it collects the data individually

through participants describing the experience, whilst the researcher finds meaning and concepts through coding (open coding; axial coding; selective coding) with an end result of a collection of themes. Through these themes' patterns are identified which can generate theories. In contrast to IPA, it does not use interpretative methods for analysis and continues to add participants until theoretical saturation is reached.

Another alternative methodology considered to answer the research question was narrative analysis. Narrative analysis overlaps with the interpretative component of IPA in Bruner's narrative model (1987) which consists of an "interpretative meaning making endeavour" (Smith et al., 2009, p.196). Narrative analysis main focus is the life story of a few participants or narrator. In contrast to IPA, narrative analysis does not create themes but leaves the final version of the participant or narrator's story untouched allowing the narrator to make sense of their own story (Riessman, 1993).

In summary, the research question and epistemological position indicate that IPA would enable an understanding of the lived experiences and meanings associated with attending a mindfulness and compassion course. Qualitative approaches are aligned with the post-positivist paradigm and are helpful when "*exploring, describing and interpreting the personal and social experiences of participants*" (Smith, 2008). IPA has also been deemed appropriate for research that aims to relate findings to bio-psycho-social approaches (Smith, 2004). This is relevant to the overall aims of the thesis as it includes the neurophenomenological approach. Therefore, IPA analysis is the most appropriate method to use for the qualitative component within this research.

### **The Steps of IPA**

The approach to data collection was in line with Smith et al. (2009) Interpretative Phenomenological Analysis (IPA). IPA aims to capture and explore the meanings that

participants assign to their experiences (Reid et al., 2005). The IPA process includes a four-step process. Firstly, step one includes the reading and re-reading of the text to get a feel for the text. This process keeps the participant at the centre of the focus and is where the analyst is actively engaging with the participant's experience. The second step is the initial noting of points of interest or the identification of specific experiences such as how the participant felt or behaved. These exploratory notes are added to the right side of the margin and include three levels: descriptive, linguistic and conceptual comments (Smith et al., 2009). The first level is descriptive which looks to identify descriptions, explanations, phrases and emotional responses. The second level is linguistics which explores language and how this is conveyed through the transcript. This can include tone, repetition, the pace of the text and metaphors. The final level known as conceptual is focused on the interpretation. 'This stage includes a change in perspective towards the researcher's perspective of the participant's understanding of the experience. Step three is the development of emergent themes by mapping connections and seeking patterns across the text. Themes reflect both the participant's experience and the analyst's interpretation (Smith et al., 2009, p.92). The final step is searching for connections across emergent themes to identify super-ordinate themes across participants. For this process a list or mind maps are created in order to visually see the themes, while searching for patterns. To support analysts to identify patterns within emergent themes the following options are proposed: abstraction; subsumption; polarization; contextualisation; numeration; function (Smith et al., 2009, p. 96).

In the current research abstraction, subsumption, polarization and numeration were strategies to support the identification of patterns. Abstraction is the identification of patterns between themes towards a super-ordinate theme. This usually encompasses creating a new name for the super-ordinate theme. For example, the theme '*Shifting awareness of body, place and mind*' is an example of abstraction. This involved collating similar emergent themes

together such as *'Aware of background noises'*, *'Smell of the burning stick'*, *'Sense of heaviness in my legs'* and *'Visual images of body keep jumping out of mind during body scan'*. After collating the emergent themes, the development of a new name for the super-ordinate theme was created *'Shifting awareness of body, place and mind'*.

Subsumption refers to when an emergent theme inherits the status of a super-ordinate theme. For example, the theme *'The importance of the teacher in making it okay to experience uncertainty'* was a theme included in the analysis, which also inherited status as a superordinate theme. Numeration is as it states, is the frequency in which an emergent theme occurs. Within the *'The importance of techniques/ metaphors/stories in making sense of mindfulness concepts'*, repetition of themes relating to *'the second dagger'* and *'labelling techniques'* were identified. Polarization is the identification of oppositional emergent themes. For example, *'Noticing suffering in everyday life'* and *'Responding differently to suffering in everyday life'* are shown to be at different ends of the spectrum and offer a comparison of experiences.

### **Rigor of the Analysis Process**

Yardley's (2000) criteria of rigor was followed for the research. This included the following, sensitivity to context including existing literature; commitment and rigor; transparency and coherence; impact and importance. Within this piece of research it was essential that sensitivity was given. From the outset IPA was the methodology and with this decision, an empathetic and considerate stance was given to the participants. As the area of research could attract vulnerable individuals due to the nature of the course, it was essential that this was addressed from the start. Participants were given the opportunity to discuss any questions they had prior to the research taking place. This was offered either via email or in a private space before the research was conducted. Any disclosures that were given were addressed with the suitable advice. Participants were also informed that they did not need to



complete the research if they didn't want to and could withdraw in a set time period if they wished. When analysing the data any disclosures of a sensitive nature should be handled professionally and with care.

To ensure commitment and rigor attentiveness will be given to each participant. This will include giving the full attention to only one participant at a time to ensure that I am fully immersed in their experience. The sample of participants ensures the rigor of this research. All participants were participating on a mindfulness and compassion course which allowed the lived experience to be fully achieved through the diaries. The analysis process was completed using the IPA guidelines (Smith et al., 2009), allowing for a systematic and thorough process. All stages of the IPA process are outlined in the write up to allow for transparency. At the beginning of the analysis, some raw data, initial notes and emergent themes were shared and discussed with a member of the supervisory team (CP) until agreement was reached.

The impact and importance of the research is outlined in the limited number of studies that have conducted a mixed methods approach that has including an IPA analysis using diary entries. The importance of this research gives the participants on a mindfulness course a voice about their journey and what is happening for them as an individual person.

## **Results**

The codes and theme development were taken from the tables (see appendix 17 & 18). The results from the analysis revealed twelve themes.

- 1) Expectations a person brings to mindfulness training
- 2) The social awkwardness of practising in a group
- 3) Meditation for beginners is hard work

- 4) The importance of the teacher in making it okay to experience uncertainty
- 5) The importance of metaphors/stories in making sense of mindfulness concepts
- 6) Compassion: important but challenging
- 7) Shifting awareness of body, place and mind
- 8) Epiphanies/turning points/game changers: when it just makes sense
- 9) Noticing suffering in everyday life
- 10) Responding differently to suffering in everyday life
- 11) Knowing the self-better: in a non-judgemental way
- 12) Simple class vs. cluttered life: practising in class is different to practising in everyday life

### **1) Expectations a Person Brings to Mindfulness Training**

This theme represents the expectations that individuals can bring to mindfulness training. There are numerous reasons people attend mindfulness; therefore, different expectations are placed onto the courses, these include learning new skills for emotional regulation, a retreat experience or a break from normal life, step towards teacher training or to have a go at something new. A mixture of internal and external motivators are present in the expectations an individual brings to a mindfulness course. Internal motivators can be defined as an intrinsic want or need within the individual towards making a change. In opposition external motivators are forces outside of an individual that place pressure towards a change such as the pressure received from other people or an experience. Participant 22 for example, describes the expectations placed on the course through external pressures of the employer. These expectations include the management of mental health difficulties that have been a struggle.

‘I am putting a lot of pressure on this course helping me to better handle stress, anxiety and depression I have been struggling with over the past twelve months.

Whilst my employer has been patient that patience is wearing thin’. P22 2-8

This external pressure has come after a long struggle with mental health and the participant feels that the patience of their employer is now coming to an end. This places additional pressure for the course to be successful. Expectations around mental wellbeing are also a consideration for Participant 43 who describes how unknowingly the course helped to find pauses in life, while the expectations of the course was to get a hold of the anxious mind from running around all day creating a negative feedback loop:

‘So I started the course unknowingly to find pauses again. Knowingly, to stop my anxious brain from running around and around and around and around all day, everyday’. P43 34-38

As a beginner in mindfulness there can be many questions regarding the process of change in the relationship one has with one’s thoughts, in particularly thoughts of negativity. One of these questions include the expectation of mindfulness quieting or shutting up the darker thoughts. Participant 56 questions how mindfulness will help in the hope that it will make some changes to the difficulties they are facing and whether they will become worse before they get better:

‘I am wandering if whatever may have happened/may be happening/ or will be happening will give my dark side something to moan about! Is mindfulness going to train it to shut up? Or does it just melt away? Will it get nastier before it goes?’. P56 20-26

## **Summary of Theme**

This theme outlines a range of expectations that participants bring to a mindfulness course. These expectations encompass a range of areas including both internal and external motivators such as helping to manage mental health difficulties, agreeing to get further support from an employer, changing the relationship with the self and questioning how mindfulness will help to change one's current mind-set. Pressures from external sources for change or a successful outcome places further anxiety on the individual for the course to be effective. This could adversely impact on the experience the individual has on the course and contribute further damage to mental health.

## **2) The Social Awkwardness of Practising in a Group**

This theme represents participants' social awkwardness of practising in a group setting. Mindfulness practice is typically set in a group, rather than on a one-to-one basis unless included in psychotherapy. As previously stated, people attend mindfulness courses for a range of reasons. Entering a group setting for the first time and reflecting on introspection and difficult thoughts and emotions can be daunting even intimidating. And though this social setting may offer common humanity it could also further exacerbate anxiety of the new experience thus impeding personal progression. For one participant, the group setting introduced a feeling of being self-conscious. It began with the conflict of where to position themselves in the group and also craving time alone without the obligation to talk:

'I felt a little self-conscious in the meditation room as I didn't want to sit on a chair and sitting on the floor meant sitting near the front....I wanted to sit in the car at dinner time as I didn't really want to have conversations with people in the group'. P20 7-14

Participant 20 continues to express that even in a group setting a sense of discomfort can still be felt which can make one feel separate from the group. Mindfulness training is

traditionally taught in a group setting which for some can pose a challenge for those seeking time alone. For some individual's timeout and time with oneself is what they are seeking:

'After feeling uncomfortable for about ten minutes & disconnected from everyone, I then enjoyed the freedom of not having to speak to people and make conversation for the sake of it!'. P20 40-44

The uncomfortableness of group discussions can put individuals on the spot when discussing a subject that they might not feel comfortable talking openly about. Participant 30 expresses on reflection that having some patience was a better option. To see how the course continues to unfold before adding one's opinions and thoughts to the group. The uncertainty over having value to add to the discussion could be attributed to an uncomfortableness of disclosing in the group, or not having the answers to discuss at depth at this stage in the journey:

'I noticed during the group discussion time and Q & A sessions I have been very quiet..... I am normally quite vocal but upon reflection, I think I am waiting out to see how the course unfolds, how the 'land lies' maybe, perhaps I am uncertain that what I have to say has value at present or perhaps I do not have the faculty to question yet, until I know where I am' P30 22-32

New skills that a beginner experiences include periods of pauses and silences. For the beginner this practice tends to induce a sense of unease or discomfort as pauses and silences are usually a contrast to the busy lives that most are seeking a break from during the course. Participant 43 discloses how the uncomfortable feeling of pauses and silences is exacerbated when in the presence of other individuals, which can be a challenging adjustment when learning new skills:

‘Silence is a very powerful thing. As a meditation newbie, it’s tricky enough sitting in silence alone, but sharing that silence with thirteen strangers is a very disconcerting experience.’ P43 183-187

Participant 43 goes on to express the enhanced awareness of the environment but at deeper physiological level. The normal bodily functions and mishaps become ever clearer when pauses and silences are introduced into the practice. Noticing and becoming aware, but also the connection as human beings sharing the same space. ‘Participant 43 also suggests that the British control these natural urges, such as the need to break wind, out of politeness to others:

‘Rumbling tummies to heavy breathing, coughing, sniffing, nose blowing, scratching, fidgeting, the list goes on. The fear of the fart is also very real but so far we’ve controlled ourselves because we’re all ever so polite and British...’  
P43 198 -204

It is, according to participant 43, these natural and often uncontrollable bodily functions that make the silences and pauses of mindfulness practice all the more uncomfortable. The environment and the general energy in the room is silent but there is an undercurrent of discomfort:

‘During the ‘brief pause’ the room is empty of noise but rife with tension and a general feeling of discomfort’. P43 213-216

During mindfulness practices, a range of emotions can be present. Participant 56 describes a mixture of strong emotions happiness and sadness at hearing nature in the present moment. The urge to cry was strong but was blocked with the discomfort of displaying this emotion in front of the group. Mindfulness can evoke a range of emotions during the practice

and building of skills. For some individuals it may not be the right environment to feel comfortable expressing these emotions:

‘During one of the meditations I was managing to think about nothing quite peacefully when I suddenly heard a little bird chirrup briefly. I instantly felt a deep kind of sadness but at the same time I felt deep happiness. It made me want to cry but I stopped myself because I didn’t want to in front of the group’. P56  
80-87

### **Summary of Theme**

This theme outlines the discomfort and social awkwardness of the typical group setting of a mindfulness course. Typically, mindfulness courses are held in a group format and have shown benefits for participants in this setting. However, the above theme also indicates that there are participants who struggle to adjust to the expectations of a group setting, which include sharing in the class, pauses and silences within mindfulness skills training, sounds and sensations within the silences and the anxieties of the environment where they will practice. These blocks of emotion might limit one from fully feeling and being with the emotion, which in turn could weaken the connection with the self and with other individuals.

### **3) Meditation for Beginners is Hard Work**

This theme represents how meditation for beginners can be hard work. Meditation encompasses a range of new skills that can bring up a range of challenges. As meditation is a skill, it can become easier with practice and patience. Some of the practices within meditation involve quiet periods during what would normally be a social experience. For example, eating lunch in silence or experiencing a whole day in silence surrounded by others. This is usually a time when one socialises with those around as well as a time when one feels expected to fill that gap to avoid the silence. Participant 20 outlines the difficulties experienced with eating

lunch in silence, but later came to enjoy the experience with the recognition that it allowed the space needed to contemplate:

‘Today we practiced eating lunch without talking. I found it quite difficult to start with but then came to enjoy it. It allowed me to have the space I needed’.

P20 35-39

Home practice is encouraged to help with both the formal and informal aspects of meditation. One of the common requests is to complete a mindful activity during a simple everyday activity such as brushing teeth or showering. Participant 29 attempts to have a go at this practice but recognises the uncertainty around what it means to have a mindful shower:

‘We were told to be mindful in our actions e.g. a ‘mindful shower’ whilst I attempted to do this I realised that I did not actually know what this means’.

P29  
16-19

Focused attention is a skill that requires constant awareness and can be challenging for beginners. Participant 30 highlights the frustration of feeling sleepy during a meditation but also expressed frustrations with the expectation that a guided meditation should keep them more awake:

‘In both the body check and sound meditation I found myself feeling dozy, which I found frustrating as I would have thought that a more specific guided meditation would be more engaging and easier to follow more closely, whereas in reality I was very close to going to sleep.’

Participant 30 goes on to reflect and acknowledge not to beat oneself up over lack of concentration but to continue with the practice of the present moment and acceptance:



‘I am concerned about how I can improve my concentration/awareness and reduce the following of my thoughts/distractions. But I now know not to beat myself up about it and to try to just accept what is and be present and aware of what is going on’. P30 49-55

Further concerns are expressed by participant 39 who describes an experience of feeling they had to remain in stillness during the meditation, while suppressing any other emotion or movement. As the meditation progressed, they were able to see that this was not correct and were able to rectify:

‘I struggled to stay focused on my breath. I felt I had to remain still – suspend any other emotion but later saw that this was not right’. P39 5-9

A key concern of the beginner is if they are correctly implementing the mindfulness techniques. This uncertainty of thoughts, sensations and the external world can be frustrating for a beginner. Participant 43 outlines these doubts around getting it right, but there are no right or wrong thoughts, only thoughts:

‘And then I’d think God I am doing this all wrong because I am thinking all the wrong thoughts and I don’t feel at one with nature etc and yet the rules say there are no right or wrong thoughts, just thoughts. P43 139-144

Participant 43 continues with the process of meditation and likens it to a bespoke suit. Recognising that the skills do not come instantly but once things come into place it works out better in the long run:

‘Reaping the benefits of meditation feels like waiting for a bespoke suit, custom made entirely to your lumps and bumps. It takes a lot longer than the instant

purchase, with many irritating backward-and-forward trips to the tailor, but fits way better in the end.’ P43 168-175

Participant 52 also outlines the frustrations with the resistance to practice. Through this new found awareness the participant has identified that when a light shines on difficulties there is a resistance against what might come up. During meditation practice difficult thoughts, feelings and sensations can feel overwhelming as they are brought to the surface:

‘Thoughts included frustration at my resistance to practice. Feelings include a lot of resistance coming up to shine the light on stuff maybe I don’t want to see.’

P52 15-19

A common difficulty for beginners is the ability to focus on the breath with the acceptance that the mind will naturally drift. Participant 56 expresses the frustration of what seems like a failure when the mind drifts and wanders. Participant 56 questions the fears of feeling like a failure when trying to follow the breath:

‘Try to follow the breath – fail – try again etc etc!! Must ask about this- I am always going to fail it seems expected – would I just feel like a failure??

(common bad thought for me) P56 51-55

### **Summary of Theme**

This theme represents the trials and tribulations of meditation. The theme outlines the uncertainty around completing the practices correctly, new feelings and sensations that come up and the challenges that come with being new to mindfulness. Another dimension includes the potential adverse effects for those new to meditation, which include the repetition of failure to grasp the concepts which feed into previous feelings or beliefs around failure. In addition, concerns of how to continue with skill building can add to the concerns around meditation.

#### 4) The Importance of the Teacher in Making it Okay to Experience Uncertainty

This theme represents the importance of the teacher in making it okay to experience uncertainty and embodying mindfulness. During mindfulness classes, skill building is at the forefront of the experience. However, little is detailed about the support that a teacher can offer during this process. This support can differ in many ways that participants find helpful and comforting.

Many teachers publish work regarding the wisdom and practice they provide, giving an insight into the type of intervention they offer. Participant 30 outlines the importance of reading the teachers book before the course, which allowed them to become familiar with some of the concepts, which then consequently instilled confidence:

‘Glad I read one of the teachers books as the concepts he mentions – the Jewel in the ICE is not an alien one and that gives me confidence’. P30 33-36

Participant 30 goes on to outline the words of wisdom from the teacher about how to treat our thoughts – not so much as enemies but just to observe. This helped the participant to feel less pressured by the current concerns they were feeling:

‘Teacher highlighted that thoughts are not the enemy and should not be treated as such, just noted and observed. I felt this took the pressure off my concerns....’  
P30 107-112

During meditation, new experiences and sensations come into play. Participant 34 details how a meditation had an impact on her body, which filled her with a sense of unease. Afterwards the teacher posed a question, igniting a sense of laughter, which was somewhat of a relief to the participant during a moment of uncertainty:

‘During the meditation the first thing I felt was the pull at the heart and then the tightness, quivering lips and flaring nostrils I sat with it, it eased a little and I just felt what was there. When the teacher asked us to look at the other side I then felt this urge to laugh and smile. It felt somewhat a relief.’ P34 87-94

As the courses progress a continuation of practice and consequently new behaviours are implemented. Participant 43 reiterates the teacher’s response of the skills and techniques becoming easier with practice. With this practice, one will begin to notice the changes in everyday life:

‘And that is what daily practice will eventually teach us; to sit more comfortably with our thoughts. Teacher tells us that it will get easier and when we start to notice the small changes it gradually makes in our everyday lives, we’ll get through the initial pain of doing it. So we persist’. P43 144-151

The continuation of the practice through support by the teacher is also highlighted by participant 79 who reports a time when they became so deep in the meditation that it became frightening and came out of it. The teacher offered support with the feelings of the unknown and encouraged the participant that it will become easier with more practice:

‘A couple of times I got so deep I got so deep into the meditation that I got a fright and snapped myself out of it. When I asked the teacher what this was, he said it was the fear of the unknown and that I should become more comfortable with going deeper the more I do it. At the end of the day I felt more relaxed and less anxious’. P79 7-16

## **Summary of Theme**

This theme outlines the importance of the teacher in making it okay to experience uncertainty, fears, anxieties and the unknown along with highlighting the adverse effects of mindfulness. The teacher is shown to play a vital role in the development of mindfulness using the skills of embodiment and the lived experience. Without this support, participants may not get an opportunity to ask about the expectations of building these new skills or be prepared to face the unknown alone. The teacher also offers comfort to participants when confidence is lacking in one's ability to practice and continue with the skills.

