

**Maternal health behaviours:
the development and feasibility evaluation
of a mindfulness-based behaviour change
intervention for pregnant women**

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Abstract

Background: Maternal health behaviours are associated with the likelihood of pregnancy complications, and with infants' immediate and lifetime outcomes.

Aim: The overarching aim was to investigate whether mindfulness training might have any potential as the basis of a maternal behaviour change intervention.

Method: The project employed mixed methods. The intervention development was guided by the Behaviour Change Wheel handbook. A cross-section survey investigated relationships between pregnant women's trait mindfulness and: health behaviours: physical activity, taking Vitamin D supplements, BMI at conception, drinking alcohol, smoking; subjective wellbeing and perceived stress; and health behaviour motivation (n = 318). The feasibility of a novel 17-week maternal mindfulness-based behaviour change intervention, "Mind the Bump", was evaluated in an uncontrolled repeated measures and feedback feasibility study (n = 32).

Results: Trait mindfulness was not related to maternal health behaviours. Trait mindfulness was positively related to positive affect and wellbeing, health behaviour motivation, and negatively related to perceived stress and negative affect. Non-adherence to UK recommendations for exercise, Vitamin D, alcohol, and smoking was related to: poorer subjective wellbeing and lower health behaviour motivation. Concurrent risks were more common in women with lower wellbeing and higher negative affect.

The intervention was feasible in terms of recruitment, acceptability, and retention. Adherence was moderate in the contact period (week 1 to 8), and reduced in the self-led period (week 9 to 16). There were no significant changes in health behaviours: physical activity, fruit and vegetable intake, Vitamin D supplementation, or alcohol consumption. There were significant improvements in positive aspects of mental health: mindfulness, positive affect, and wellbeing. There were no significant changes in negative aspects of mental health: perceived stress, negative affect, general anxiety, antenatal depression, and pregnancy distress. There may be more potential to improve health behaviours prior to pregnancy.

Conference presentations

Oral presentations

Hennelly, S., Foxcroft, D., & Smith, L. *Mind the Bump: Mindfulness and antenatal health behaviours*, British Psychological Society West Midlands Branch Annual Conference, Coventry, September 2015.

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Glossary of terms

Antenatal	Before birth, relating to pregnancy
Dispositional	Characteristic
Epidemiology	The incidence, prevalence and possible control of disease and harm to health
Epistemology	The nature, source and limits of knowledge
In utero	Whilst in the womb
In vivo	Whole, living organisms
Lay epistemology	Knowledge from which people arrive at their decisions
Multiparous	Has given birth to one or more children
Neuroplastic	Neurological/brain adaptations to experience
Nulliparous	Has not given birth to children
Parity	The number of times a woman has given birth
Perimenopausal	The period when women's oestrogen levels drop prior to cessation of ovulation at menopause
Perinatal	The period around birth: several weeks prior and post
Postnatal	The time after birth, typically six weeks
Postpartum	After giving birth
Trait	Characteristic, a person's natural inclination
Trimester	Period of pregnancy; first trimester to 13 weeks, second trimester to 26 weeks, third trimester to birth

Glossary of abbreviations

BCT	Behaviour change technique
BCW	Behaviour Change Wheel
BMI	Body mass index
COM-B	Capability, opportunity, and motivation model of behaviour
fMRI	Functional magnetic resonance imaging
GWG	Gestational weight gain
MaPP	Mindfulness: A Practical Programme for Finding Peace in a Frantic World
MBCT	Mindfulness-based Cognitive Therapy
MBEAT	Mindfulness-based Eating Awareness Therapy
MBI	Mindfulness-based intervention
MRI	Magnetic resonance imaging
MBRP	Mindfulness-based Relapse Prevention
MBSR	Mindfulness-based Stress Reduction
MRC	Medical Research Council
NHS	National Health Service
NICE	National Institute for Health and Care Excellence
NIHR	National Institute for Health Research
PIS	Participant Information Sheet
RCT	Randomised controlled trial

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1

Chapter One: Maternal health behaviours and mindfulness.

1.1 Introduction

Maternal health behaviours are associated with the likelihood of pregnancy complications, and infants' immediate and lifetime outcomes (DoH, 2015; Zilbauer et al., 2016). Whilst at least 60% of British pregnancies are uncomplicated (Brocklehurst et al., 2011), there are diverse reasons why some pregnant women do not adhere to UK health behaviour guidance (Olander, Darwin, Atkinson, Smith, & Gardner, 2015). Attention is increasingly turning to consideration of how best to improve maternal health behaviours, and to creating interventions which appeal to women.