### **5) The Importance of Metaphors/Stories in Making Sense of Mindfulness Concepts**

This theme represents the importance of metaphors and stories in making sense of mindfulness concepts. Mindfulness is not only taught through the experiential practice, but through Buddhist stories, metaphors and philosophy that help to cement important concepts within mindfulness. Typically in other therapeutic orientations, such as Cognitive Behavioural Therapy (CBT), stories and metaphors are also used to consolidate new skills and support behaviour change (Otto, 2000).

One participant describes the experience of learning about the two-dagger teaching as an important concept that needs further analysis. Through this concept, the participant has become aware of the relationship with oneself, which has allowed them to reflect on how the two daggers are applicable to the sense of self:

‘The two dagger teaching was a hugely important idea that I need to think about more. It makes sense and as someone who is pretty tough on herself it really struck a chord’ P30 75-79

This participant continues further with another metaphor of the cracked vase. They feel this is something to work towards but at present they are unable to achieve. The story of the

cracked vase also touched on the existential human condition around the acceptance of endings and death:

‘The cracked vase story was also massive. I can see it is something to strive for but at present I cannot see myself achieving that level of un-attachment and acceptance that everything breaks/dies...more food for thought’ P30 80-85

One participant describes a moment of introspection as the metaphor ‘changing the contents of the container’ is considered at depth with the idea of being less self-centred and ego driven. The participant goes further and recognises that there is still a way to go with building the skills around mindfulness:

‘Changing the container – not just even the contents – need to be less self-centred – see how the ego is curious/contains – changing my container/thoughts is only part of the journey and not thought awareness increasing’ P37 68-74

Participant 37 goes on to recognise how events can affect our thoughts, emotions and actions. Participant 37 explores the fear for the need to be in control and how these fears can create stories. On further reflection participant 37 believes that stepping back highlights that it is not often the event but the thoughts and beliefs that cause the suffering:

‘I often fear the need to be in control drawn by unconscious fears that create stories in my head – the need to step back and see things more clearly. I think it is often not an ‘event’ I react to rather than my beliefs about it and the thoughts I have’. P37 86-92

As one learns the skills of mindfulness and becomes more aware of how to apply these new skills, a framework is built on how to manage future situations that allow further opportunity for practice. Participant 39 describes the use of the second dagger, followed by

becoming aware and being able to realise what was happening. On reflection of this situation, the participant was able to understand the power of thoughts and present moment reality:

‘A situation occurred when I was describing an object and felt suddenly that I may have upset someone, but then realised that it was a thought and a second dagger. When I prompted to think, I am now clear and realised how easily you can believe your thoughts without questioning and realising you are not in the present moment of reality’. P39 111-121

The teacher uses old records as a comparison for how mindfulness allows us to take things a bit slower and integrating pauses into our lives. Participant 43 goes on to suggest that streaming music is an analogy for the fast-paced lives that we live. On reflection, participant 43 recognises that slowing down and finding pauses are needed in their life:

‘He reminds us of the good old days when records - proper records-had pauses between the songs and all you’d hear at that point between the tracks was maybe a spot of fluff on the needle. Nowadays streaming music has no room for pause, and neither do our lives. So I started the course, unknowingly, to find pauses again’. P43 27-35

### **Summary of Theme**

This theme outlines the importance of metaphors and stories in making sense of mindfulness concepts. Metaphors and stories have been shown not only to be helpful in the understanding of concepts, but also when faced with real life situations. The double/two daggers is a metaphor that participants seem to relate to as an important concept, one which can easily be applied outside of the course. Metaphors and stories can help to build awareness through reflection, which help to reinforce new behaviours and support behaviour change.

## 6) Compassion: Important but Challenging

This theme represents the important but challenging nature of compassion and practices around compassion. Compassion is part of mindfulness practice and can vary depending on the curriculum of the course. Compassion can be taught through awareness of one's interactions and experientially as a meditation. Compassion is a concept that is multi-faceted and far-reaching not only expanding to the self but also others to. Compassion can also be experienced differently depending on where the compassion is directed. This practice encompasses self-compassion and compassion for others.

On the final session, participant 29 describes the compassion meditation as warming and rewarding. The most difficult aspect of the compassion meditation was giving compassion to someone they found challenging. However, on completion, they felt enlightened and this feeling was the strongest compared to the others:

'During the final session today, we were introduced to compassionate meditation. I found this very warming and rewarding. I found the hardest letting someone in who I found challenging, but once I managed this, I found it the most enlightening and the feeling was the strongest'. P29 73-79

Even with practice, participant 34 also expresses how self-compassion can still be a challenging skill. Participant 34 is aware of feeling angry towards the lack of self-compassion practice, whilst feeling at ease focusing on another. Further self-analysis shows a propensity towards giving compassion rather than self-compassion:

'I always find this practice a little harder because I find it harder to be compassionate towards myself and I notice this when I meditate as when I focus on myself I feel angry as I don't do this enough. When I focus on another I feel



lighter and comforted perhaps. I find it easier to be compassionate towards others and not myself'. P34 121-130

Participant 37 describes how sitting with difficult emotions and feelings in a calm and non-judgemental way can support self-compassion. With this awareness, self-compassion becomes an important concept:

'Sitting with and feeling my emotions-with curiosity and no judgement very calming and helpful. Can see the compassion for self is powerful'. P37 57-61

Participant 37 goes on to express their commitment to find out who they are and to find happiness. With the commitment of mindfulness, they feel in a better position to cope with life and to make the best of themselves integrating the skills learnt. While acknowledging that compassion and acceptance will support this process:

'I want to know who I am and find happiness. I am committed to the practice of mindfulness. I feel better equipped to cope with my life and make the best of me with compassion and acceptance'. P37 94-100

Participant 43 explores and reflects the changes that have been made whilst being on the course. This has resulted in a greater understanding of oneself and has led to a kinder more compassionate relationship with the self:

'I'm a bit different now. I'm getting to know myself, I'm kinder and more understanding of myself, and most important of all, I like myself. Me and myself are mates! Not to say I didn't like myself before, but I barely gave myself a chance to know me. I thought the good bits were alright, they'd do. I despised the bad and would do anything in my power to cover them up, from others and from me'. P43 608-617

Participant 48 finishes with a commitment to giving themselves self-compassion with taking time for themselves. For participant 48 this act of self-compassion is a change from their normal behaviours:

‘Committed to giving myself time/space – a new concept for me. I feel committed to showing myself compassion’. P48 45-48

### **Summary of Theme**

This theme represents compassion as both an important and difficult concept. Blocks towards compassion for the self and others can be a difficult to hold but are recognised as a skill essential to repairing and rebuilding the self. Barriers towards compassion can indicate a breakdown of connection which has been integrated as part of a reoccurring negative feedback loop. Becoming aware of difficulties within compassion allows the participants to make positive changes for themselves and others.

#### **7) Shifting Awareness of Body, Place and Mind**

This theme represents the shifting awareness of body, mind and place. During meditation, focused attention and awareness are key components of the practice. Key skills include the shifting to different areas of attention, which gives individuals a varied experience of awareness. The body scan is one of the core components of mindfulness practice. The technique of focusing on parts of the body and using anatomical areas as anchor points is used to help connect the mind and body. For participant 34 this experience made them feel more connected between the mind and body but also felt good to feel what was also going on in the body:

‘This was a body scan meditation – I felt more connected with this and it was good to feel that what was going on in the body as well as the mind. I always

feel that when I meditate I reconnect my head to the rest of my body throughout the day'. P34 9-16

Our connection to other places can be brought about by what we engage with in the present moment. Participant 39 recalls reading about feelings that another individual felt during an experience that evoked a strong emotional reaction. The participant initially wanted to block the emotion but felt being with it through acceptance was the right thing to do:

'I read Jon Kabat-Zinn's meditation for life (page 182) and the geese passing over his head. He mentions he feels blessed by their passing over his head and I become aware of a new emotion of being moved to tears. My automatic reaction is to block this emotion, but I stopped this block, accepted this emotion, expressed it and waited for it to end naturally'. P39 66-76

During meditation practice we become aware of how the mind works and this tends to be negatively orientated. Participant 43 describes how they become aware of their own mind and how it regularly works against the self, resulting in created scenarios. However, they begin to see the differences between helpful and unhelpful thoughts.

'I am becoming aware of how my mind plays tricks on me and regularly works against me.....Watching my mind at work though – playing out scenarios of bad things which I invent will happen.....means I am starting to see which thoughts are destructive, meaningless and harmful, and which thoughts are constructive, meaningful and helpful', P43 401-417

Participant 44 describes during the experience of meditation they felt a physical shift in their body, along with the heart feeling like it was going to explode. This experience for the participant was very emotional:

‘My mind was spinning like crazy and this time I felt that the right part of my body was higher than the left one (I could control balance). I also had the feeling that my heart exploded (started breathing louder and louder) – got very emotional’. P44 5-11

### **Summary of Theme**

This theme represents shifting awareness of body, place and mind. This includes new body experiences, sound sensations in nature, awareness of emotional triggering and thoughts. Meditation is not only a practice that highlights internal awareness and sensations but also expands one’s skills to the external experiences within the environment such as sounds, smells and touch. This change of focus for participants is a key area in the practice of focused attention and shifting awareness.

### **8) Epiphanies/Turning Points/Game Changers: When it Just Makes Sense**

This theme represents epiphanies, game changes and turning points during the meditation course where things begin to fall into place and start to make sense. These can be interactions with others, experiences we have during practice and the relationship we have with the self. During the course, introspection and self-analysis is paramount to understanding patterns of behaviours for oneself, both the positive and negative. Participant 22 describes a moment of introspection when they realise that the biggest critic is themselves and how during meditation the critical thoughts were towards oneself:

‘I’ve realised today that my biggest critic is myself. During meditation, I became aware that as my thoughts drifted off I was criticising myself. This has been an epiphany for me’. P22 21-25

During the course, individuals may begin to notice changes to oneself. Participant 29 summaries the negatives of lying down while trying to meditate but then immediately expounds the health and wellbeing benefits following the first day of the course :

‘I was in bed and found that I was too tired to concentrate and that doing it lying down was not the right thing as I fell asleep very fast. On important thing to mention is that I do not sleep well and actually found that I slept very well’. P29 5-11

When entering meditation for the first time it can be daunting to consider guiding oneself away from the comfort of a teacher and a group. Participant 29 outlines this experience as a turning point in life:

‘This was the first time that I had ever meditated by myself and this followed from the previous day being the first time I had ever meditated. I knew that this was a turning point in life and that it’s something that I am really keen to build on’. P29 28-35

During mindfulness practice introspection techniques can highlight one’s current situation including the inclination towards a fast-paced environment. Participant 30 realises during the meditation practice that she had not sat still for a short time since her last pregnancy over three years ago:

‘The first meditation practice was also a profound experience in that I realised I had not sat still (physical) for 10 minutes like that in over 3 years, probably during a meditation session when in my last pregnancy’. P30 9-14

Turning points in practice help to consolidate and make changes to current patterns of behaviour. Participant 37 describes lightbulb moments as helping to become aware of judging thoughts while recognising that it is okay to experience emotions:

‘Found today really helpful – quite a few lightbulb moments, especially related to the need to ‘ cleanse our soul’ as well as ourselves – not to judge thoughts and know that emotions are okay, but to distinguish what is real rather than just thoughts’. P37 33-40

Once we begin our path towards self-development we can begin to recognise moments of absence and distractions. The pursuit of present moment experience becomes a higher purpose. Participant 39 describes how the hurry has gone with trying to fit everything in. They reflect on the absentness of watching TV, which now seems a waste of time:

‘My hurry has gone – trying to cram in everything just so I could sit in front of the telly and to be absent seems such a waste of life now’. P39 95 – 98

Some of the teachings in mindfulness go against what our natural inclinations such as recalling difficult thoughts when we would like to push them away. Participant 43 describes the often perplexing nature of the experiencing as a ‘mind-screw’:

‘The game-changing/ mind-screwing bit for me was the teacher encouraging us to sit with a reoccurring thought we may have that is causing us unnecessary stress, or created emotions, and to say in our heads, having a thought’. P43 290 – 296

When we come across turning points in life and recognise the values in these new skills, we want to pass them onto others in the hope that they can offer some comfort and support.

Participant 56 expresses this desire in the hope that when her son is ready he will be open to the practice:

‘So much about mindfulness is so simple and obvious yet I have been blind to much of it until I discovered it. Better late than never. I hope my son will be open to it when he is ready’. P56 134-138

### **Summary of Theme**

This theme outlines the turning points/game changers and epiphanies that a mindfulness course can bring for participants. These are highlighted as times during the course when what has been learnt begins to make sense. This new awareness enables the participant to implement interventions that can lead to positive behavioural changes. Some of these moments include the relationship with oneself, the additional physical benefits to practicing mindfulness and the transferring of skills to support others.

#### **9) Noticing Suffering in Everyday Life**

This theme represents noticing suffering in everyday life. Mindfulness offers an opportunity to explore and become aware of the suffering not only for the individual but also expanding and acknowledging the suffering around us. This awareness of suffering is not only of the self but also of one’s interactions with others.

On reflection, participant 34 describes their experience of the difficult relationship between food and the self. Along with recognising the impact of one’s thoughts on health & wellbeing:

‘...I was starting to find I was living in my head for too much and giving myself a hard time about things such as not eating properly’. P34 20-23

Once awareness of one's own negative behaviours comes into focus there tends to be an acute awareness of others' behaviours. Participant 39 describes noticing the vacant absent look of those not in the present moment, working on autopilot with the reactions:

'I am noticing others wandering around absently rushing with a vacant look, knowing they are not in the present, working on automatic reacting not interacting'. P39 105 109

As we become more mindful of the behaviours one can also become mindful of the impact we have and the suffering we could impose on others. Participant 43 describes the treatment another would receive should they feel the need to win the argument. On reflection they arrive at the conclusion that their argumentative attitude is socially detrimental:

'But if in the process of an argument I win by making the unlucky recipient of my wrath feel terrible, it's not winning at all...If I dish out the silent treatment to the offender until they realise the error of their way, guess what? I also don't win as silence is almost as hard as admitting defeat for me'. P43 575 - 587

Awareness of the suffering we impose on ourselves can be more intense when we do not have the support of others. Participant 56 describes the 'interrupting thoughts' as more positive but once at home the thoughts began to turn to negative past events. Support from course members helped to explore this further:

'On the course the 'interrupting thoughts' were more interesting, motivating and happy. At home, they were putting me down and dwelling on past experiences. I suppose, as I discussed with a course member these are part of my ICE which needs melting. My mind keeps making me remember them and time is not healing'. P56 6-15



## Summary of Theme

This theme represents the participants' ability to notice suffering in everyday life while attending the course. Participants were not only able to notice times of suffering when difficult thoughts arose but also suffering connected to the body. As self-awareness increased a further shift towards the suffering of others was also noticed.

### 10) Responding Differently to Suffering in Everyday Life

This theme represent how one responds differently to suffering in everyday life with the skills that have learnt. This informal practice of mindfulness skills allows the participant to apply skills to situations outside of the formal practices of mindfulness. One of the most challenging informal practices can be trialling our new skills in a stressful situation that we encounter. Participant 29 describes how coming across traffic lights they were able to slow down and enjoy the moment:

‘When possible I focused on the moment and thinking about other things. I found myself rushing less when the traffic lights changed red. I didn’t speed up I slowed down and waited. I enjoyed that moment’. P29 55-60

Participant 34 has a similar experience while in the car but was able to bring themselves back and even find the funny side to the automatic negative reaction:

‘Also, when I was driving home from the course, someone pulled out on me, at first I reacted in a negative way and then I was able to bring myself back and laugh at my reaction by using the two dagger technique’. P34 74-79

Participant 29 also states how they have responded differently to suffering through what they learnt that day. Changing the behaviour stopped the second dagger from occurring while minimising the suffering for others around:

‘There was a particular event that became of my learning that day I acted differently which undoubtedly stopped the second dagger for me as well as causing further issues for my daughter and wife’ P29 39-44

Changing the behaviour of oneself does allow one to make a choice and this leads to a direct impact on those around us. Participant 30 describes how this recognition of thoughts has led to acceptance around their children’s sleeping issues:

‘I do feel that the recognition and marking of thoughts as just that does make a difference has done already, stopping the tangle and frustration i.e. my 2 year old will not go to sleep, that is not how I should be thinking. This has made me more accepting of the situation’. P30 92-98

For some individuals they are aware of the triggers that normally set off the negative thought process but have come across that situation while on course. Participant 48 describes the application of mindfulness skills and techniques to a situation that regularly induces anxiety. However, using the technique of focusing on their immediate environment helped the panic to settle:

‘That evening I went to the theatre. I do experience claustrophobia – as always, my panicky racing thoughts’ started. I spent some time focusing on everything around me – I suddenly realised the panic had settled. I feel optimistic this skill might help me’. P48 4-10

Participant 78 describes another experience that once pain and tension became the centre of attention and became acknowledged they felt weaker. This participant gives an indication of how pain could become more manageable with the integration of the mind and body:

‘The second somewhat easier, the counting of the breath helped me to be aware about my thoughts. Pain and tension helped to concentrate, but they started to get weaker after becoming the centre of the attention’. P78 7-14

### **Summary of Theme**

This theme represents responding differently to suffering. This includes suffering to the self and to others around us, both directly and indirectly. Individuals are able to put the brakes on before responding automatically, which allows them to process the situation and respond effectively.

#### **11) Knowing the Self Better: in a Non-Judgemental Way**

This theme represents knowing the self better in a non-judgemental way. During mindfulness practices, one begins to become acquainted with the self, which includes all of one’s thoughts and behaviours. Once we become aware of how one operates in mind and body than one has a better chance of making positive changes. Some of what mindfulness practices bring does not feel comfortable as it shines a spotlight on both the good and not-so-good aspects of our inner selves and one’s life. Participant 29 describes the first day of the mindfulness course as lacking in exploration, which has shone a light on how life is currently in their opinion ‘unmindful’:

‘I found myself following the finishing of the first day and the days end being very reflectful of how ‘un-mindful’ my current life is’. P29 12-15

With the exploration of one’s life and the self, the frustration felt can be a mixture of challenges that need to be faced. Participant 44 recognises during the course that the frustration they feel towards their partner is more to do with the lack of space and breaks they have in their own life:

‘I just realised that my frustration with my partner is not because whatever he was doing – it’s because I’m not having any ‘breathing’ space in my life/I don’t allow myself to have breaks’. P44 13-17

Participant 56 describes the experience of the course as a release of tension. The protected time within the meditation allows one to not have to think of all the things one must get done. The only things one needs to try is to remain in the present allowing for an opportunity to refresh:

‘Really though I have been walking on air. I have experienced a release of tension knowing that during a meditation I don’t have to think, I don’t have time to plan, I don’t have time to solve problems all that is to do is to be present and this makes room for the rejuvenating brain – rest, peacefulness and happiness’. P56 100-108

When we do slow down and begin to take pauses, we also recognise that our lives can be fast paced and for some chaotic. Participant 65 explores the reasons as to why there is so much need for distraction in their life. This is continued with more depth on reflecting why they are not choosing to experience life much of the time:

‘...it made me wonder if I am limiting myself with negative worries and concern. I was wondering during today’s session why am I distracting myself so much? Why am I choosing not to experience my life so much of my time?’. P65 50-57

### **Summary of Theme**

This theme represents knowing the self-better in a non-judgemental way. Introspection can be difficult as it includes self-analysis and this can lead us to be judgemental. Within

mindfulness practice just noticing without judgement allows one to build a better relationship with the self. This awareness can expand further to include reflections on current thoughts and behaviours and the relationships with others.

### **12) Simple Class vs. Cluttered Life: Practising in Class is Different to Practising in Everyday Life**

This theme explores the differences between practicing and learning in class to the application in real life. During the course, many aspects of our lives are different as we learn new skills and take on different perspectives to the situations we come across. Participants are also encouraged to apply the new skills and techniques to real life.