This project took a novel approach to understanding and intervening in antenatal lifestyles by investigating the relationships between maternal health behaviours and a psychological characteristic called mindfulness. The overarching aim was to explore whether mindfulness training had any potential to improve women's health behaviours during pregnancy. There were two principal research questions:

To what extent is trait mindfulness related to women's health behaviours during pregnancy?

Is mindfulness training a feasible behaviour change intervention for pregnant women?

The behaviour change and intervention development focus of this project was guided by frameworks and recommendations from the Medical Research Council (MRC) (2000, 2008), National Institute of Health and Care Excellence (NICE) (2007, 2014b), and the Behaviour Change Wheel (BCW) (Michie, Atkins, & West, 2014; Michie, van Stralen, & West, 2011), although the a priori decision to evaluate a mindfulness-based intervention (MBI) constrained their application.

The MRC guidance for developing and evaluating complex health interventions (MRC, 2000, 2008) begins with a preclinical stage which entails exploring the pertinent evidence. Phase I is to identify components for an appropriate intervention, and the anticipated mechanisms by which it will engender behaviour change. Phase II is an exploratory trial. If the intervention shows promise, iterative changes can be made and evaluated until it is sufficiently affective and acceptable to progress to Phase III, a randomised controlled

NICE provides guidance on the principles of developing and evaluating behaviour change interventions (NICE, 2007, 2014b). The first step is a preliminary investigation of the factors associated with the pertinent health behaviours, and the apparent barriers to behaviour change.

The next step is to develop an intervention. The guidelines recommend including effective evidence-based behaviour change techniques, including goal setting, self-monitoring, and social support, and ensuring that behaviour change techniques and delivery formats are a good fit to the potential participants (NICE, 2007, 2014b).

University College London's Centre for Behaviour Change synthesised behaviour change theories, methods and evidence to provide step-by-step recommendations for developing and theorising behaviour change interventions in the BCW (Michie et al., 2014). The first step is to investigate the factors associated with targeted behaviours and to categorise them according to the capability, opportunity and motivation model of behaviour (COM-B) (Michie et al., 2011). The next is to identify the capability, opportunity and/or motivation aspects which the intervention will attempt to change, and then to select behaviour change techniques (BCTs) and intervention formats that are a good fit to the problem and the intended participants (Michie et al., 2011; NICE, 2007).

The BCW includes guidance in how to specify the "ingredients" of the intervention and to consider whether it appears to be implementable. This includes a taxonomy of behaviour change techniques (BCTT v.1); categories to identify the function(s) of the intervention; modes of delivery; and implementation criteria, including affordability, practicality, effectiveness, acceptability, safety, and equity (APEASE) (Michie et al., 2014; Michie et al., 2013). The Theoretical Domains Framework (TDF), which synthesises 33 separate behaviour change theories into a coherent a single 14 domain, 84 construct framework, provides a COM-B compatible approach to anticipating the mechanisms by which an intervention might realise health behaviour change (Cane, O'Connor, & Michie, 2012).

The next step is to test the whether the intervention is feasible. NICE and the National Institute of Health Research (NIHR) make specific recommendations for the criteria against which to assess the feasibility of behaviour change interventions, including recruitment, adherence, costs, safety, indicative affects, and acceptability (NICE, 2007; NIHR, 2015).

The first step of the current project followed the MRC, NICE and BCW recommendation to review the evidence (Michie et al., 2014; MRC, 2000, 2008; NICE, 2007). It begins by summarising the evidence for the potential effects of inactivity, poor diet, high body mass index (BMI), high gestational weight gain (GWG), drinking alcohol, and smoking on maternal and infant outcomes. It outlines the pertinent UK guidance for health behaviours during pregnancy and the estimated

prevalence of non-adherence to these recommendations. The potentially modifiable and fixed factors associated with non-adherence are identified and described in accordance with the capability, opportunity and motivation aspects of behaviour (Michie et al., 2011).