Part of the home practice is to put in place the skills learnt and to notice one's reactions to our internal and external environment. Participant 22 describes a situation where the 'two daggers' was triggered when considering the continuation of the course and the practices, setting off negative feelings. Participant 22 also discloses the uneasy around return to everyday life:

'We were set the challenge to notice any situation where the 'two daggers' came into about the course I was doing I felt negative about continuing the practice. I am feeling apprehensive about returning to everyday life'. P22 59-66

During the course, taking the time out of normal life to learn these skills can also be seen as a respite for some individuals. Participant 24 states that they have given themselves permission not to be stressed during the course but is curious as to whether this can be continued after the course:

‘As I am on a course I’ve sort of given myself permission not to stress about the things that are not getting done whilst on course. Will be interesting to see if I can maintain that level of calmness’. P24 57-62

Participant 30 describes how learning these perceived ‘simple’ skills and concepts can be overwhelming, especially when leaving the course and having to apply all they have learnt to everyday life:

‘In some ways these ‘simple’ concepts can also be rather overwhelming. Applying them to everyday life will be interesting’. P30 99-102

Further reflection by participant 30 on the application to everyday life includes the questions of how they will they guarantee the time to complete the formal mindfulness practice with the responsibilities of two small children. However, participant 30 remains optimistic and opts for a problem-solving strategy before the worry begins:

‘I am still concerned about how I am going to ensure I have 15 mins guaranteed uninterrupted practice everyday with 2 small children.....but where there is a will etc...Maybe I am learning to be less worried about these things and I will first work it out’. P30 141-148

Time constraints was identified as a potential barrier to the implementation and adoption of mindfulness practice. Participant 52 acknowledges this barrier but is able to bring themselves to the present and acknowledge that taking one day at a time is the better option:

‘Had an overwhelming feeling of how will I do this for the rest of my life and decided to take one day at a time made it feel manageable and easier’. P52 28-

Being on course offers support and an avenue to discuss any concerns. Participant 65 describes how on course they were full of positive emotions such as happiness and motivation. However, on leaving the course things and practicing alone begins to feel harder and more challenging than originally thought:

‘On leaving the course I was full of energy, happy and motivated. Now at 20:40 I feel things may be harder than I thought’. P56 16-19

### **Summary of Theme**

This theme outlines how learning on the course can be very different to applying it to real life. Time constraints, practicing alone, juggling responsibilities and entering back into normal life are some of the concerns expressed by people attending a mindfulness course.

### **Discussion**

The aim of this study was to explore the lived experience of attending a mindfulness and compassion course while offering an insight into the participants’ experience using qualitative methodology. This study explored the lived experiences of participants during an 8-week or 3-4-day equivalent mindfulness and compassion course. Some of the findings found in this study are novel and have not been identified elsewhere from qualitative research. Mindfulness has predominately been researched using quantitative outcome measures to identify changes. Diary research in this area is also limited and therefore this study offers an understanding of participant experiences during a course. These experiences are important for future participants as they give an insight into what one may encounter as a participant while also giving teachers an awareness of participant experiences.

From the diary entries twelve themes were identified offering a broad and rich collection of data. The number of themes also highlights the vast array of experiences that

participants encounter on a mindfulness and compassion course. The results emphasised themes that integrate with key timescales within a mindfulness course which include: before one attends the course; beginning the course; learning new skills and experiences; introspection; application to life outside the course.

The majority of the themes identified in the current research are what one would expect to see from a mindfulness intervention. These themes include meditation for beginners is hard work, the importance of the teacher in making it okay to experience uncertainty, epiphanies /turning points/game changers: when it just makes sense, the importance of metaphors/stories in making sense of mindfulness concepts and knowing the self better: in a non-judgemental way, compassion: important but challenging. These are all themes that we would expect to encounter on a mindfulness intervention, however this research is the first to identify these experiences from a qualitative stance using diary entries.

The themes of expectation a person brings to mindfulness training, the social awkwardness of practising in a group, noticing suffering in everyday life and responding differently to suffering in everyday life are themes that are novel to this research area. The expectation a person brings to mindfulness training highlights the pressure an individual feels to make the training effective in their life. In an ironic contrast Buddhism would define expectations as part of the ‘wanting mind’ driven by wants, desires and anxieties that lead to suffering. The Buddha described and outlined the four noble truths as a pathway to support a reduction in suffering. These include (1) Life is full of suffering (*Dukkha*), (2) There is a cause of this suffering (*Dukkha-samudaya*), (3) There is a way to stop suffering (*Dukkha-nirodha*), (4) There is a pathway that leads to the cessation of suffering (*Dukkha-nirodha-marga*) (Davids, 2003). However, a mindfulness intervention would encourage a flexible state of mind when encountering difficulties. An example of this transition is encapsulated in the entry of participant 22 who at the end of the course recognised this difficulty and block.



‘I am putting a lot of pressure on this course helping me to better handle stress, anxiety and depression I have been struggling with over the past twelve months. Whilst my employer has been patient that patience is wearing thin’. P22 2-8

‘I recognise that the frustration I felt yesterday was because I had erected raised expectation of what I wanted to get from the practice’. P22 77-80

An additional novel theme of the social awkwardness of practicing in a group highlights the difficulties individuals can face in group settings. Even though participants were attending an intervention promoting self-care, some individuals can feel vulnerable in settings with new people. Group settings tend to be open to personal disclosures which for some individuals may feel uncomfortable. For example, this could include very basic introductions made at the start of the course around the reasons for attendance on the course and what changes they would like to make from the course.

The results also indicated the hardship and potential adverse effects while being on a mindfulness and compassion course. Participants recognised that not all the experiences are pleasant and frustrations were highlighted when new skills were being developed. Adverse effects and potential harm have been highlighted as an area in much need of further research (Baer et al., 2019). However, in the current research teacher support and the importance of metaphors and stories helped participants to work through some of the frustrations while building confidence.

### **Previous Research**

Previous research highlighted moments of distress relating to practice during a mindfulness course (Kerr et al., 2011) and possible difficulties (Stelter, 2009). In support of this finding the current research identified the theme ‘meditation for beginners is hard work’

and ‘the social awkwardness of practising in a group’ as relating to some of the difficulties experienced during a mindfulness course. For the majority of participants there were times of difficulties while engaging in mindfulness practice. However, what was also identified in the current research was the importance of the teacher in making it okay to experience uncertainty. The teacher’s reassurance and support to explore these difficulties helped to attenuate some of the distress experienced by participants. Previous research has shown that during a mindfulness course motivational support and skilful guidance supports the needs of the participants (Lundgren et al., 2018).

Words or metaphors describing mindfulness was identified as a theme in previous research (Stelter, 2009). This theme has similarities with the theme ‘The importance of metaphors/stories in making sense of mindfulness concepts’ highlighted in the current research. In the current research participants included the names of metaphors such as ‘two daggers’ and ‘cracked vase’, which helped to consolidate mindfulness concepts. The use of metaphors could provide an alternative perspective that offers clarity when uncertain of the concepts.

During the course, participants began to become aware of the observing self through changes such as noticing and responding differently to suffering in everyday life. As participants began to notice these changes, the relationship with one’s thoughts became more positive and compassionate. Previous research also identified one of the key transformations during a mindfulness course was the changing relationship with one’s thoughts (Stelter, 2009).

The current study extends not only on previous research but also the quantitative neurophysiological chapter in this thesis. The current study adds to previous research in the following areas: possible difficulties and distress during a mindfulness intervention; the use of metaphors to support mindfulness and the concepts; the change in the observing self. The novel areas identified in this study include ‘expectations brought to mindfulness course’, ‘social

awkwardness of practising in a group' and the identification of the metaphors that helped during the course. The current study recruited participants from an opportunistic sample of individuals who were already set to attend a mindfulness course. From the sample very few participants declined to take part and reported that it supported the experience of being on the course. Diaries also offered the participants the opportunity to fully express how they felt during the course at their own pace and in their own time.

Limitations of IPA include the debate around the participant's ability to capture experience and whether this is more aligned with stating opinion rather than experience. This also raises the question around whether participants and the analyst can accurately identify experiences including the right skills (Tuffour, 2017). The lack of standardization of the IPA processes has been identified as an issue including the ability to distinguish between good and poor IPA research (Giorgi, 2010). However, Smith et al. (2009) suggests that "IPA is a creative process and it is not a matter of following a rulebook" (Smith et al., 2009, p.184). Therefore, some measure of flexibility needs to be incorporated. To support good IPA process and ensure rigor during the research, Yardley (2000) has offered guidance on what this should include: sensitivity to context including existing literature; commitment and rigor; transparency and coherence; impact and importance. Additional limitations for the study design include the one site of recruitment for participants which suggests that findings may only be specific to participants on these courses, offering little diversity. The courses were mainly self-funded with course fees averaging £150-£200, indicating a participant population with the financial ability to self-fund a course. Therefore, those unable to pay may not have had an opportunity to be part of this population. However, MindfulnessCIC does offer free places on some of the courses to compensate for this disparity.

## **Conclusion**

The current study provides an understanding of the lived experience of participating in a mindfulness and compassion course. The findings may contribute and offer future participants an insight into the experiences of previous participants, both positive and negative. It will also give participants an idea of the experiences one may have during a mindfulness course. The research will also provide practitioners an 'insight' into of the experiences that participants may encounter. This additional knowledge could support practitioners to be prepared to address any issues that arise. Some of the findings would also offer additional support and awareness to those practitioners offering one-to-one mindfulness sessions either as a full or part intervention. Further investigation into the lived experience of mindfulness interventions is required not only to build a platform of knowledge around participant experiences but also to add to the findings from quantitative outcomes. Using qualitative methods such as IPA will help support identifications of the processes of change that occur during a mindfulness intervention.

# **Chapter 9**

## General Discussion

## CHAPTER 9

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This chapter outlines a concluding summary of the findings gathered from both the quantitative and qualitative studies. The results from both of the studies complement and enhance each other. This chapter will outline the findings whilst making advisory notes for clinical practice and future research.

### **General Discussion**

The overall research aim was to evaluate a mindfulness and compassion course using a mixed methods approach.

To answer the research aim, smaller objectives included:

### **Objectives**

- 1) To complete a review of the current literature evaluating mindfulness-based and compassion-focused interventions (MBCI) using physiological measures of stress (heart rate and blood pressure) in a non-clinical population.
- 2) To investigate changes in physiological measures of heart rate and blood pressure at pre and post time points during an 8-week mindfulness and compassion course.
- 3) To investigate brain activation changes in frontal hemispheric alpha asymmetry at pre, post and follow-up time points (6-months) during an 8-week mindfulness and compassion course to support physiological findings.
- 4) To explore the relationship between fears of compassion and perceived stress following an 8-week mindfulness and compassion course.
- 5) To examine the lived experience of completing a mindfulness and compassion course.

## **Aims and Objectives related to Findings**

The main aim of this research was to evaluate a mindfulness and compassion course using a mixed methods approach which included neuropsychophysiological and phenomenology measures. This aim was broken down into smaller objectives to allow a mixture of methodologies to answer the main research aim. The first objective included a review of the current literature evaluating mindfulness based and compassion-focused interventions (MBCI) using physiological measures of stress (heart rate and blood pressure) in a non-clinical population. The review highlighted the need for further research to include physiological measures of heart rate and blood pressure within MBCI. The only intervention that did include physiological measures in the reviewed studies was mindfulness-based stress reduction (MBSR). This finding led to the inclusion of the physiological measures of heart rate and blood pressure as a main outcome measure during the mindfulness and compassion course.

The second objective was to investigate changes in physiological measures of heart rate and blood pressure at pre and post time points during an 8-week mindfulness and compassion course. The findings did not indicate a significant result from pre to post measurements, but did indicate a decrease in all physiological measures of stress (heart rate, DBP and SBP), highlighting a positive pattern of change. To support physiological findings, a neurological facet was included as a third objective.

The third objective investigated brain activation changes in frontal hemispheric alpha asymmetry at pre, post and follow-up time points (6-months) during an 8-week mindfulness and compassion course to support the physiological findings. Again, the results did not indicate a significant change but highlighted a distinct pattern of change from right (avoidance) to left (approach) frontal hemisphere from pre to six-month time point measure. The EEG showed that at baseline participants were predominately in the right frontal hemisphere for all electrode

areas, which represents negative affect and avoidance motivation. At the six-month time point, dominant brain activation had shifted to the left frontal hemisphere, representing positive affect and approach motivation. The left hemisphere is associated with the processing of positive affect and approach motivation, while in contrast the right hemisphere is linked to negative affect and withdrawal or avoidance of an emotional stimulus (Coan & Allen, 2004). The mindfulness and compassion course not only aims to reduce negative variables such as stress but also increase positive variables such as compassion and wellbeing. Although positive variables were not measured using self-reports, a neurological shift was indicated from negative to positive affect following the mindfulness and compassion course. The study showed a strong pattern of change with only six participants therefore future work should aim to include a higher number of participants to strengthen this result.

The fourth aim was to explore the relationship between fears of compassion and perceived stress following the 8-week mindfulness and compassion course. A significant positive correlation was identified between fears of expressing kindness and compassion to oneself and stress. Fears of responding to compassion from others was shown to have a strong correlation to fears of expressing kindness and compassion to oneself but no significance to stress and was therefore identified as a potential suppressor variable. The study hypothesised that the amplification effects of the suppressor could impact on the ability to recognise the need and necessity of compassion from others and to the self.

The fifth aim was to examine the lived experience of completing a mindfulness and compassion course. This was completed alongside quantitative measures to encapsulate and understand the participant's experience. Participants were invited to complete diary entries detailing their experiences during a mindfulness and compassion course. An Interpretative Phenomenological Analysis (IPA) was performed to analyse the entries. The results revealed twelve themes: expectations a person brings to mindfulness training; the social awkwardness



of practising in a group; meditation for beginners is hard work; the importance of the teacher in making it okay to experience uncertainty; the importance of metaphors/stories in making sense of mindfulness concepts; compassion: important but challenging; shifting awareness of body, place and mind; epiphanies/turning points/game changers: when it just makes sense; noticing suffering in everyday life; responding differently to suffering in everyday life; knowing the self-better: in a non-judgemental way; simple class vs. cluttered life: practising in class is different to practising in everyday life. The results not only highlight both positive and negative experiences for participants during a mindfulness and compassion course, but also making positive changes to one's life is not always an easy and straightforward journey.

### **Quantitative and Qualitative Findings**

The findings from both quantitative and qualitative studies highlight different dimensions of change and experience. The first notable result was the changes, even though not significant, in physiological (heart rate and blood pressure) and neurological measures (frontal alpha asymmetry) during the mindfulness and compassion course. All physiological measures identified decrease in the means at each time point, highlighting a pattern of significance of positive change. Shifts in frontal hemispheric activation from right to left were observed in the EEG study. Both of the quantitative studies highlight that an 8-week mindfulness and compassion course have a positive change on both physiological and neurological facets. The final quantitative study used a multiple regression analysis which highlighted the positive relationship between fears of expressing compassion for the self and stress but not for the other two subscales of fears of compassion. Consequently, when fears for expressing compassion for the self decreases so does perceived stress. This demonstrates the important relationship between the two measures and how closely linked they are to wellbeing. The second notable finding from this study was the identification of the potential suppressor variable and how this indicated the close relationship between fears of expressing compassion

to the self and fears of receiving compassion from others. Both of the quantitative studies not only added partial support for the mindfulness and compassion course but also to benefits of mindfulness interventions in general.

The qualitative studies identified participant's positive and negative experiences of attending a mindfulness and compassion course. The most notable themes include: expectations a person brings to mindfulness training; the social awkwardness of practising in a group; noticing suffering in everyday life; responding differently to suffering in everyday life as themes that are novel to this research area. However, given that twelve themes were identified in the analysis, this suggests that a wide variety of experiences were encountered on a mindfulness and compassion course.

In sum, quantitative findings were able to highlight the objective changes at both a physiological and neurological level, while qualitative findings give an insight into why these changes occurred through the experiences of the participants identified within the themes identified. An example includes pre-measures of right prefrontal asymmetry (avoidance behaviours, negative affect); however, following the mindfulness and compassion course a hemispheric shift has been made from right to left prefrontal asymmetry (approach behaviours, positive affect). This aligns with some of the qualitative themes identified during the course that move towards approach behaviours and positive affect. The themes include: noticing suffering in everyday life; responding differently to suffering in everyday life; knowing the self-better: in a non-judgemental way.

### **Key findings from the Research**

- Physiological measures indicated positive decreases in both heart rate and blood pressure (DBP & SBP);

- Neurological measures of EEG frontal alpha asymmetry indicated a change from right (negative affect and avoidance approach) to left hemisphere (positive affect and approach motivation);
- A positive relationship between fears of expressing kindness to the self and perceived stress following an 8-week mindfulness and compassion course;
- A potential suppressor variable effect relating to fears of receiving compassion from others with fears of expressing compassion to the self;
- The lived experience of a mindfulness and compassion course highlighted a variety of both positive and negative experiences. The most notable of the themes include expectations a person brings to mindfulness training, the social awkwardness of practising in a group, noticing suffering in everyday life and responding differently to suffering in everyday life are themes that are novel to this research area.

### **Limitations, Strengths and Considerations**

The mindfulness and compassion course had two formats to the course the full 8 week or the three/four day both offering the same skills and coverage of teaching (see chapter 5). Previous research has highlighted the benefits of short courses of mindfulness and meditation practices (Tang et al., 2007; Tang et al., 2010; Kwak et al., 2020). However, for this thesis an exploration of the differences and the impact between the two formats was not completed. Consideration of whether short interventions such as three to four days offer more of an introductory or retreat setting requires further consideration.

A further limitation included the data collection and analysis process for the multiple regression. During the collection of data for the multiple regression, scores were only taken following the 8-week mindfulness and compassion course. Collecting data from pre-course

stage would have offered a comparison of the relationship between pre and post 8-week course for fears of compassion and perceived stress.

The current thesis offers an insight into a mindfulness and compassion course yet to be researched using a mixed methods design. Using a mixed methods design has offered an understanding into the neuropsychophysiological and phenomenological experiences for participants offering novel and interesting findings. A further strength to this work is the diversity of applications not only in psychological areas such as psychotherapy and coaching but also neuropsychology, education and working environments. Finally, further recommendations are given below outlining how practitioners in both clinical and non-clinical populations can use and reflect on the participant experiences outlined in the current research.

The mindfulness and compassion course has been outlined in detail, covering teachings, meditations and home practices (see chapter 5). However, to offer a comparison of the mindfulness and compassion course to comparable interventions, an overview of MBSR and Breathworks has been outlined (see appendix 6). This highlights not only the differences in teachings and approach for the mindfulness and compassion course but also the structure of the sessions. Alongside this comparison of the interventions it is also worth noting that mindfulness interventions not only offer an array of different courses to choose from but these course also variations in teaching experience. For example, would a Mahayana teacher offer a different approach compared to a Zen teacher? As a consequence of the multitude of variations of courses and teaching backgrounds, identifying comparable similarities and difference can be challenging. In addition to the teacher background and experiences, there are differences in the types of meditations that are taught. The mindfulness and compassion course integrates both focused attention meditation (FAM) and open monitoring meditation (OMM); however, some course may only focus on one specific type of meditation rather than a variety.

Finally, the variation in experiential meditations and home practice should be considered when reviewing courses. The mindfulness and compassion course advocates the importance of experiential practice and therefore integrates it into the course teachings. Alternative interventions may opt for more didactic teachings alongside the meditations such as that found in MBSR, thus offering a different experience for participants. This is also true for home practice, various levels of homework will be expected from each course and some will require logs and reflective pieces to support practice outside of the intervention.

On reviewing the positive changes made following the mindfulness and compassion course, it is important to consider the role of confounding variables. It is not unheard of for participants in preparation for mindfulness courses to make general positive changes to their lifestyle as a holistic approach towards wellbeing. For example, the inclusion of starting a new positive habit, such as regular exercise or healthy eating, has been shown to reduce negative variables such as stress and anxiety, while promoting wellbeing (Mikkelsen et al., 2017; Ramón-Arbués et al., 2019). Therefore, future research should take into consideration other lifestyle factors that could promote wellbeing alongside beginning a mindfulness intervention rather than just the mindfulness intervention itself. This could include a lifestyle questionnaire during the initial stages of data collection.

### **Recommendations for Future Research**

An expansion on the physiological and neurological aspects around fears of compassion is essential. This includes the relationship between fears of expressing compassion to the self and fears of receiving compassion from others as identified in multiple regression as a potential suppression effect. Further research integrating frontal asymmetry and fears of compassion following a mindfulness and compassion course would offer neurological support in this research area. A further consideration should be the continuation of physiological and

neurological measures to be used on mindfulness interventions to collect data on the changes with a focus on longitudinal time points.

The limitations of the present study that need to be taken into consideration include the awareness that pre and post physiological measures are likely to have a higher measure at the pre-stage due to heightened arousal of attending a new course. Mindfulness-based stress reduction is aimed at reducing stress, thus it is reasonable to assume that some individuals will be participating with unmanageable stress levels and a heightened sympathetic nervous system.

During the course, some participants would disclose intrinsic and extrinsic motivation for attending, which consisted of both intrinsic and extrinsic motivators. For example, participants are increasingly being referred to mindfulness interventions by an employer or medical practitioner. The National Institute for Health and Care Excellence (NICE), a regulatory body offering guidance on health services, recommends mindfulness in the prevention of mental health conditions such as depression (NICE, 2009). One area under researched is mindfulness and motivation (Donald et al., 2020). Research that investigated motivators and the relationship with mindfulness would help identify any key motivating factors around attendance on mindfulness interventions.

During the progression of this thesis, the structure of the studies reflected and embodied that of the neurophenomenological approach. Valera (1996) proposed a neurophenomenological programme which aimed to bring together first-person accounts and third person accounts to understand the conscious mind. The neurophenomenological programme is 'a model that accounts for both phenomenology and neurobiology of consciousness in an integrated and coherent way' (Thompson et al., 2005, P.87). Part of the requirements for the neurophenomenological approach is the inclusion of training participants to reflect on their experience, therefore a mindfulness intervention would offer an excellent

experiential opportunity to gather data. Even though this thesis did not intend to use a neurophenomenological approach, it could be argued that it does reflect the characteristics of this approach and should be taken into consideration as further research within this area of knowledge.

A final area for future consideration is to extend and add to the mechanisms of mindfulness. This thesis has integrated support for the S-ART approach for the mechanisms of mindfulness (Vago & Silbersweig, 2012). This was due to both the neurophysiological aspects and previous research evidencing mechanisms of mindfulness within diary entries. However, in conjunction with the rise in studies exploring the mechanisms of mindfulness, the concomitant increase in understanding of those mechanisms may support and strengthen definitions and measurements for the future of mindfulness interventions.

### **Implications for Practice**

The results from both the quantitative and qualitative research not only offer teachers and practitioners an insight into the experiences of participant's but the potential positive and negative impacts of mindfulness for participants about to embark on an intervention.

These have been outlined below:

- To consider the participant experiences as potentially combining both positive and negative experiences;
- The social awkwardness of a group setting and how this could impact on certain individuals;
- Reviewing group dynamics and how this can impact on individual experience;
- The challenges faced being a beginner - good screening can help to identify the needs of individuals attending interventions;

- The important role of the teacher in times of uncertainty;
- The positive relationship between fears of expressing kindness to the self and stress;
- The difficulties around fears of compassion;
- The relationship between fears of expressing compassion to the self and fears of receiving compassion from others;
- The impact of compassion-based meditations including those that seek to improve compassion for the self and others such as loving kindness-based meditations. The difficulties this could pose for some individuals with these fears;
- Enhancing courses with the inclusion of heart-based practices to support emotional safety and reducing fears of compassion.

If teachers and/or practitioners are equipped with the skills and knowledge contained in the above recommendations this might result in better participant experience and outcome measures. A final consideration includes teacher and practitioners being aware that they are likely to attract individuals from a clinical population who may be using the mindfulness intervention as an additional support or as the only support mechanism for current difficulties. A thorough screening process will allow this to be reviewed before participants enrol on the intervention. Through diary entries participants expressed concerns around mental health, therefore good practice would include referrals to services such as the GP and a list given to all participants of additional support services.

### **Long Term Implications**

This research adds to a small body of research but also includes novel findings across both quantitative and qualitative studies for a non-clinical population on a mindfulness and compassion course. Firstly, decreases in physiological measures of heart rate and blood pressure were identified. Secondly, the EEG added a neurological dimension which highlighted



changes in EEG frontal alpha asymmetry. Thirdly, the multiple regression highlighted a significant positive correlation identified between fears of expressing kindness and compassion to oneself and stress. Fears of responding to compassion from others was shown to have a strong correlation to fears of expressing kindness and compassion to oneself but no significance to stress and was therefore identified as a potential suppressor variable. The amplification effects of the suppressor variable could impact on the ability to recognise the need and necessity of compassion from others and to the self. Finally, the IPA highlighted that attending a mindfulness and compassion course can be a mixture of positive insightful realisations and challenges. Further consideration also needs to be given to the importance of the struggles faced by a non-clinical population during a mindfulness intervention. These difficulties were disclosed on a course that primarily aims to enhance and work towards positive wellbeing, yet these difficulties were still present for some participants during the course. In contrast the results from the EEG highlighted positive changes in frontal alpha asymmetry following the mindfulness and compassion course.

### **Reflections of Research**

This research on mindfulness was a journey for both participants and researcher. As much as I was aware of the difficulties brought to mindfulness interventions having attend similar courses in the past, the difficulties experienced by participants was greater than expected. It highlighted that mindfulness for many is both a journey likened to a double edge sword. To open and experience ourselves involves the opening and exposure of the good, the bad and the ugly. This is a challenge that most participants entering mindfulness interventions are ill prepared. A good screening assessment would allow teachers/practitioners to identify the individual needs of participants, while minimising the challenges faced. Baer et al. (2019 p.110), in a review on mindfulness interventions, states that ‘A careful assessment of potential participants and well considered exclusion criteria are important’ in protecting participants.

Alongside this initiative further support to participants could include a brief induction outlining what participants can expect on the intervention, any reasonable adjustments required and internal and external options for seeking further support. Further research on dropout rates due to the distress of mindfulness intervention should be considered.

The first year of the PhD involved gathering all areas of interest together to decide how best to approach the research questions. The research protocol was created and ethical approval was sought to cover all aspects of the research. Alongside the research proposal the systematic review was started to aid the research proposal. The systematic review was an opportunity to expand the search into MBCI with a focus on the physiological measures of stress in a non-clinical population. The review highlighted interesting findings including participant settings and instruments used for measurements, which drove the final decision on how to complete the physiological measures.

Changes were made along the way mainly due to difficulties around collecting data. Firstly, a six-month follow-up was part of the initial research proposal for the physiological study, but after numerous unsuccessful attempts to gather the six-month follow-up data, the two remaining time points of pre and post were the sole focus. Participants were either non-responsive to emails or were unable to attend the monthly free sessions held by MindfulnessCIC. As the course is offered to individuals outside the UK, geographical difficulties may have contributed to this difficulty.

An additional set back in this study included the low numbers that consented to attend the EEG study. Further courses were set up for participants but all declined to take part in the EEG experiment, therefore limiting the results to only six participants out of a potential forty. Participants were more open to the diary entries and enjoyed this reflective tool alongside the intervention. Some participants requested a copy of their diary entries to continue building on

what they had contributed. Participants were able to complete the diaries at their own pace and at a time that suited them. Another difficulty encountered with the diary analysis was during the use of the NVIVO system for qualitative analysis. Ultimately, this led to the decision to manually hand write the analysis rather than complete it through the online system.

During the preliminary stages of the PhD numerous opportunities to begin discussing the research area while networking was instrumental to my development. Throughout the first two years I was invited to guest lecture on the MSc Mindfulness and Compassion course. This enabled me to highlight the links between mindfulness, compassion and physiological measures of stress while also affording me an opportunity to present and discuss emerging findings with fellow practitioners from different disciplines. Another highlight of note was when my supervisor (Dr. Liz Sparkes) and I attended the BACPR conference in London. This was one of the first major conferences outside of the Midlands in which I was able to co-present the physiological findings of my research.

This thesis not only added to previous findings but has expanded and included novel findings. The hope is that practitioners and researchers continue to progress this much needed area to allow further investigations to be conducted. Psychoneuroimmunology is a growing area of interest in which stress and the nervous system can be combined to show further connections between the mind and the body.

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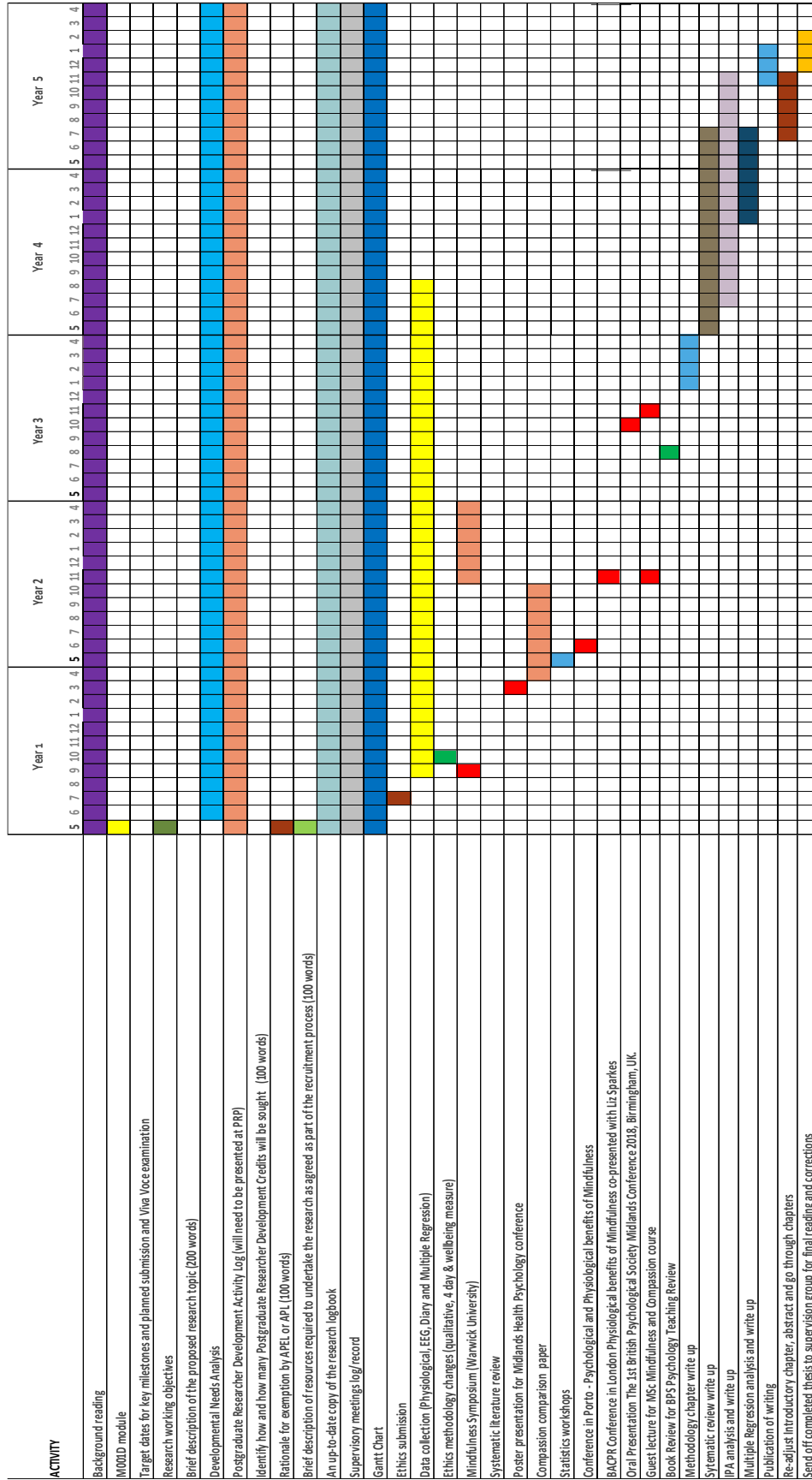
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# Appendices



# Appendix 1 GANTT Chart

## GANTT Chart



## **Appendix 2**

### **Participant Information Sheet**

**Study title:** To evaluate a mindfulness and compassion intervention using a mixed methods design.

#### **What is the purpose of the study?**

The aim of this study will evaluate 8-week Mindfulness intervention or equivalent 4-day intensive course using a mixed methods design. The measures included Blood Pressure, Resting Heart Rate, Perceived Stress, Mindfulness, Compassion and Motivation pre, post and follow-up (6-months), alongside diary entries to capture the lived experience. The measures included EEG frontal asymmetry, blood pressure, heart rate, perceived stress, mindfulness, compassion and motivation. Alongside these measure participants will have the opportunity to participate in diary entries during the intervention.

#### **Why have I been approached?**

For the purpose of this study I require a large number of participants from the general population. The only requirement is for participants to have already secured a place on an 8 week mindfulness programme at Coventry University or at Leicester (MindfulnessCIC).

#### **Do I have to take part?**

No, participation is entirely voluntary. If you do change your mind during any part of the research you can withdraw and still continue on the 8 week mindfulness programme. You can withdraw by contacting me by email and providing the participant reference number. If you decide to withdraw all of the data collected will be destroyed and will not be used for research purposes. There are no consequences to withdrawing from the study at any point.

#### **What will happen to me if I take part?**

You will be asked to attend the 8 weekly sessions for the mindfulness intervention the same as other individuals that are not participating in the research.

During the first session a series of self-reported questionnaires will be issued to participants. These questionnaires will measure mindfulness, perceived stress and compassion scores. Additional physiological measures of blood pressure and heart rate will also be measured. These will be replicated after the 8 week mindfulness and at the 6-months time point. To standardise the physiological measurements, participants will be requested to engage in 2 minutes silence before testing. This will also be replicated at all-time points.

An additional physiological EEG measurement will be offered to participants completing the intervention at Coventry University. Participants will be informed at the start of the course if this is available to them. If you have the opportunity and consent to take part in the EEG research you will find attached with this document an additional information sheet.

### **What are the possible disadvantages and risks of taking part?**

Participating in this research has been measured as low risk. However, you may feel some discomfort answering questionnaires on sensitive issues such as your compassion and perceived stress. Physiological testing of EEG, blood pressure and heart rate have shown no unwanted side effects, however you will have an opportunity before the research to ask any questions you may have. The simplicity of testing will be outlined and tested by the researcher before individuals agree to participation. The testing will only be completed at pre, post and follow-up stage of the 8 week mindfulness intervention.

### **What are the possible benefits?**

As a participant taking parts in this research you will be part of growing and important area of research, which could have future implications for supporting individuals in a range of different areas.

### **What if something goes wrong?**

If at any point you are not able to complete the course or you have any issues please get in contact by using the details below. You can withdraw by contacting me on email and providing the participant reference number. If you decide to withdraw all of the data collected will be destroyed and will not be used for research purposes. There are no consequences of withdrawing from the study at any point.

**Will my taking part in this study be kept confidential?**

Yes. Only I will have access to the raw data. Documentation including the consent forms and questionnaire responses will be kept in a separate and secure (locked) location. You will only be identifiable by your participant number, which again only I will have access. The raw data will only be retained until the thesis has been completed. After this all raw data will be destroyed after 6-months.

**What will happen to the results of the research study?**

The results will be written up and presented as part of a thesis that will be defended during a viva. If the results are innovative, they may be presented at academic conferences or written up for publish in an academic journal.

**Who is organising and funding the research?**

The research is organised by Laura Allen, who a researcher in the department of Health & Life Sciences at Coventry University. The research is funded by Coventry University College.

**Who has reviewed the study?**

The Research Ethics Committee at Coventry University has reviewed and approved this study.

**What If I want to make a complaint?**

[If you wish to make a complaint regarding the research, please use the contact details below:](#)

[Dr Elizabeth Sparkes \(Supervisor for this research\)](#)

[Priory Street](#)

[Coventry University](#)

[CV1 5FB](#)

[aa8163@coventry.ac.uk](mailto:aa8163@coventry.ac.uk)

Professor Ian Marshall, DVC

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Laura Allen (Researcher)

allenl9@uni.coventry.ac.uk or [Laura.Allen@cuc.coventry.ac.uk](mailto:Laura.Allen@cuc.coventry.ac.uk).

[Dr Elizabeth Sparkes \(Supervisor for this research\)](#)

[aa8163@coventry.ac.uk](mailto:aa8163@coventry.ac.uk)

## Appendix 3

### Informed Consent Form

The aim of this study will evaluate an 8-week Mindfulness intervention or equivalent 4-day intensive course using a mixed methods design. The measures included Blood Pressure, Resting Heart Rate, Perceived Stress, Mindfulness, Compassion and Motivation, alongside diary entries to capture the lived experience.

- |  | <b>Please tick</b>       |
|--|--------------------------|
| 1. I confirm that I have read and understood the participant information sheet for the above study and have had the opportunity to ask questions.  | <input type="checkbox"/> |
| 2. I understand that my participation is voluntary and that I am free to withdraw at anytime without giving a reason.  | <input type="checkbox"/> |
| 3. I understand that all the information I provide will be treated in confidence.  | <input type="checkbox"/> |
| 4. I understand that I also have the right to change my mind about participating in the study for a short period after the study has concluded (2 weeks).  | <input type="checkbox"/> |
| 5. I agree to take part in the qualitative research including the diaries.   | <input type="checkbox"/> |
| 6. I agree to take part in the longitudinal study that will take place 6 months after the initial 8 week mindfulness programme.  | <input type="checkbox"/> |
| 7. I agree to take part in the current research project, and I understand that my data may be added to the follow-up research which will conclude May 2021. However, participation will only be required for the studies stated, not for the duration of research. | <input type="checkbox"/> |
| 8. I am happy to be contacted up until May 2021.   | <input type="checkbox"/> |

Name of participant: .....

Signature of participant: .....

Date: .....

Name of Researcher:.....

Signature of researcher: .....

Date: .....

## Appendix 4

### Informed Consent Form – EEG

The aim of this study will evaluate an 8-week Mindfulness intervention or equivalent 4-day intensive course using a mixed methods design. The measures included Blood Pressure, Resting Heart Rate, Perceived Stress, Mindfulness, Compassion and Motivation, alongside diary entries to capture the lived experience.

**Please tick**

- |  |                          |
|--|--------------------------|
| 1. I confirm that I have read and understood the participant information sheet for the above study and have had the opportunity to ask questions.  | <input type="checkbox"/> |
| 2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving a reason.   | <input type="checkbox"/> |
| 3. I understand that all the information I provide will be treated in confidence.  | <input type="checkbox"/> |
| 4. I understand that I also have the right to change my mind about participating in the study for a short period after the study has concluded (2 weeks).  | <input type="checkbox"/> |
| 5. I agree to take part in the qualitative research including the diaries.   | <input type="checkbox"/> |
| 6. I agree to take part in an EEG study pre, post and follow-up  | <input type="checkbox"/> |
| 7. I agree to take part in the longitudinal study that will take place 6 months after the initial 8 week mindfulness programme.  | <input type="checkbox"/> |
| 8. I agree to take part in the current research project, and I understand that my data may be added to the follow-up research which will conclude May 2021. However, participation will only be required for the studies stated, not for the duration of research. | <input type="checkbox"/> |
| 9. I am happy to be contacted up until May 2021.   | <input type="checkbox"/> |

Name of participant: .....

Signature of participant: .....



Date: .....

Name of Researcher: .....

Signature of researcher: .....

Date: .....

## Appendix 5

### Debrief

**Study title:**

To evaluate a mindfulness and compassion intervention using a mixed methods design.

The aim of this study was to evaluate 8-week Mindfulness intervention or equivalent 4-day intensive course using a mixed methods design. The measures included Blood Pressure, Resting Heart Rate, Perceived Stress, Mindfulness, Compassion and Motivation, alongside diary entries to capture the lived experience.