I will propose that mindfulness might be a further factor in maternal health behaviours, and that a mindfulness-based intervention might have some potential to improve them. I will provide a rationale for this by reviewing the literature on the relationships between mindfulness and health behaviours and mental health in clinical, non-clinical and pregnant populations.

1.2 The potential effects of maternal health behaviours on maternal and infant outcomes

The evidence base for the potential impacts of maternal health behaviours is drawn from national surveys, and national and multinational cohort studies. Outcomes associated with maternal physical activity and diet outcomes were reported in Gjestland, Bo, Owe, and Eberhard-Gran's (2013) prospective cohort study with Norwegian 3,482 women; and Stuebe, Oken, and Gillman (2009) prospective cohort study with 1,388 American women.

Systematic reviews of experiment and observational studies inform the effects of adherence to dietary supplements. Prospective UK cohort studies include the Southampton Women's Survey, which reported child outcomes on 948 births (Crozier et al., 2010); the Millennium Cohort's outcomes in 10,534 seven year old children years (Kelly et al., 2013), and the Avon Longitudinal Study of Parents and Children cohort (ALSPAC), which includes 6,500 children (Sayal et al., 2013). An international prospective multi-cohort included British and Irish women reported health behaviours and outcomes for 5,628 women in Chappell et al.(2013) and McCarthy et al.(2013), and 17,244 women in O'Keeffe et al. (2015).

Large scale retrospective reviews of medical records have indicated the potential effects of health behaviours. They include 333,057 Swedish births from 1984 to 2007 (Gardner et al., 2015), and 1,536,828 New York State births from 1993 to 2003 (Mills, Troendle, Conley, Carter, & Druschel, 2010).

Systematic reviews of diverse UK and international studies report consistent effects of non-adherence to guidance for Vitamin D (Wei, Qi, Luo, & Fraser, 2013), alcohol (Flak et al., 2014;

Henderson, Gray, & Brocklehurst, 2007; Henderson, Kesmodel, & Gray, 2007), and smoking (Pineles, Park, & Samet, 2014).

Whilst the data may be subject to social desirability, recall and publication bias, and utilise various quantitative and qualitative methods and measures, their large sample sizes support reliability and generalisability.

Potential impacts of health behaviours during pregnancy

Physical activity

According to Royal College of Gynaecologists (RCOG) advice to health care professionals and pregnant women, women who are active during pregnancy tend to be fitter, happier and less at risk of excessive GWG and pregnancy and/or birth complications than women who are sedentary (RCOG, 2011). The advice is supported by findings that higher activity levels and intensity were associated with lower risk of high GWG (Stuebe et al., 2009), and reduced likelihood of back and pelvic girdle pain and depression in later pregnancy (Gjestland et al., 2013).

Diet

Eating a balanced diet during pregnancy provides women and their infants with the necessary nutrition, and women who do not overeat are less likely to gain excessive weight (NICE, 2008b, 2010c). Gjestland et al. (2013) supported this guidance by indicating that higher calorie intake and eating fried foods were associated with increased odds of higher GWG, although reliance on self-reported GWG and food frequency questionnaires may affect the reliability of the findings.

Supplementing the diet with Folic Acid prior to and during early pregnancy reduces the risks of infant neural tube defects (NRDs) (NICE, 2008a), which are associated with increased risk of infant morbidity and mortality (Blencowe, Cousens, Modell, & Lawn, 2010). Vitamin D throughout pregnancy protects against maternal and infant deficits in calcium metabolism (NICE, 2014d) and may reduce the risk of gestational diabetes, pre-eclampsia, prematurity, and small-for-age infants (Wei et al., 2013).

Body mass index and gestational weight gain

Women who have high BMI at conception and/or gain excessive weight during pregnancy are at higher risk of hyper-tension, gestational diabetes, and birth complications (DoH, 2015; NICE,

2010c). The Southampton Women's Survey indicated that the children born to women who gained excessive weight were more likely to have higher neonatal fat, and to be overweight at four and six years (Crozier et al., 2010). Retrospective analysis of a Swedish cohort found that the mothers of 6,420 children with diagnosed autism spectrum disorders were more likely to have high GWG, controlling for BMI and family factors (Gardner et al., 2015). Similar retrospective analysis of American data indicated that the odds of congenital health defects increased with maternal obesity (Mills et al., 2010).