In this research, a mixed methods design encompassing self-reported questionnaires, neurophysiological measures of EEG frontal asymmetry, blood pressure and heart rate and diary entries were used to gather the results.

From conducting this research it is anticipated that there will be a decrease in perceived stress, blood pressure, heart rate and an increase in mindfulness and compassion following the mindfulness intervention. It is expected that the EEG measures will highlight a greater left than right frontal brain activation following the mindfulness intervention. Mindfulness aims to support individuals towards positive affect. Previous research has shown that the left hemisphere specialises in processing positive affect and approach motivation, whilst in contrast increased frontal EEG  $\alpha$ -asymmetry in the right hemisphere is linked to negative affect and withdrawal or avoidance of an emotional stimulus (Davidson 1993).

Diaries were used to capture the lived experience of attending a mindfulness and compassion intervention, alongside a potential indicator of practice and changes that may run concurrent with quantitative findings. A 6-month longitudinal study was included to highlight the long term findings of the initial 8 week MBSR programme or the 4-day intensive course.

The findings of this thesis will offer additional research in support of areas such as health, education, work, whilst adding to areas such as Psychoneuroimmunology which specialises in how stress and the nervous system can be combined to show further connections between the mind and the body.

If you have any further questions please contact Laura Allen at the following email address [allenl9@uni.coventry.ac.uk](mailto:allenl9@uni.coventry.ac.uk) ,or alternatively the supervisor for this research, Dr Elizabeth Sparkes on [aa8163@coventry.ac.uk](mailto:aa8163@coventry.ac.uk) .

[If you wish to make a complaint regarding the research, please use the contact details below](#)

[Dr Elizabeth Sparkes \(Supervisor for this research\)](#)

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Professor Ian Marshall, DVC

Priory Street

Coventry University

CV1 5FB

[i.marshall@coventry.ac.uk](mailto:i.marshall@coventry.ac.uk)

Thank you for your participation in this research.

### **Links to mindfulness research**

Independent mindfulness research

<http://www.mindfulnet.org/page4.htm>

Andy Puddicombe – Mindfulness meditation

[https://www.ted.com/talks/andy\\_puddicombe\\_all\\_it\\_takes\\_is\\_10\\_mindful\\_minutes?language=en](https://www.ted.com/talks/andy_puddicombe_all_it_takes_is_10_mindful_minutes?language=en)

Thich Nhat Hanh – what is mindfulness?

<https://youtu.be/xD7i6VUOrI>

[http://www.thichnhathanhfoundation.org/?gclid=CI\\_v1PXi\\_80CFawy0wod\\_8ICEQ](http://www.thichnhathanhfoundation.org/?gclid=CI_v1PXi_80CFawy0wod_8ICEQ)

Kabat-Zinn, J. (1994) *Wherever you go, there you are* Vol. 4, New York: Hyperion.

### **Mindfulness retreats and courses**

[http://www.mindfulnesscic.co.uk/?gclid=CP7\\_0rjT\\_80CFUQW0wodWVwKvw](http://www.mindfulnesscic.co.uk/?gclid=CP7_0rjT_80CFUQW0wodWVwKvw)

## Appendix 6

### Self-report scales for study 2 (multiple regression)

#### Scale 1: Expressing compassion for others

- |     |  |   |   |   |   |   |
|-----|--|---|---|---|---|---|
| 1.  | People will take advantage of me if they see me as too compassionate   | 0 | 1 | 2 | 3 | 4 |
| 2.  | Being compassionate towards people who have done bad things is letting them off the hook                     | 0 | 1 | 2 | 3 | 4 |
| 3.  | There are some people in life who don't deserve compassion   | 0 | 1 | 2 | 3 | 4 |
| 4.  | I fear that being too compassionate makes people an easy target  | 0 | 1 | 2 | 3 | 4 |
| 5.  | People will take advantage of you if you are too forgiving and compassionate                                 | 0 | 1 | 2 | 3 | 4 |
| 6.  | I worry that if I am compassionate, vulnerable people can be drawn to me and drain my emotional resources    | 0 | 1 | 2 | 3 | 4 |
| 7.  | People need to help themselves rather than waiting for others to help them                                   | 0 | 1 | 2 | 3 | 4 |
| 8.  | I fear that if I am compassionate, some people will become too dependent upon me                             | 0 | 1 | 2 | 3 | 4 |
| 9.  | Being too compassionate makes people soft and easy to take advantage of                                      | 0 | 1 | 2 | 3 | 4 |
| 10. | For some people, I think discipline and proper punishments are more helpful than being compassionate to them | 0 | 1 | 2 | 3 | 4 |

**Scale 2: Responding to the expression of compassion from others**

- |     |  |   |   |   |   |   |
|-----|--|---|---|---|---|---|
| 1.  | Wanting others to be kind to oneself is a weakness   | 0 | 1 | 2 | 3 | 4 |
| 2.  | I fear that when I need people to be kind and understanding they wont be   | 0 | 1 | 2 | 3 | 4 |
| 3.  | I'm fearful of becoming dependent on the care from others because they might not always be available or willing to give it | 0 | 1 | 2 | 3 | 4 |
| 4.  | I often wonder whether displays of warmth and kindness from others are genuine   | 0 | 1 | 2 | 3 | 4 |
| 5.  | Feelings of kindness from others are somehow frightening   | 0 | 1 | 2 | 3 | 4 |
| 6.  | When people are kind and compassionate towards me I feel anxious or embarrassed  | 0 | 1 | 2 | 3 | 4 |
| 7.  | If people are friendly and kind I worry they will find out something bad about me that will change their mind              | 0 | 1 | 2 | 3 | 4 |
| 8.  | I worry that people are only kind and compassionate if they want something from me   | 0 | 1 | 2 | 3 | 4 |
| 9.  | When people are kind and compassionate towards me I feel empty and sad   | 0 | 1 | 2 | 3 | 4 |
| 10. | If people are kind I feel they are getting too close   | 0 | 1 | 2 | 3 | 4 |
| 11. | Even though other people are kind to me, I have rarely felt warmth from my relationships with others                       | 0 | 1 | 2 | 3 | 4 |
| 12. | I try to keep my distance from others even if I know they are kind   | 0 | 1 | 2 | 3 | 4 |
| 13. | If I think someone is being kind and caring towards me, I 'put up a barrier'   | 0 | 1 | 2 | 3 | 4 |

**Scale 3: Expressing kindness and compassion towards yourself**

- |     |  |   |   |   |   |   |
|-----|--|---|---|---|---|---|
| 1.  | I feel that I don't deserve to be kind and forgiving to myself   | 0 | 1 | 2 | 3 | 4 |
| 2.  | If I really think about being kind and gentle with myself it makes me sad  | 0 | 1 | 2 | 3 | 4 |
| 3.  | Getting on in life is about being tough rather than compassionate  | 0 | 1 | 2 | 3 | 4 |
| 4.  | I would rather not know what being 'kind and compassionate to myself' feels like                                 | 0 | 1 | 2 | 3 | 4 |
| 5.  | When I try and feel kind and warm to myself I just feel kind of empty  | 0 | 1 | 2 | 3 | 4 |
| 6.  | I fear that if I start to feel compassion and warmth for myself, I will feel overcome with a sense of loss/grief | 0 | 1 | 2 | 3 | 4 |
| 7.  | I fear that if I become kinder and less self-critical to myself then my standards will drop                      | 0 | 1 | 2 | 3 | 4 |
| 8.  | I fear that if I am more self compassionate I will become a weak person  | 0 | 1 | 2 | 3 | 4 |
| 9.  | I have never felt compassion for myself, so I would not know where to begin to develop these feelings            | 0 | 1 | 2 | 3 | 4 |
| 10. | I worry that if I start to develop compassion for myself I will become dependent on it                           | 0 | 1 | 2 | 3 | 4 |
| 11. | I fear that if I become too compassionate to myself I will lose my self-criticism and my flaws will show         | 0 | 1 | 2 | 3 | 4 |
| 12. | I fear that if I develop compassion for myself, I will become someone I do not want to be                        | 0 | 1 | 2 | 3 | 4 |
| 13. | I fear that if I become too compassionate to myself others will reject me  | 0 | 1 | 2 | 3 | 4 |
| 14. | I find it easier to be critical towards myself rather than compassionate   | 0 | 1 | 2 | 3 | 4 |
| 15. | I fear that if I am too compassionate towards myself, bad things will happen                                     | 0 | 1 | 2 | 3 | 4 |

### The Perceived Stress Scale

	Almost			Fairly	Very
	Never	Never	Sometimes	Often	Often
<b>1. In the last month, how often have you been upset because of something that happened unexpectedly?</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>2. In the last month, how often have you felt that you were unable to control the important things in your life?</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>3. In the last month, how often have you felt nervous and “stressed”?</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>4. In the last month, how often have you felt confident about your ability to handle your personal problems?</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>5. In the last month, how often have you felt that things were going your way?</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>6. In the last month, how often have you found that you could not cope with all the things that you had to do?</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>7. In the last month, how often have you been able to control irritations in your life?</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>8. In the last month, how often have you felt that you were on top of things?</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>9. In the last month, how often have you been angered because of things that were outside your control?</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Appendix 7

### Comparison of Mindfulness Interventions

Week	MBSR	Breathworks (STRESS)	Mindfulness and Compassion - Vision and Transformation
1	<p>Theme</p> <ul style="list-style-type: none"> <li>❖ There is more right with you than wrong with you.</li> <li>❖ Mindfulness awareness – present moment.</li> </ul> <p>Class content</p> <ul style="list-style-type: none"> <li>❖ Raisin exercise, inquiry &amp; body scan</li> </ul> <p>Home practice</p> <ul style="list-style-type: none"> <li>❖ Body scan x 6 days</li> <li>❖ 9 dot exercise</li> <li>❖ 1 mindful meal</li> </ul>	<p>Theme</p> <ul style="list-style-type: none"> <li>❖ What we resist persists (the more resist unpleasant experiences the more it persists)</li> </ul> <p>Class content</p> <ul style="list-style-type: none"> <li>❖ Raisin exercise – 30 minutes</li> <li>❖ Intro to primary and secondary experience (example if a stressful situation – primary is situation, secondary is our thoughts and feelings)</li> <li>❖ Enact this out in the group using examples – get participants to feel the physical symptoms</li> <li>❖ Mindful tea drinking</li> <li>❖ Meditation body scan 15 minutes – discuss in group</li> </ul> <p>Home practice</p> <ul style="list-style-type: none"> <li>❖ Body scan twice a day</li> <li>❖ One small thing a day practice</li> <li>❖ Complete home practice tracking sheet</li> </ul>	<p>Theme - <b>The Jewel in the Ice</b></p> <p>Setting the scene We have mindful pauses in every session and 10-minute break</p> <p>Class Content</p> <ul style="list-style-type: none"> <li>❖ The jewel - our natural joy, the ice is the barrier. How to melt the ice through mindfulness. Approx 20 minutes</li> <li>❖ Intro to mindfulness of breath and body then 15 minute practice followed by discussion</li> <li>❖ Discussion Mindful pause(s) Pausing throughout class</li> <li>❖ Talk about Vision and transformation</li> <li>❖ Teaching on pain and suffering...using the two dagger metaphor</li> <li>❖ 15 minute mindfulness of B&amp;B</li> </ul> <p>Home Practice</p>
2	<p>Theme</p> <ul style="list-style-type: none"> <li>❖ Perception and thinking outside the box.</li> <li>❖ How people see their stressors.</li> <li>❖ Relationship to stress</li> </ul> <p>Class content</p> <ul style="list-style-type: none"> <li>❖ Body scan</li> <li>❖ Standing yoga</li> <li>❖ Discussion of 9 dots</li> <li>❖ Short sitting meditation</li> <li>❖ Enquiry into previous weeks home practice</li> <li>❖ Short awareness of breath meditation</li> </ul> <p>Home practice</p> <ul style="list-style-type: none"> <li>❖ Body scan x 6 days</li> <li>❖ 10/15 mins sitting meditations</li> <li>❖ Pleasant events calendar daily</li> <li>❖ Daily mindful routine activity</li> </ul>	<p>Theme</p> <ul style="list-style-type: none"> <li>❖ Coming to our sense (problem solving can be counterproductive – thinking about our stress keeps us stressed)</li> </ul> <p>Class content</p> <ul style="list-style-type: none"> <li>❖ Home practice review</li> <li>❖ Introduce breath awareness</li> <li>❖ Enquiry into breath practice x 4</li> <li>❖ Tea break</li> <li>❖ Introduction to doing and being modes – moving to direct perceptions</li> <li>❖ Introduction to mindfulness of breathing meditation practice – led practice</li> <li>❖ Enquiry of practice</li> </ul> <p>Home practice</p> <ul style="list-style-type: none"> <li>❖ Body scan</li> <li>❖ Mindfulness of breathing (CD)</li> <li>❖ Listening to the sounds (CD)</li> <li>❖ One small thing</li> </ul>	<p>Theme - <b>The Feeling Body</b></p> <ul style="list-style-type: none"> <li>❖ Home practice review</li> <li>❖ Mindfulness of B&amp;B -15 minutes - Enquiry</li> <li>❖ Teaching on being at 'home' in the body - discussion</li> <li>❖ Mindful pauses/breaks throughout</li> <li>❖ Thought labelling - working with the 'voices' of criticism and judgement etc - beginning of self-compassion</li> <li>❖ exploring obstacles, feeling stuck in meditation</li> <li>❖ Guided body awareness (BA) meditation 20 minutes - enquiry</li> </ul> <p>Home Practice</p> <ul style="list-style-type: none"> <li>❖ Alternate Mindfulness of B&amp;B with BA during week</li> <li>❖ Practice thought labelling</li> <li>❖ More on second dagger</li> <li>❖ Mindful activities</li> </ul>