Alcohol

Alcohol is a neurotoxin and can damage infants' neural systems. Drinking in early pregnancy is associated with increased risk of miscarriage (NICE, 2008a). Alcohol-related damage can be evident at birth if a child has the physical characteristics of Foetal Alcohol Syndrome (Abel, 1998; Autti-Ramo, 2002), or can emerge as developmental deficits. Leibson, Neuman, Chudley, and Koren (2014) estimated that 1% of American children are affected by Foetal Alcohol Spectrum Disorders.

Flak et al.'s (2014) meta-analysis included 10,000 children between six months and 14 years, and concluded that prenatal binge drinking was significantly detrimental to child cognition. Although they found no evidence of effects of low, moderate or binge drinking on academic performance, attention, behaviour, or other developmental indicators, they advised that there is no "safe" amount of alcohol in pregnancy. Bay and Kesmodel's (2011) systematic review concluded that amounts upwards of four drinks per day appear to be associated with deficits in children's motor functions.

However, neither observational nor prospective studies provide consistent outcomes on alcohol-related harms. The UK's longitudinal Millennium Cohort study indicated that self-reported light drinking (up to 2 units per week; one unit is 10 millilitres of pure alcohol) during pregnancy was not associated with significant differences in teacher and parent-rated behavioural and cognitive outcomes in 10,534 children at seven years (Kelly et al., 2013). Self-reported light drinking in the first trimester (< 1 glass of alcoholic drink per week) was not associated with deficits in teacher and parent-rated mental health and Key Stage 2 results in 6,500 11 year old children in the ALSPAC cohort (Sayal et al., 2013).

McCarthy et al.'s (2013) prospective cohort study 5,628 nulliparous women, 60% of whom drank during pregnancy, found no associations between interview and self-report assessed occasional, low, moderate, heavy, or binge drinking on the odds of small for age, low birth weight, pre-eclampsia, or preterm birth.

Systematic reviews of papers published from 1975 to 2005 found no convincing evidence of adverse effects from low to moderate drinking, or of occasional or regular binge drinking on miscarriage, stillbirth, growth restriction, prematurity, birth weight or birth defects (Henderson, Gray, et al., 2007; Henderson, Kesmodel, et al., 2007).

The disparities between the reviews may be due to under-report of drinking, to under-diagnosis, or to methodological weaknesses or publication bias in the included studies. Self-report of stigmatised and/or potentially health-adverse behaviours may be affected by social desirability bias, and women may be inhibited about disclosing foetal alcohol exposure (Lange, Shield, Koren, Rehm, & Popova, 2014; Morleo et al., 2011; Mullally, Cleary, Barry, Fahey, & Murphy, 2011).

Smoking

Cigarette smoke contains a multitude of toxins. Mund, Louwen, Klingelhofer, and Gerber (2013) described smoking as the singularly most avoidable cause of adverse pregnancy outcomes due to its links with prematurity, placental deficiency, congenital heart defects, still-birth, and lifelong health complications, including obesity. There are indications from a French longitudinal birth cohort study that self-reported smoking throughout pregnancy predicts parent-rated hyperactivity and inattention (Melchior et al., 2015). However, Obel et al. (2016) suggested an alternative epigenetic association between maternal smoking and Attention Deficit Hyperactivity Disorder (ADHD), in that child ADHD is more likely the result of maternal ADHD genetics (and higher likelihood of smoking in adults with symptoms) and family environment than the effects of smoking.

Systematic review indicate that active smoking during pregnancy increased the relative risk of miscarriage by 1% for each cigarette smoked per day, and that passive smoking elevated the risk by 11% (Pineles et al., 2014); that heavy smoking whilst pregnant doubled the risk of sudden infant death syndrome (K. Zhang & Wang, 2013); and that lung function can be negatively affected,

leading to greater disposition towards respiratory illnesses during childhood, and to cardiac diseases in adulthood (Maritz & Harding, 2011).

Although the list of potential harms is extensive, “unhealthy” maternal lifestyles are not certain to result in adverse consequences for women or children, and the evidence base is constrained to observational studies. Chappell et al. (2013) identify normal BMI and blood pressure, regular fruit consumption prior to pregnancy, no use of drugs, and being in paid employment as factors which contribute to positive birth outcomes in first time mothers (nulliparous women).

Limitations include reliance on self-reported, observed maternal and child outcomes, and experimental animal studies, as human research is justifiably ethically constrained.