3	<p>Theme</p> <ul style="list-style-type: none"> <li>❖ Pleasure and power in being present in body &amp; mind through yoga and meditation.</li> <li>❖ Yoga</li> <li>❖ Awareness of labelling events as pleasant and unpleasant events</li> </ul> <p>Class content</p> <ul style="list-style-type: none"> <li>❖ Meditation with breathing only</li> <li>❖ Enquiry of sitting and home practice</li> <li>❖ Walking meditation</li> <li>❖ Mindfulness lying down yoga</li> <li>❖ Review of pleasant events calendar</li> <li>❖ Short breathing to expand to whole body.</li> </ul> <p>Home practice</p> <ul style="list-style-type: none"> <li>❖ Alternative body scan with yoga</li> <li>❖ Unpleasant events calendar daily</li> </ul>	<p>Theme</p> <ul style="list-style-type: none"> <li>❖ A penny for our thoughts (Thoughts are our main cause of stress – trapping us into a loop)</li> </ul> <p>Class content</p> <ul style="list-style-type: none"> <li>❖ 25 minutes of mindful movement</li> <li>❖ Home practice review in small groups</li> <li>❖ Tea break</li> <li>❖ Intro to 3-minute breathing space</li> <li>❖ Intro to mindfulness of thoughts</li> <li>❖ Mindfulness of breathing</li> </ul> <p>Home practice</p> <ul style="list-style-type: none"> <li>❖ Mindfulness of breathing (CD)</li> <li>❖ Working with thoughts (CD)</li> <li>❖ Mindful movement (CD)</li> <li>❖ One small thing</li> </ul>	<p>Theme - <b>Living in the present</b></p> <ul style="list-style-type: none"> <li>❖ Home practice review</li> <li>❖ Mindful movement followed by Guided mindfulness of B&amp;B with sounds - Enquiry</li> <li>❖ Teaching on (not trying to be mindful/present) but noticing what takes us away from being mindful/present - discussion</li> <li>❖ Pauses</li> <li>❖ 3 step breathing space</li> <li>❖ The roots of mindfulness - the four truths and how they apply to each moment of our lives - discussion</li> <li>❖ a few words on right effort in meditation</li> <li>❖ BA meditation and being compassionate to discomfort and/or pain - enquiry</li> </ul> <p>Home Practice</p> <ul style="list-style-type: none"> <li>❖ Mindfulness of B&amp;B daily</li> <li>❖ Bringing pauses into daily life</li> <li>❖ Mindful activities</li> </ul>
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4	<p>Themes</p> <ul style="list-style-type: none"> <li>❖ Conditioning and perception shape our experience.</li> <li>❖ Review of physiological &amp; psychological bases of stress reactivity and how mindfulness can be used to work with stressful situations and experiences.</li> </ul> <p>Class content</p> <ul style="list-style-type: none"> <li>❖ Sitting meditation 30 minutes (breath and body sensations)</li> <li>❖ Enquiry from previous home assignments</li> <li>❖ Coping with stress discussions (trying to escape drugs, alcohol &amp; suppression of feelings)</li> <li>❖ Short sitting practice</li> </ul> <p>Home practice</p> <ul style="list-style-type: none"> <li>❖ Alternate body scan with lying down Yoga daily</li> <li>❖ Sitting meditation 20 minutes, breath and body sensations</li> </ul>	<p>Theme</p> <ul style="list-style-type: none"> <li>❖ When your buttons are pressed (Life issues and how mindfulness can develop skills to cope better)</li> </ul> <p>Class content</p> <ul style="list-style-type: none"> <li>❖ Mindfulness of breathing (25 minutes)</li> <li>❖ Home practice in small groups</li> <li>❖ Tea break</li> <li>❖ Intro to key concept – Acceptance</li> <li>❖ Acceptance meditation</li> <li>❖ Mindful movement (notice an unpleasant experiences)</li> </ul> <p>Home practice</p> <ul style="list-style-type: none"> <li>❖ Mindfulness of breathing (CD)</li> <li>❖ Body scan (CD)</li> <li>❖ Mindful movement (CD)</li> <li>❖ One small thing</li> </ul>	<p>Theme - <b>Calming the Chattering mind</b></p> <ul style="list-style-type: none"> <li>❖ Home Practice Review and recap on previous sessions</li> <li>❖ Guided meditation B&amp;B and looking for pleasant experience - enquiry</li> <li>❖ A little on why we have busy minds and what we can do to help ourselves</li> <li>❖ More on thought labelling</li> <li>❖ Tools for calming the mind in everyday life</li> <li>❖ Pauses and breaks</li> </ul> <p>Halfway reflection. Do I need to recommit?</p> <ul style="list-style-type: none"> <li>❖ Teaching on kindness/compassion being essence of mindfulness - discussion</li> </ul> <p>Home Practice</p> <ul style="list-style-type: none"> <li>❖ Mindfulness of B&amp;B and BA</li> <li>❖ Practice thought labelling</li> <li>❖ Mindful activities</li> </ul>
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5	<p>Themes</p> <ul style="list-style-type: none"> <li>❖ Awareness of the conditioned patterns of escape from difficulty (flight/ fight stress reactivity/ mindfulness)</li> <li>❖ Connect mindfulness with perception/appraisal in the critical moment of contact and the arising of physical responses.</li> <li>❖ Paying attention to the capacity to respond rather than to react to stressful situations.</li> <li>❖ Honour the full range of emotions.</li> </ul> <p>Class content</p> <ul style="list-style-type: none"> <li>❖ Standing Yoga</li> <li>❖ Sitting meditation – 40 minutes (breath, sounds, emotions, choiceless awareness)</li> <li>❖ Reflections on course so far.</li> <li>❖ Enquiry into previous weeks home practice</li> </ul>	<p>Theme</p> <ul style="list-style-type: none"> <li>❖ The pleasure of small things (Noticing the small pleasures of life that may get missed our life has difficulty)</li> </ul> <p>Class content</p> <ul style="list-style-type: none"> <li>❖ Body scan</li> <li>❖ Home practice review in small groups</li> <li>❖ Tea break</li> <li>❖ Intro to key concept – Negativity bias</li> <li>❖ Letting in the good practice (looking and feeling at something that could evoke a pleasant feeling)</li> <li>❖ Mindful movement</li> </ul> <p>Home practice</p> <ul style="list-style-type: none"> <li>❖ Body scan (CD)</li> <li>❖ Mindfulness of breathing (CD)</li> <li>❖ Mindful movement (CD)</li> </ul>	<p>Theme - <b>Dancing with Dragons/Self Compassion</b></p> <ul style="list-style-type: none"> <li>❖ Home practice review</li> <li>❖ Meditation - enquiry</li> <li>❖ How we live matters - guidelines for living</li> <li>❖ Pauses and breaks</li> <li>❖ 3 SBS</li> <li>❖ Acceptance - what it really is and how to do it</li> <li>❖ qualities we bring to meditation practice</li> <li>❖ Meditation on self compassion. How to embrace difficult feelings - discussion</li> </ul> <p>Home practice</p> <ul style="list-style-type: none"> <li>❖ Mindfulness of B&amp;B and short Self compassion practice during the week</li> <li>❖ New mindful activities</li> <li>❖ Revisiting the second dagger metaphor</li> </ul>
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6	<p>Theme</p> <ul style="list-style-type: none"> <li>❖ Exploring stressful communications</li> <li>❖ Interpersonal mindfulness – staying aware and balanced in relationships</li> <li>❖ Emphasis on recovering and being more balance in difficult conversations</li> </ul> <p>Class content</p> <ul style="list-style-type: none"> <li>❖ Sitting meditation with less instruction - 40 minutes (breath, body, sounds, thoughts, emotions, choiceless awareness)</li> <li>❖ Enquiry into mediation and previous home practice</li> <li>❖ Optional reflection + discussion of difficult communications calendar</li> <li>❖ Communications exercise e.g. hand or verbal aikido-based exercise, role play of avoiding, submissive, aggressive, open +assertive.</li> </ul>	<p>Theme</p> <ul style="list-style-type: none"> <li>❖ <b>The Tender gravity of Kindness</b> (Awareness as warm, gentle and kind)</li> </ul> <p>Class content</p> <ul style="list-style-type: none"> <li>❖ Mindful movement into mindfulness of breathing</li> <li>❖ Home practice review in small groups</li> <li>❖ Tea break</li> <li>❖ Review of key concepts – the three major emotion systems and kindness (red= threat, blue=drive and green=contentment)</li> <li>❖ Kindness to self meditation (30 minutes)</li> </ul> <p>Home practice</p> <ul style="list-style-type: none"> <li>❖ Kindness to self meditation (CD)</li> <li>❖ Any other meditation of choice</li> <li>❖ One small thing – staying in green area when possible</li> </ul>	<p>Theme - <b>Compassion (loving kindness meditation)</b></p> <ul style="list-style-type: none"> <li>❖ Home practice review</li> <li>❖ Mindful movement/walking</li> <li>❖ BA meditation - enquiry</li> <li>❖ Teaching on compassion - what it is and what it isn't - discussion</li> <li>❖ Pauses and breaks</li> <li>❖ Short teaching on moving from self compassion to compassion for others</li> <li>❖ 3/5 stage compassion meditation practice 25 minutes - enquiry</li> <li>❖ Teaching on the difference between true and false emotion</li> </ul> <p>Home Practice</p> <ul style="list-style-type: none"> <li>❖ Mindfulness of B&amp;B and compassion meditation alternate days</li> <li>❖ Notice people's little acts of kindness</li> <li>❖ Notice own acts of kindness and unkindness</li> </ul>
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7	<p>Theme</p> <ul style="list-style-type: none"> <li>❖ Integrating mindfulness practice more fully and personally into daily life.</li> <li>❖ Participants are asked to purposefully reflect on lifestyle choices that are adaptive and self-nourishing as well as those that are maladaptive and self-limiting.</li> </ul> <p>Class content</p> <ul style="list-style-type: none"> <li>❖ Changing exercise seats exercise (optional)</li> <li>❖ Yoga choices exercise (optional)</li> <li>❖ Sitting meditation – choiceless awareness, breath as anchor</li> <li>❖ Home practice and retreat discussion</li> <li>❖ Discussion of what we take in (food &amp; other sensory experiences)</li> <li>❖ Optional mountain/lake or lovingkindness mediation</li> </ul>	<p>Theme</p> <ul style="list-style-type: none"> <li>❖ <b>Meanwhile the world goes on</b> (Taking the kindness meditation further – bringing others to mind)</li> </ul> <p>Class content</p> <ul style="list-style-type: none"> <li>❖ Kindness to self and friend meditation (20 minutes)</li> <li>❖ Home practice review in small groups</li> <li>❖ The exhaustion funnel</li> <li>❖ Sustainers and drainers exercise (likes and dislikes)</li> <li>❖ Tea break</li> <li>❖ Kindness to others exercise (discussion of when someone was kind to you)</li> <li>❖ Kindness to others mediation</li> </ul> <p>Home practice</p> <ul style="list-style-type: none"> <li>❖ Kindness to friend mediation (CD)</li> <li>❖ Kindness to others meditation (CD)</li> <li>❖ Meditations of own choice (CD)</li> <li>❖ One small thing – choose to respond rather than act</li> </ul>	<p>Theme - <b>ABC of mindfulness - it's not what you think it is</b></p> <ul style="list-style-type: none"> <li>❖ Home practice review</li> <li>❖ BA meditation - enquiry</li> <li>❖ The ABC of mindfulness teaching (the contents and the container) This is done partly via visual demonstration with props - discussion</li> <li>❖ Pauses and breaks</li> <li>❖ Contents and container meditation - building on ABC teaching - enquiry</li> <li>❖ Teaching - difference between concentration and mindfulness</li> </ul> <p>Home Practice</p> <ul style="list-style-type: none"> <li>❖ Mindfulness of B&amp;B or Compassion meditation</li> <li>❖ More on thought labelling</li> <li>❖ Being aware of the 'inbetween' times. For example when walking up stairs, when waiting for something.</li> </ul>
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8	<p>Theme</p> <ul style="list-style-type: none"> <li>❖ Keeping up the momentum of intention and commitment developed over the course.</li> <li>❖ Review of supports to help integrate the learning from this program over time: books, recordings, graduate programs, free all day sessions for all graduates 4 times per year, retreat.</li> </ul> <p>Class content</p> <ul style="list-style-type: none"> <li>❖ Body scan</li> <li>❖ Yoga stretches (guided or not)</li> <li>❖ Sitting meditation (mostly silent)</li> <li>❖ Guided reflection – learning from course, goals for future + write a letter to self, or complete post program paperwork.</li> <li>❖ Discuss course in pairs</li> <li>❖ Group discussion of practice without recordings</li> <li>❖ Review course</li> </ul>	<p>Theme</p> <ul style="list-style-type: none"> <li>❖ Let life live through you (Review everything practiced and look to the future)</li> </ul> <p>Class content</p> <ul style="list-style-type: none"> <li>❖ Meditation (30 minutes)</li> <li>❖ Review of course</li> <li>❖ Tea break</li> <li>❖ Following the hands into the breath into kindness (participants in pairs, one participant rests hands on top of the other, the leader of the two gives instructions that the follower must try to tune into with the distractions of bell ringing)</li> <li>❖ A letter to myself</li> </ul>	<p>Theme - <b>Bringing mindfulness to life and what next</b></p> <ul style="list-style-type: none"> <li>❖ Home practice review</li> <li>❖ Meditation - Enquiry</li> <li>❖ Mindfulness in daily life - story of two chicken farmers or similar</li> <li>❖ Discussion</li> <li>❖ Pause/Break</li> <li>❖ Review of course material</li> <li>❖ Option for students to comment on course</li> <li>❖ How to maintain a practice</li> <li>❖ Give them the eight session online course to help this maintain practice</li> <li>❖ Discussion on what next...free practice evenings once a month. Sesshin (intensive meditation days) weekend retreats, seven day retreats with silence, train to teach Vision and Transformation</li> </ul> <p>Goodbyes</p>
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## Appendix 8

### Search strategy example

#### MEDLINE Search Strategy

#### Intervention

S1	MM mindfulness	1598
S2	MM meditation	916
S3	MM "acceptance and commitment therap**"	221
S4	MM "mental health"	5896
S5	MM "holistic health"	187
S6	TI mindfulness OR AB mindfulness	2544
S7	TI meditation OR AB meditation	1253
S8	TI "mental health" OR AB "mental health"	45718
S9	TI "holistic health" OR AB "holistic health"	87
S10	TI "mindfulness based stress reduction" OR AB "mindfulness based stress reduction"	359
S11	TI MBSR OR AB MBSR	273
S12	TI MBCT OR AB MBCT	179
S13	TI "mindfulness based cognitive therap**" OR AB "mindfulness based cognitive therap**"	208
S14	TI DBT OR AB DBT	445
S15	TI "dialectical behavioural therap**" OR AB "dialectical behavioural therap**"	48
S16	TI ACT OR AB ACT	20648
S17	TI "acceptance and commitment therap**" OR AB "acceptance and commitment therap**"	344
S18	TI CFT OR AB CFT	513
S19	TI "compassion focussed therap**" OR AB "compassion focussed therap**"	31
S20	TI "compassion based intervention" OR AB "compassion based intervention"	147
S21	TI "kindness based intervention" OR AB "kindness based intervention"	19

S22	TI "loving kindness based intervention" OR AB "loving kindness based intervention"	8
S23	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22	60882

### Physiological

S24	MM "blood pressure"	11129
S25	MM "heart rate"	19719
S26	MM "respiratory rate"	386
S27	TI "heart rate" OR AB "heart rate"	23773
S28	TI "blood pressure" OR AB "blood pressure"	49888
S29	TI "respiratory rate" OR AB "respiratory rate"	1722
S30	S24 OR S25 OR S26 OR S27 OR S28 OR S29	81420
S31	S23 AND S30	<b>992</b>

## Appendix 9

### Cochrane Collaboration's tool for assessing risk of bias (Chapter 4 Systematic review)

Domain	Support for judgement	Review authors' judgement
<i>Selection bias.</i>		
<b>Random sequence generation.</b>	Describe the method used to generate the allocation sequence in sufficient detail to allow an assessment of whether it should produce comparable groups.	Selection bias (biased allocation to interventions) due to inadequate generation of a randomised sequence.
<b>Allocation concealment.</b>	Describe the method used to conceal the allocation sequence in sufficient detail to determine whether intervention allocations could have been foreseen in advance of, or during, enrolment.	Selection bias (biased allocation to interventions) due to inadequate concealment of allocations prior to assignment.
<i>Performance bias.</i>		
<b>Blinding of participants and personnel</b> Assessments should be made for each main outcome (or class of outcomes).	Describe all measures used, if any, to blind study participants and personnel from knowledge of which intervention a participant received. Provide any information relating to whether the intended blinding was effective.	Performance bias due to knowledge of the allocated interventions by participants and personnel during the study.
<i>Detection bias.</i>		
<b>Blinding of outcome assessment</b> Assessments should be made for each main outcome (or class of outcomes).	Describe all measures used, if any, to blind outcome assessors from knowledge of which intervention a participant received. Provide any information relating to whether the intended blinding was effective.	Detection bias due to knowledge of the allocated interventions by outcome assessors.
<i>Attrition bias.</i>		
<b>Incomplete outcome data</b> Assessments should be made for each main outcome (or class of outcomes).	Describe the completeness of outcome data for each main outcome, including attrition and exclusions from the analysis. State whether attrition and exclusions were reported, the numbers in each intervention group (compared with total randomized participants), reasons for attrition/exclusions where reported, and any re-inclusions in	Attrition bias due to amount, nature or handling of incomplete outcome data.

	analyses performed by the review authors.	
<i>Reporting bias.</i>		
<b>Selective reporting.</b>	State how the possibility of selective outcome reporting was examined by the review authors, and what was found.	Reporting bias due to selective outcome reporting.
<i>Other bias.</i>		
<b>Other sources of bias.</b>	State any important concerns about bias not addressed in the other domains in the tool.  If particular questions/entries were pre-specified in the review's protocol, responses should be provided for each question/entry.	Bias due to problems not covered elsewhere in the table.

### Study 1. Amutio (2014)

Domain	Support for judgement	Review authors' judgement
<i>Selection bias.</i> <b>Clear</b>		
<b>Random sequence generation.</b>	Randomisation through statistical programme SPSS	
<b>Allocation concealment.</b>	No clear description of allocation concealment	
<i>Performance bias.</i> <b>unclear</b>		
<b>Blinding of participants and personnel</b> <i>Assessments should be made for each main outcome (or class of outcomes).</i>	Not mentioned	
<i>Detection bias.</i> <b>unclear</b>		
<b>Blinding of outcome assessment</b> <i>Assessments should be made for each main outcome (or class of outcomes).</i>	Not addressed.	
<i>Attrition bias.</i> <b>Low/med risk</b>		
<b>Incomplete outcome data</b>	No missing data but phase 2 did not include control measures due to logistics.	

<i>Assessments should be made for each main outcome (or class of outcomes).</i>		
<b>Reporting bias.</b>	<b>Low risk</b>	
<b>Selective reporting.</b>	Study protocol is not available but it is clear that the article includes all expected outcomes.	
<b>Other bias.</b>	<b>Low risk</b>	
<b>Other sources of bias.</b>	Appears to be free of other sources of bias.	

### Study 2: Amutio et al 2015

Domain	Support for judgement	Review authors' judgement
<i>Selection bias.</i>	<b>Clear</b>	
<b>Random sequence generation.</b>	Randomisation through statistical programme SPSS	
<b>Allocation concealment.</b>	No clear description of allocation concealment	
<i>Performance bias.</i>	<b>Unclear</b>	
<b>Blinding of participants and personnel</b> <i>Assessments should be made for each main outcome (or class of outcomes).</i>	Not mentioned	
<i>Detection bias.</i>	<b>Unclear</b>	
<b>Blinding of outcome assessment</b> <i>Assessments should be made for each main outcome (or class of outcomes).</i>	Not addressed.	
<i>Attrition bias.</i>	<b>Low/med risk</b>	
<b>Incomplete outcome data</b> <i>Assessments should be made for each main</i>	No missing data but phase 2 did not include control measures due to logistics.	



<i>outcome (or class of outcomes).</i>		
<b>Reporting bias.</b>	<b>Low risk</b>	
<b>Selective reporting.</b>	Study protocol is not available but it is clear that the article includes all expected outcomes.	
<b>Other bias.</b>	<b>Low risk</b>	
<b>Other sources of bias.</b>	Appears to be free of other sources of bias.	

### Study 3. Geary et al (2011)

Domain	Support for judgement	Review authors' judgement
<b>Selection bias.</b>	<b>Unclear</b>	
<b>Random sequence generation.</b>	No clear description of randomisation procedure – randomised depending on location	
<b>Allocation concealment.</b>	No clear description of allocation concealment – allocated depended on location	
<b>Performance bias.</b>	<b>Unclear</b>	
<b>Blinding of participants and personnel</b> <i>Assessments should be made for each main outcome (or class of outcomes).</i>	No mention of opportunities for blinding	
<b>Detection bias.</b>	<b>Unclear</b>	
<b>Blinding of outcome assessment</b> <i>Assessments should be made for each main outcome (or class of outcomes).</i>	Not addressed.	
<b>Attrition bias.</b>	<b>Low risk</b>	
<b>Incomplete outcome data</b> <i>Assessments should be made for each main outcome (or class of outcomes).</i>	Data missing for year follow -up due to Hurricane Ike (Sept,2008)- only impacted some participants.	
<b>Reporting bias.</b>	<b>Low risk</b>	

<b>Selective reporting.</b>	Study protocol is not available but it is clear that the article includes all expected outcomes and outlines reasons for missing data.	
<i>Other bias.</i>	<b>Low risk</b>	
<b>Other sources of bias.</b>	Appears to be free of other sources of bias.	

### Study 1. Nyklickek et al (2013)

Domain	Support for judgement	Review authors' judgement
<i>Selection bias.</i>	<b>Clear</b>	
<b>Random sequence generation.</b>	Randomisation without stratification through SPSS	
<b>Allocation concealment.</b>	No clear description of allocation concealment	
<i>Performance bias.</i>	<b>Unclear</b>	
<b>Blinding of participants and personnel</b> <i>Assessments should be made for each main outcome (or class of outcomes).</i>	Not mentioned	
<i>Detection bias.</i>	<b>Unclear</b>	
<b>Blinding of outcome assessment</b> <i>Assessments should be made for each main outcome (or class of outcomes).</i>	Not addressed.	
<i>Attrition bias.</i>	<b>Low risk</b>	
<b>Incomplete outcome data</b> <i>Assessments should be made for each main outcome (or class of outcomes).</i>	No missing data. Data included for baseline and each interval afterwards.	
<i>Reporting bias.</i>	<b>Low risk</b>	
<b>Selective reporting.</b>	Study protocol is not available but it is clear that the article includes all expected outcomes.	

<i>Other bias.</i>	<b>Low risk</b>	
<b>Other sources of bias.</b>	Appears to be free of other sources of bias.	

### Study 1. O'Donnell et al (2018)

Domain	Support for judgement	Review authors' judgement
<i>Selection bias.</i>	<b>unclear</b>	
<b>Random sequence generation.</b>	Mentions randomisation but no clear description of randomisation procedure.	
<b>Allocation concealment.</b>	No clear description of allocation concealment	
<i>Performance bias.</i>	<b>unclear</b>	
<b>Blinding of participants and personnel</b> <i>Assessments should be made for each main outcome (or class of outcomes).</i>	No mention of blinding	
<i>Detection bias.</i>	<b>Unclear</b>	
<b>Blinding of outcome assessment</b> <i>Assessments should be made for each main outcome (or class of outcomes).</i>	Not addressed.	
<i>Attrition bias.</i>	<b>Low risk</b>	
<b>Incomplete outcome data</b> <i>Assessments should be made for each main outcome (or class of outcomes).</i>	No missing data. Data included for baseline and each interval afterwards.	
<i>Reporting bias.</i>	<b>Low risk</b>	
<b>Selective reporting.</b>	Study protocol is not available but it is clear that the article includes all expected outcomes.	
<i>Other bias.</i>	<b>Low risk</b>	
<b>Other sources of bias.</b>	Appears to be free of other sources of bias.	

## Appendix 10

### Articles included for systematic review (Chapter 4)

Table 3

*Articles included in the review*

Authors	Sample Size	Population	Age	Gender	Ethnicity
Amutio et al (2014)	42	Physicians recruited from Official Medical College of Biscay -Spain	Mean age – 47.31	57.1% women 42.9% men	Unknown
Amutio et al (2015)	42	Physicians recruited from Official Medical College of Biscay -Spain	Mean age – 47.31	57.1% women 42.9% men	Unknown
Gao et al (2016)	11	General population- Hong Kong	Mean age -35.7 years	54.5 % males 45.5 % females	63.6% Asians 36.4% Caucasians
Geary et al (2011)	59	Health Care Employees at University of Texas Medical Branch (UTMB) - USA	Intervention group – 48 +/- 9.6 Control group – 42 +/-8.7	Intervention group- 85% female Control group – 96% female	Intervention group -75% white; 18% Hispanic;2% African Am.;5% Asian Control group – 55% white; 14% Hispanic;11% African Am.; 17% Asian Unknown
Nijjar et al (2014)	18	General population - USA	Mean age – 52.7	44% men Females 70.6% Males 29.4%	Unknown
Nyklicek et al (2013)	88	General population – Netherlands	Mean age – 46.1 years		Unknown
O'Donnell (2018)	28	Middle aged - Elderly dementia caregivers	Mean age – 72 years	26 females 2 males	96% White; 4% Hispanic/Latino

## Appendix 10

### Articles included for systematic review continued (Chapter 4)

Table 4 (continued)

Authors	Design	Intervention	Measures	Results
		Pre- & post measurements		
		Intervention group – 8-week MBSR (n=44)		
		Control group - Received 8-week MBSR two months later (n=44)		
Nyklicek et al (2013)	RCT	Randomization without stratification was applied using SPSS	HRV measured by ECG Diastolic BP (DBP) Systolic BP (SBP) (Plethysmography – cuff around middle finger)	MBSR group showed larger decreases pre-post intervention for both SBP (F (1,58)=4.99, p=.029) and DBP (F(1,58)=11.09, p=.002) when compared to controls.
		No follow up		
		Intervention group – 8 weeks MBSR (n=14)		
		Control group – Progressive Muscle Relaxation (n=14)		
O'Donnell et al (2018)	RCT	5 stages of measurement Pre, post, 8 weeks, 6 months, 12 months  BP measured four times pre Emotional stress test and post for each stage of measurement	Blood pressure machine- arm cuff  Systolic blood pressure only	Decrease in systolic BP for both groups from pre, post, 8 weeks but returning to near baseline by 1-year marker

## Appendix 10

### Articles included for systematic review continued (Chapter 4)

Table 4

Summary of findings from the selected studies

Authors	Design	Intervention	Measures	Results
Amutio et al (2014)	RCT	Pre, post & follow up measurements		
		Intervention – 8 week MBSR (n=21)		Significant decreases in HR in intervention group
		Control group Received 8 week MBSR at a later date (n=21)	Heart rate – beats per minute (Model M3 Omron)	HR (P<0.001, d=-0.60)
Amutio et al (2015)	RCT	Second phase (maintenance) – psychoeducational model (Krasner et al, 2009) – 10 months later		HR not measured in control group
		Pre, post & follow up measurements		
		Intervention – 8-week MBSR (n=21)	Heart rate – beats per minute (Model M3 Omron)	Significant decreases (P<0.001) in HR & BP both in experimental but not control group.
Amutio et al (2015)	RCT	Control group Received 8-week MBSR at a later date (n=21)	Diastolic BP Systolic BP (Model M3 Omron)	Pre-Post intervention group HR (P<0.001, d=-0.60) SBP (P=0.00; d=-0.67) DBP (P=0.00; d=-0.80)
		Second phase (maintenance) – psychoeducational model (Krasner et al, 2009) – 10 months later		HR and BP not measured in control group

## Appendix 11

### Secondary outcome measures for included articles for systematic review (Chapter 4)

Table 5

#### Other outcome measures of the included articles

Author	Outcome measures
Amutio et al (2014)	Five Facets of Mindfulness Questionnaire; Smith Relaxation States Inventory
Amutio et al (2015)	Maslach Burnout Inventory; Five Facets of Mindfulness Questionnaire; Qualitative Questionnaire
Gao et al (2016)	Beck Depression Inventory; Five Facets Mindfulness Questionnaire (FFMQ)
Geary et al (2011)	Cohen's Perceived Stress Score (PSS); SCL-90-R Symptom Checklist (SCL-90); Daily Spiritual Experiences Scale (DSES)
Nijjar et al (2014)	Perceived Stress Scale (PSS-10)
Nyklicek et al (2013)	The 14-item Dutch validated version of the Perceived Stress Scale; Negative Affect subscale (PANAS); Saliva was collected using Salivettes (Cortisol)
O'Donnell(2018)	The Geriatric Depression Scale (GDS-15); The Perceived Stress Scale (PSS); The Revised UCLA Loneliness Scale (UCLA-R Loneliness Scale); The Mindful Attention Awareness Scale (MAAS); The Self-Compassion Scale (SCS); The Zarit Burden Interview (ZBI); The Revised Memory and Behavior Problems Checklist (RMBPC); The Pittsburgh Sleep Quality Index (PSQI); The Mini-Mental State Examination (MMSE); Credibility Expectancy Questionnaire (CEQ); Task Appraisal Questionnaire; Salivary Cortisol

## Appendix 12

### Characteristics of MBCI for systematic review (Chapter 4)

Table 6 Characteristics of the Mindfulness Based and Compassion Focused Therapies

Authors	Intervention	Teacher training	Duration of course	Components of course	Types of exercises	Home practice
Amutio et al (2014)	MBSR	MBSR instructor trained under Jon-Kabat Zinn	8 weeks	2.5 hours a week; 1 day's silent retreat	Body scans, yoga postures, mindfulness exercises	45 mins home practice through CD's
Amutio et al (2015)	MBSR	MBSR instructor trained under Jon-Kabat Zinn	8 weeks	2.5 hours a week; 1 day's silent retreat	1) 20 mins PowerPoint on topic of suffering 2) 45 mins mindfulness exercise (body scan, yoga and mindfulness) 3) 60 min group reflection	45 mins home practice through CD's
Gao et al (2016)	MBSR	MBSR standard training – no mention of teacher training	8 weeks	2.5 hours a week; 1 day retreat	No mention	45 mins practice of body scans and mindful breathing
Geary et al (2011)	MBSR	Taught by a certified MBSR instructor	8 weeks	3 hours a week; 1 day retreat	No mention	No mention
Nijjar et al (2014)	MBSR	No mention	8 weeks	2-3 hours a week; 1 day retreat	No mention	Daily practice encouraged
Nyklicek et al (2013)	MBSR	MBSR training followed. Teacher had completed intensive teacher training and had been teaching continuously for over a year before study.	8 weeks	2.5 hours a week; 1 day's silent retreat	Mindfulness psychoeducation; mindfulness practice; sharing experiences	45 mins home practice
O'Donnell (2018)	MBSR	Instructor followed MBSR protocol	8 weeks	2-3.5 hours a week; 1 day silent retreat	Seated meditation; walking meditation; body scan; Mindful movement (Hatha Yoga)	Homework assignments and audio – no stated time given.



## Appendix 13

### Information sheet for EEG (EEG Chapter)



This information sheet has been adapted from an information sheet prepared by the Brain and Spine Foundation. Their permission to reproduce this is gratefully acknowledged.

[www.brainandspine.org.uk](http://www.brainandspine.org.uk)

Version: 1.1 Date: 15 August 2005

#### EEG

##### What is an EEG?

EEG stands for electroencephalogram. It is a recording of the ‘brainwaves’ – the electrical activity of the brain. The many nerve cells that make up the brain produce continuous electrical activity when a person is awake, asleep or even in a coma. This can be recorded using small metal discs called electrodes, which are placed on the scalp. The electrical signals are then amplified by specialized equipment to produce what is seen in the EEG tracing. The signals show up on the EEG tracing as wavy lines, representing the fluctuations in electrical activity from moment to moment. Doctors/ EEG technicians can gain a great deal of information about the workings of the brain by examining these tracings.

##### What can I expect during an EEG?

The procedure normally takes with the recording itself usually running for about 30-40 minutes. The EEG is carried out either with you sitting up in a comfortable chair or lying on a couch.

### **Preparation for an EEG**

The first step is to apply the electrodes - usually about 20 in all - to the scalp. These are placed in standard positions, according to an internationally agreed convention. The technician will begin by measuring around the head with a tape measure to determine the position for each electrode, which they will mark with a skin pencil. The skin where each electrode is to be placed will be cleaned to ensure that the electrical contact is good enough to allow the weak signals from the brain to be recorded properly.

### **What happens during the EEG?**

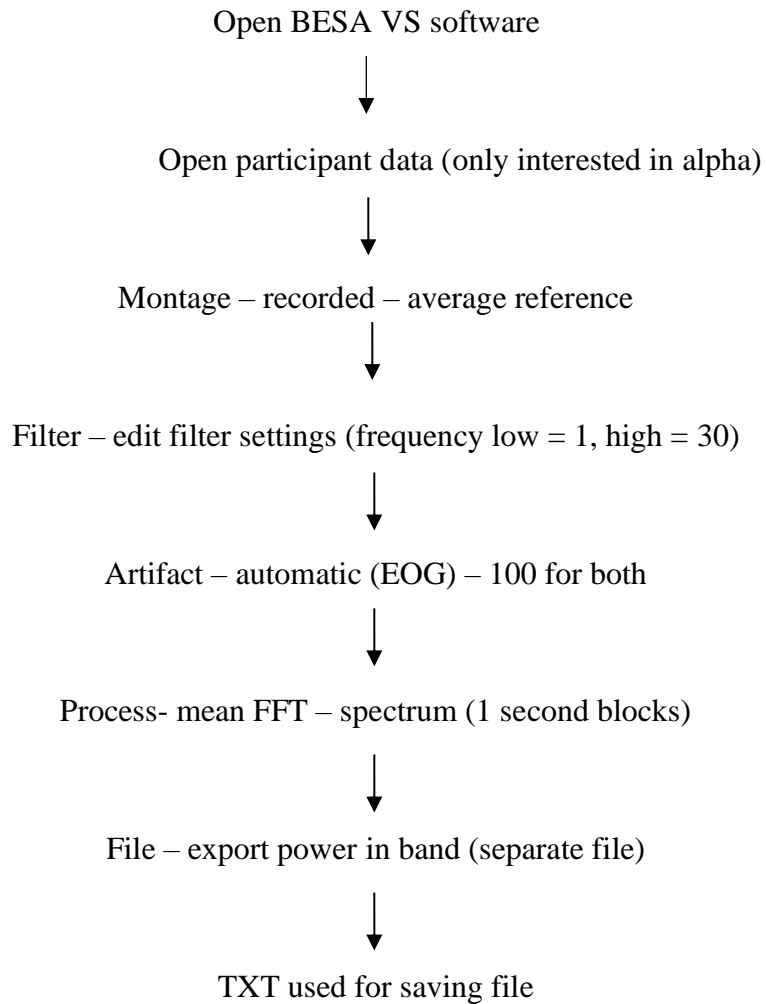
When everything is ready, the technician will ask you to sit or lie in as relaxed a state as you can. This can be quite difficult if you're feeling nervous in unfamiliar surroundings, but once the test is underway, people usually find that they are gradually able to settle down. It is quite important to relax, since a tense person will have tense muscles around the face and forehead and these will produce electrical signals of their own. The electrodes on the scalp will pick these signals up too, obscuring the EEG and making the recording less useful. During the recording, you will be encouraged to close your eyes, relax and drowse, since this may give more information than if the recording takes place when you are fully awake. Despite being in strange surroundings, people often drop off to sleep during an EEG.

### **What happens after the EEG?**

The technician will carefully remove all the electrodes from your scalp. There are no after effects from the EEG so you can carry on with your normal activities immediately.

## Appendix 14

### EEG analysis process



#### Outliers

To interpolate - click to highlight – montage (yes) – interpolate

To delete outliers manually – highlight – decline as artifact – interpolate and then average again

E.N alpha power – Python software

#### SPSS

Brain alpha index will indicate left or right activation

A negative value = greater right-side activation

*Alpha power is inversely related to brain activation*

*e.g. F4 – R hemi = 8*

*F3 – L hemi = 5*

*8-5 = 3 = left activation*

*F4 – R hemi = 3*

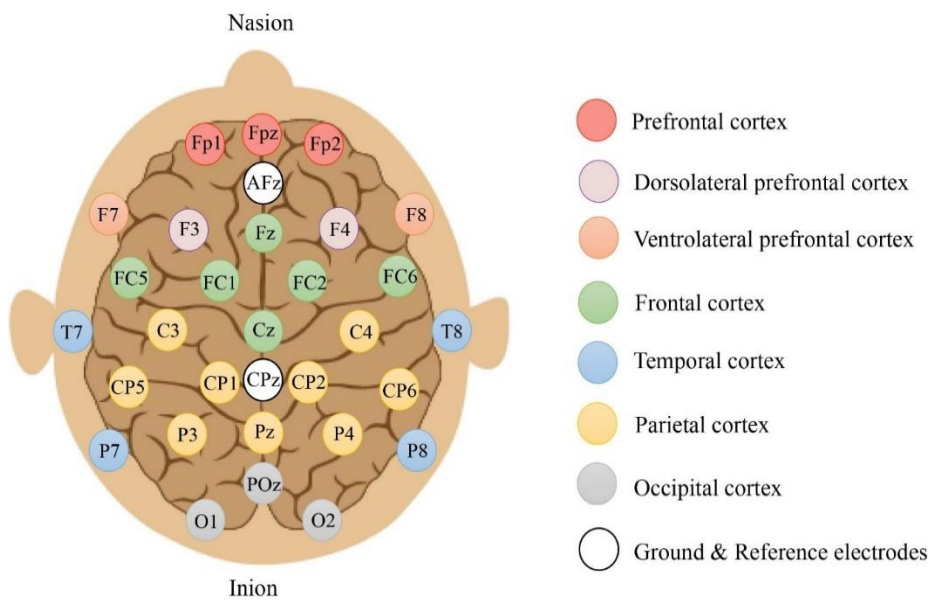
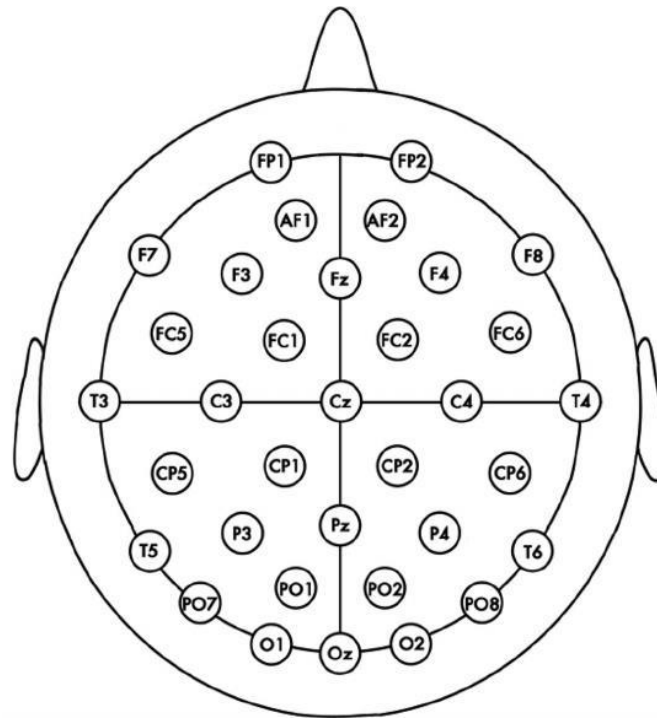
*F3 L hemi = 8*

*3-8 = -5 = right activation*

Split the two groups R VS. L hemispheres and do a between subjects pre/post/follow-up or normal t-test.

## Appendix 15

### Electrode Placement and Areas

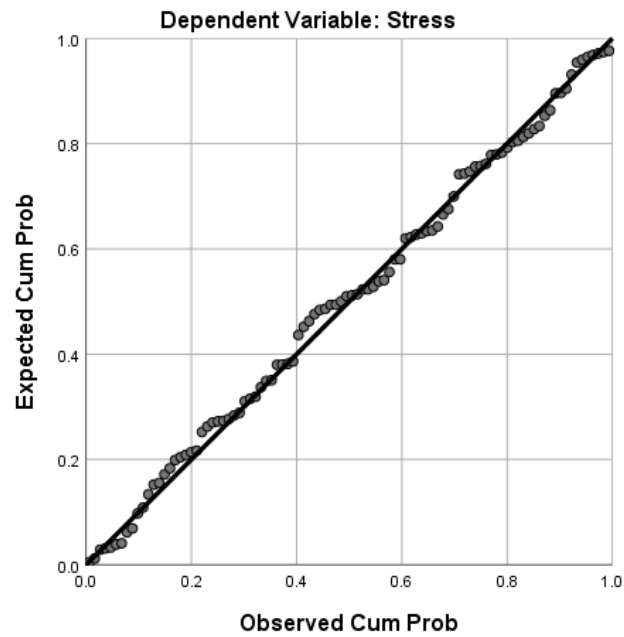


## Appendix 16

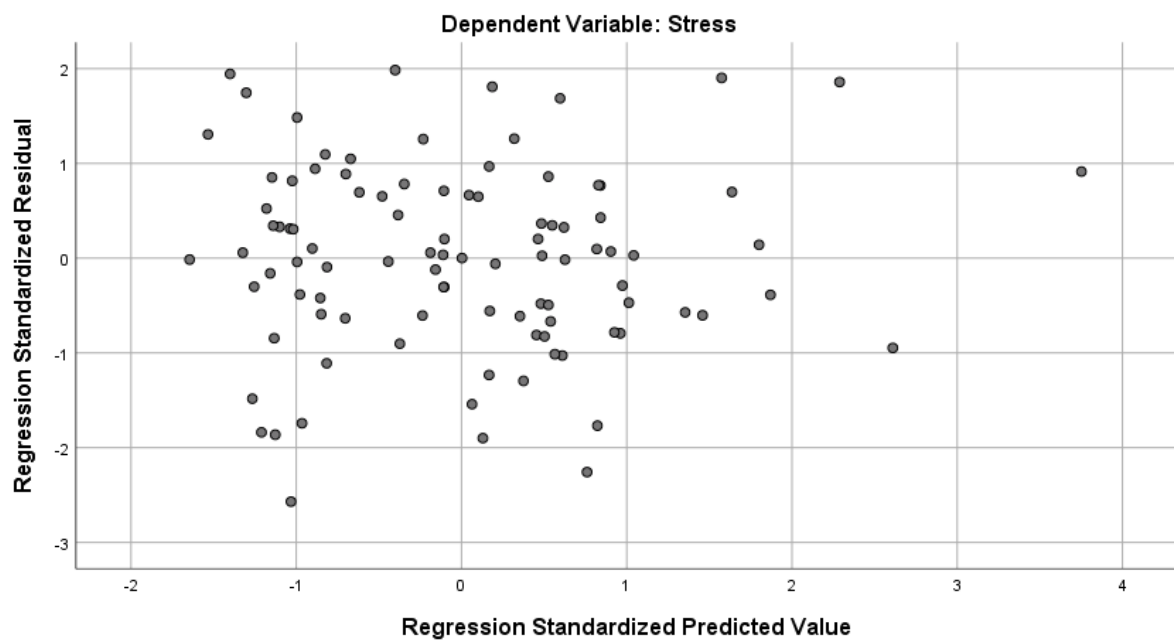
### Scatterplots for multiple regression

Regression 1

Normal P-P Plot of Regression Standardized Residual

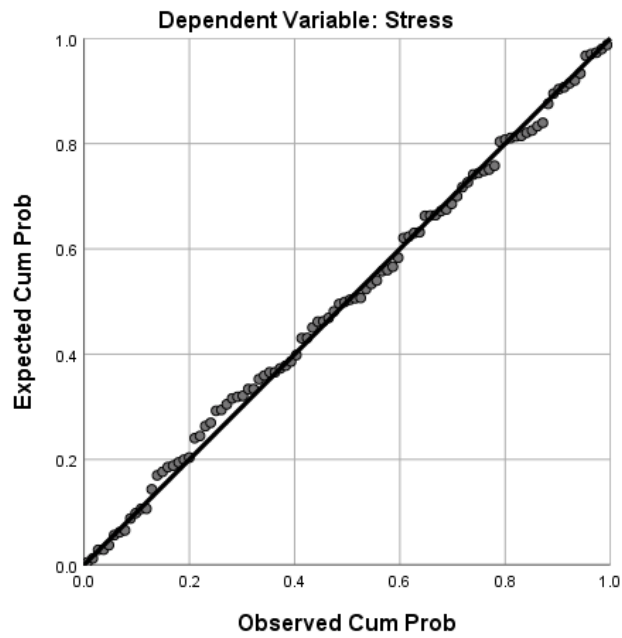


Scatterplot

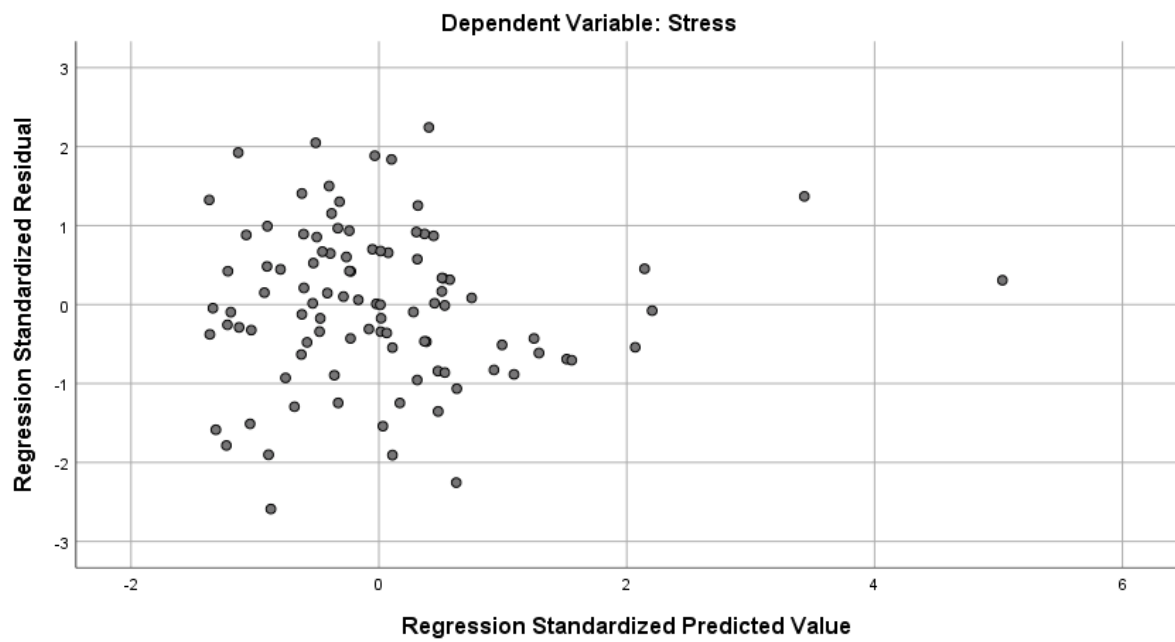


Regression 2

Normal P-P Plot of Regression Standardized Residual



Scatterplot



## Appendix 17

### Guidelines for diary completion (Chapter IPA)

Thank you for agreeing to keep a diary. This 8 week diary is specifically interested in *your* day-to-day experiences of *mindfulness*.

Please try to fill in the diary every evening, by looking back over the day and thinking of times, places or events where you became aware of mindfulness practice, in either a positive or a negative way.

The diary logs will need to be sent back to [allenl9@coventry.ac.uk](mailto:allenl9@coventry.ac.uk) on Sunday of every week. Mid weekly and weekend reminders will be sent to all participants.

In completing your diary, please try to include the following:

- **the date**
- **thoughts**
- **feelings**
- **behaviours**
- **sitting practice**

Please don't worry about grammar or spelling.

You and your diary entries will remain anonymous

Thank you for your participation.

Date .....

**Participant diary example**



Date: 01/10/2016

### **Thoughts**

Today was the first day that I realised how much mind ruminated over situations. After a brief confrontation with a work colleague over a minor disagreement, I continued to go over and over the event, even adding my own bits to the story - accelerating my frustration further. I found it difficult to stop going over it in my head but at least I was aware of it which I wasn't before.

### **Feelings**

My feelings tie in with today's event with my colleague. I struggle to accept the situation has ended and to move on. It doesn't seem that simple. I try to think about compassion for others - but I just feel angry. The event feels personal.

### **Behaviour**

After this confrontation I reflect back on my behaviour and realise that I probably shouldn't have taken it so personally. However it's so difficult not to take it personally. I feel shame/embarrassment if I don't fight my own corner - no one else will. Despite this I feel that even though this is not how I wanted the confrontation to go, I have still been more aware of how I could have handled it differently.

### **Siting practice**

9:50pm -15 minutes of breathing meditation practice

## Appendix 18

### Individual Scores for Electrode Mean

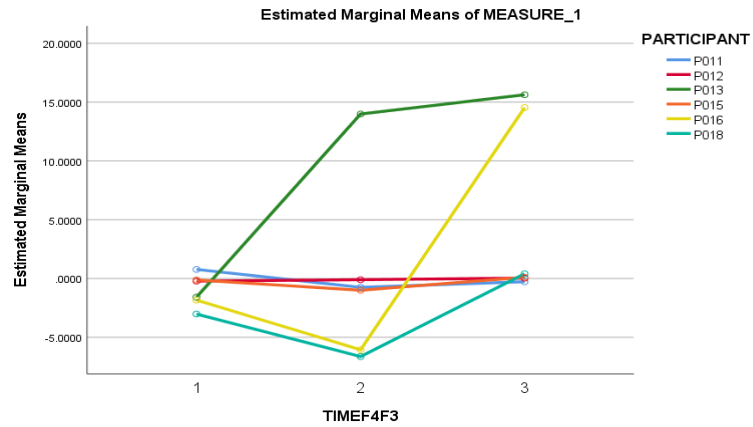


Figure 1. Individual Scores for Electrode Mean F4/F3

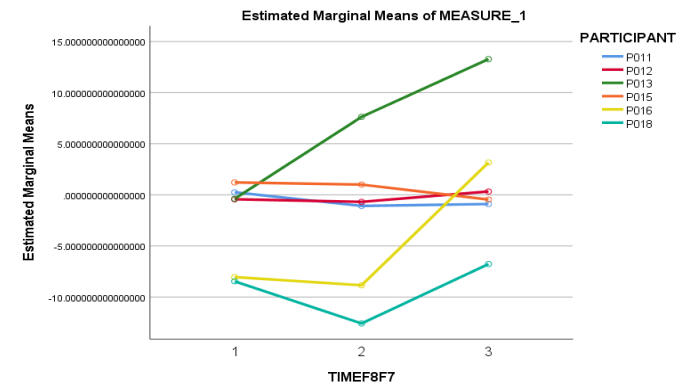


Figure 2. Individual Scores for Electrode Mean F8/F7

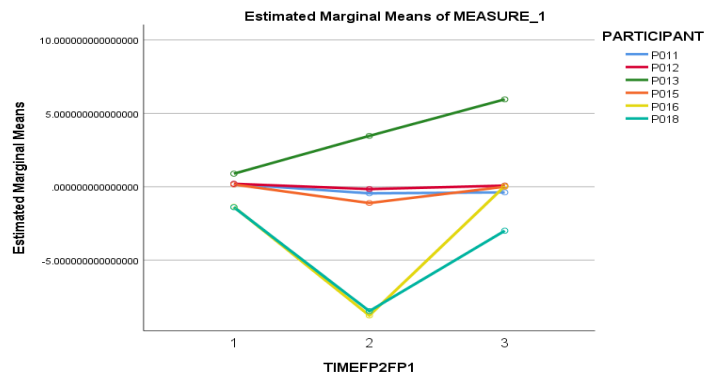


Figure 3. Individual Scores for Electrode Mean FP1/FP2

## Appendix 19

### Coding and Theme Development

<b><i>Expectations a person brings to mindfulness training</i></b>	<b><i>The social awkwardness of practising in a group</i></b>	<b><i>Meditation for beginners is hard work</i></b>	<b><i>The importance of the teacher in making it okay to experience uncertainty</i></b>	<b><i>The importance of techniques/ metaphors/stories in making sense of mindfulness concepts</i></b>
<p>Open to what the experience may bring</p> <p>Employers patience running thin</p> <p>Putting pressure on course to help with life's difficulties</p> <p>Break from normal life was welcome</p>	<p>Feeling more at ease with people</p> <p>Self-conscious of where to sit</p> <p>Disconnection to others</p> <p>Didn't feel safe enough to disclose</p>	<p>Mind racing with thoughts</p> <p>Frustration over difficulties of exercises</p> <p>Difficult to let thoughts go</p> <p>Unaware of what was a mindful shower</p> <p>Body scan most difficult</p>	<p>Teacher advice helpful around those that live in the past or future don't live</p> <p>Reassurance from teacher about going into unknown</p> <p>Should become more comfortable with going deeper the more I do it</p>	<p>Showering with others metaphor helpful</p> <p>Second dagger metaphor was very rewarding</p> <p>Cup analogy – making it bigger</p> <p>Awareness of second dagger</p> <p>Mindfully brushing teeth</p>

<p>Feelings of guilt/self-indulgence</p> <p>Unmet expectations led to frustration</p> <p>Weight of expectation – from self or others that the course will ‘fix’ something</p> <p>Stop anxious brain from running around</p> <p>Fears based on past experience</p> <p>Hopeful of benefits after the course</p>	<p>Awareness of group – struggling to concentrate</p> <p>Previous unrecognised bodily responses whilst meditating</p> <p>Fear of the fart</p> <p>Group very British and polite</p> <p>Don't sit well with silence</p> <p>Discomfort of no distraction</p> <p>Began feeling more at ease with people</p>	<p>Got deeper into meditation then got frightened and had to come out</p> <p>Finding balance between going deeper and not falling asleep</p> <p>Experience overall is difficult – daydreaming can hardly be stopped</p> <p>Thinking all the wrong thoughts</p> <p>Meditation like tailoring – it can take longer than the instant purchase</p> <p>Meditation as ‘frienemy’</p> <p>Meditation can be excruciatingly hard for some of us</p>	<p>Teacher guidance – noticing the small changes</p> <p>Teachers advice of letting go</p> <p>Teachers guidance on continued practice</p> <p>Teacher offered relief around uncertainty</p> <p>Trying to follow teacher's instructions</p> <p>Connection to teacher</p> <p>Teachers feedback</p> <p>Guidance on how to practice reassures, facilitates engagement with further practice</p>	<p>Thinking technique was helpful</p> <p>ABC concept/metaphor difficult to grasp</p> <p>Voice dialogue techniques were interesting</p> <p>Drinking mindfully in the park</p> <p>Two dagger technique showed how rigid my behaviour can be</p> <p>Body awareness was useful and relaxing</p> <p>Changing the container</p> <p>Felt connected to body scan</p>
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<p>Future teacher training</p> <p>Someone else take responsibility for meditations</p> <p>Questioning what mindfulness can do – can it help</p>	<p>Fitting in with the group sometimes - acceptance</p> <p>Stopped myself from crying in front of the group</p> <p>Indecision over spending time with others on the course</p>	<p>Sitting in silence is difficult</p> <p>Focus on breath is difficult</p> <p>Frustration at resistance to practice</p> <p>Spotlight on things I don't want to see</p> <p>Couldn't be bothered with practice – tired, emotional and lethargic</p> <p>Surprised at how difficult it was to focus on present</p> <p>Worried that I can't grasp skills</p>	<p>Feeling better with teachers support</p> <p>Support from teacher was helpful</p>	<p>Able to use labelling technique to come back</p> <p>Using labelling and breath as anchor</p> <p>Jewel in the ICE</p> <p>Second Dagger</p> <p>Labelling technique used with the course practice</p> <p>Able to label thoughts without breaking off</p> <p>Enjoyed self-compassion meditation</p> <p>'Thinking techniques' helpful</p>
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		<p>Critical of focus with a meditation practice</p> <p>Feeling inadequate in my own practice</p> <p>Questioning benefits of second dagger</p> <p>Hard to keep faith that practice will really make a difference to second dagger suffering</p> <p>Awareness of failing to follow the breath</p> <p>Feelings of being a failure</p> <p>Outstanding questions during meditation</p>		
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		Uncertainty around stillness during meditation		
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<b><i>Compassion: Important but challenging</i></b>	<b><i>Shifting awareness of body, place and mind</i></b>	<b><i>Epiphanies/turning points/game changers: when it just makes sense</i></b>	<b><i>Noticing suffering in everyday life</i></b>	<b><i>Responding differently to suffering in everyday life</i></b>	<b><i>Knowing the self better: in a non-judgemental way</i></b>	<b><i>Simple class vs. cluttered life: practising in class is different to practising in everyday life</i></b>
<p>Compassion given to friend in need</p> <p>Experience of compassion to others and to self</p> <p>Felt enlightened when able to allow a difficult person into</p>	<p>More in tune during body scan</p> <p>Aware of background noises</p> <p>Better at feeling body parts compared to earlier</p>	<p>Don't have to be controlled by thoughts</p> <p>Epiphany that thoughts drift to self-criticism</p> <p>Knew this was a turning point in life</p> <p>Sitting with difficult thoughts was game</p>	<p>Biggest critic is self</p> <p>Awareness of thoughts drifting to self-criticism</p> <p>Pain and tension helped to concentrate becoming weaker after</p>	<p>Felt in control and not so impatient</p> <p>Giving compassion to self – no needing to stress</p> <p>Felt calm and in control from second dagger response</p>	<p>Awareness of how current life is 'un-mindful'</p> <p>Pauses are helpful with interactions with others</p> <p>Frustration with partner as needing more space in life</p>	<p>Anxiety around not practicing at home</p> <p>Worry that I won't remember what I have learnt and put it positive practice</p> <p>Permission not to stress during course</p>

compassion meditation	Less tension in the body	changing/ mindscrewing	being centre of attention	Second dagger applied to traffic issues	Getting to know myself	Balancing family life with meditation practices
Self-compassion techniques supported coming back to the breath earlier	Sleep improvement compared to normal	Fast pace has gone – no need to rush	Awareness of clinging and insisting	Exploring emotions helped detach myself from it	Struggle to let go of being right	Worry I don't have time
Mixture of feelings of self-criticism and self-compassion	Focusing on parts of the body	Quite a few lightbulb moments – 'cleanse soul as well as ourselves'	Awareness and compassion of others on the losing end	Able to let go of thoughts of anger, irritation	Constantly busy - physically and in my head	Hard to practice on own with no community
Experience of compassion to others and to self	Counting breaths helped with awareness	Realising I had neglected stillness for a long time	Clinging to always being right impacts on others	Sitting with difficult emotions in meditation	Awareness of how 'nexting' impacts on life	Limited time to be aware outside of course
Lack of self-compassion	Smell of the burning stick		Rationalizing detriment of clinging	Gave emotions a chance to be heard	Began feeling more at ease with people	
	The sounds of the bell provided me with inner power	Sudden profound awareness of aspects of life	Noticing chaos of others around		Choosing not to experience life	Overwhelming feeling with 'how will I do this every day for the rest of my life?'
Self-critical when burning milk	Feeling freezed from the inside is locked in my body	Mindfulness concepts simple but have been blinded till now	Automatic reaction is to block emotion	Partner notices pauses in heated moments	Aware that I judge others a lot – people, things	Concern of practice in everyday life
Committed to giving myself			Sleep interrupted by		At times I feel like I am going mad	



time, compassion and space	Visual images of body keep jumping out of mind during body scan		work issues and to do lists	'having a thought' with partner	Letting go is the biggest difficulty	Difficulty of Integration into normal life
Make the best of me with compassion and acceptance	Can hardly feel the feeling but can only see it		Struggling with obsessiveness of audio books	Increasing capacity to cope by making cup bigger	Fear the need to be in control	Overwhelmed with simplicity
Compassion meditation hard	Incredible sensations in my body		Limiting self with negative worries/concerns	Felt in control and not so impatient	I want to know who I am and find happiness	Simple concepts vs. Complicated Cluttered everyday life
Find it difficult to give myself compassion and easier to give it to others	Sense of heaviness in my legs		Own thoughts keep me trapped	Be more present with daughter	Showed me how rigid my behaviour can be	Awareness of being critical at home
Angry at myself for not practicing self-compassion enough	Feelings of heart exploding		Cycle of suffering is a habit	Pain and tension helped to concentrate becoming weaker after being centre of attention	It's not the event but the reaction that keep me trapped	Home practice difficult
Importance of adding self compassion	Felt that right side of body was higher than left		Giving myself a hard time – not eating properly	Taking one day at a time	Second dagger huge issue for me	Thoughts at home bring up bad experiences
			Emotional and sadness around	Experience of using the breath when		

<p>Comparison of giving compassion to others</p>	<p>Feeling hotness and emotions around heart</p> <p>Meditation with sounds brought a lot of frustration but able to stay with unwanted sounds</p> <p>Wandering mind showing images but not thoughts during meditation</p> <p>Feeling hotness and emotions around heart</p> <p>Helpful vs harmful thoughts</p> <p>Body awareness in present moment</p>		<p>the heart during meditation</p> <p>Negative thoughts centred around work</p> <p>Anxious and knotty stomach when thinking about work</p> <p>Giving myself a hard time – not eating properly</p> <p>Felt tired and drained</p> <p>Aware of experiencing second dagger a lot*</p> <p>Feelings of worry due to</p>	<p>feeling claustrophobic</p> <p>Not judging thoughts</p> <p>Distinguishing thoughts from reality</p> <p>Responding differently using second dagger whilst driving</p> <p>Exploring critical self</p> <p>Giving oneself compassion</p> <p>Not beating oneself up</p> <p>Acceptance with children</p>	<p>Frustration at second dagger approach</p> <p>Acceptance as a key concept</p> <p>Awareness of not having to think or plan whilst being present</p>	<p>Thoughts on course interesting and motivating</p>
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	<p>Awareness of sounds</p> <p>I noticed the haze of the joss stick smoke gently billow around the room</p> <p>I picked up on a bird song</p> <p>The wind blowing</p> <p>Good to feel what was going on in the body as well as the mind</p> <p>Drawn to the heart during the body scan</p> <p>Blood flowing to areas of attention</p>		<p>past experiences</p> <p>Apprehensive because of past unpleasant feelings</p> <p>Noticing others distress in everyday life*</p> <p>Unmet expectations led to frustration</p> <p>Feeling inadequate in my own practice</p> <p>Awareness of daggers</p>	<p>Reduced frustration with children</p> <p>Becoming less reactive in everyday life</p> <p>Seeing inner voice as a challenge</p> <p>Grateful for what is in life</p>		
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	<p>Increased awareness of nature</p> <p>Increased awareness of physical sensations</p> <p>Feeling dozy during body check and sound meditation</p> <p>Feeling present during dog walk</p> <p>Nature brought me back to present</p> <p>Awareness of bird chirrup</p>		<p>Can use up to four daggers during daydreaming</p> <p>Mixture of feelings of deep sadness and happiness</p> <p>Self-critical – common thought</p>			
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<i>The importance of the teacher in making it okay to experience uncertainty</i>	No	Yes			Yes	Yes			Yes							Yes
<i>The importance of metaphors/stories in making sense of mindfulness concepts</i>	No	Yes			Yes		Yes	Yes	Yes							
<i>Compassion: Important but challenging</i>	Yes	No		Yes		Yes	Yes				Yes					
<i>Shifting awareness of body, place and mind</i>	No	No				Yes		Yes	Yes	Yes			Yes			
<i>Epiphanies/turning points/game</i>	Yes	Yes		Yes	Yes		Yes	Yes	Yes				Yes			

<i>changers: when it just makes sense</i>																
<i>Noticing suffering in everyday life</i>	No	Yes!				Yes		Yes	Yes				Yes			
<i>Responding differently to suffering in everyday life</i>	Yes			Yes	Yes	Yes					Yes				Yes	
<i>Knowing the self better: in a non-judgemental way</i>	No			Yes			Yes		Yes	Yes			Yes	Yes		
<i>Simple class vs. cluttered life: practising in class is different to practising in everyday life</i>	No	Yes	Yes		Yes							Yes	Yes			

## Appendix 21

### Mindfulness Concepts & Terminology relating to IPA

**ABC:** A Bigger Contain (ABC) is a further metaphor extension of changing the container (below). ABC highlights the importance of using the skills in mindfulness to make one's container bigger to reduce the chances of the container overflowing when we have become overwhelmed.

**Awareness of Mind, Body & Place:** Part of mindfulness practices include building skills around the awareness of your body and your environment. This would be include using meditations such as the body scan and using your senses. These are a key part of the practice and enable the participant to move after from fusing with subjective thoughts to objective reality.

**Bodyscan:** A body scan is a meditation in which you focus on your body and the sensations that arise. This practice usually moves down from the head to the toes allowing the individual to move their focus to parts of the body.

**Changing the container:** Changing the container is a metaphor used to outline one's capacity to deal with the difficulties that as human beings we will experience.

**Cracked vase:** The cracked vase has a couple of definitions relevant to mindfulness. The first is around accepting one flaws and clinging to perfection and attachment of what one perceives to be the ideal. Accepting that we are all flawed and therefore cracked. The second analogy ties in with not only Buddhism but with Japanese Art Kintsugi. When an item usually pottery is broken instead of it being cast aside as rubbish, it will be mended with gold creating something unique, beautiful whilst accepting the flaws and imperfections.

**Jewel in the ICE:** The jewel represents the position or place we would like to be in e.g. feeling less stressed and the ice represents our emotions/thoughts/behaviours that block us from moving forward to achieve the jewel.

**Mindful activity:** A mindful activity is part of the informal practices of mindfulness that are encouraged during the course. This mindful activity can include any activity that you solely focusing on whilst observing the activity of your wandering mind.



***Second dagger/ double dagger:*** A metaphor used to highlight suffering and the role one can play within suffering. The first dagger is defined as the event/experience that has caused the suffering. The second dagger is the stories and the worries that one fuses to that add to the initial suffering. The second dagger not only adds to the suffering but usually causing us more distress.