1.2.1 Guidance for maternal health behaviours

Despite the conflicting perspectives on harms, awareness of the potential impacts of unhealthy lifestyle during pregnancy led to NICE providing guidance about what women should and should not do when they expecting a child. They are designed as a guide for health-care professionals, and are the basis for public-facing NHS guidance for people who are planning or expecting a child. This section describes the UK guidance. The UK guidance for exercise, diet, body mass index, alcohol, and smoking during pregnancy is illustrated in Table 1.1.

Table 1.1 UK guidance for maternal health behaviours

Behaviour	Guidance for pregnant women
Exercise	Optimal exercise is at least 30 minutes of moderate intensity leisure time activity per day, and no less than 4 x 30 minutes of moderate activity per week. Sedentary women should begin with 3 x 15 minutes of gentle-moderate exercise per week, increasing to at least 4 x 30 minutes per week. Suitable activities include energetic walking, swimming, and cycling on flat roads or gentle hills (NHS, 2015b).
Diet	Women should adhere to the “Eatwell plate” recommendations. This is a balanced daily diet of at least five portions of fruit and vegetables, starchy carbohydrates, protein-rich foods, and dairy products, and minimal processed, high fat, and sugary foods. They should avoid contraindicated foods (NHS, 2013b). Calorie intake should not exceed 2000 calories per day in the first and second trimester (to week 26) and 2200 to 2300 calories per day in the third trimester (NICE, 2010b). Women should take Vitamin D supplements throughout pregnancy, and Folic Acid supplements prior to conception and throughout the first trimester (to week 13) (NICE, 2008a, 2010a).
Body mass index	Pre-pregnancy body mass index should be within normal range of 18.5 to less than 25 (NICE, 2010c). No guidance for gestational weight gain.
Alcohol	Women should not drink alcohol during pregnancy. NHS and RCOG advise women to remain abstinent throughout pregnancy. NICE advise complete abstinence when planning pregnancy and in the first trimester*. Women who choose to drink after the first trimester should not exceed one to two units of alcohol once or twice a week, and should not binge drink (six units on a single occasion) (NHS, 2013a; NICE, 2008a; RCOG, 2015).
Smoking	Women should not smoke when planning pregnancy or during pregnancy (NICE, 2010b).

*UK Chief Medical Officers’ new guideline is abstinence throughout pregnancy (DoH, 2016).

1.2.2 Prevalence of non-adherence to guidance

There is lack of clear evidence about adherence to guidance, and pregnant women's health behaviours are not routinely monitored by health care professionals. Prevalence figures are obtained prospective and retrospective studies and from Office of National Statistics (ONS) and Health and Social Care Information Centre (HSCIC) pregnancy surveys. General population data provides a basis from which to extrapolate expectations for inactivity, poorer diet, and higher BMI during pregnancy.

Physical activity

National survey data indicate that 45% of British women are insufficiently active (HSCIC, 2014e) in comparison to guidance to engage in either at least five sessions per week of 30 minutes of moderate exercise (150 overall), 75 minutes per week of vigorous activities, or a combination of both (NHS, 2015e).

Exercise levels appear to reduce during pregnancy. According to Atkinson, Parsons, and Jackson's (2014) cross-sectional survey on the impact of pregnancy discovery on physical activity (jogging, cycling, exercise classes, and/or walking briskly), 47% of 1,001 currently or recently pregnant British women self-reported exercising less on becoming pregnant, and 12% stopped exercising. Common reasons included physical symptoms of tiredness, aches and pains, and morning sickness, and 27% were concerned that these activities might cause miscarriage (Atkinson et al., 2014).

International studies indicate that 80% to 90% of pregnant women are classified as inactive, although the generalisability of this to UK women is constrained by variance in the parameters for sufficient activity (Amezcu-Prieto et al., 2013; Borodulin, Evenson, & Herring, 2009; Gjestland et al., 2013).

We can conservatively expect at least 50% of UK women to be insufficiently active during pregnancy.

Diet

All British adults are recommended to eat at least five portions of fruit and/or vegetables each day. Amongst women of reproductive age, 25% adhere to the recommendation (HSCIC, 2014c). The Southampton Women's Survey, which collected data from 12,445 women between 1998 and

2002, reported that 53% of 238 women who became pregnant self-reported eating “five a day” prior to pregnancy (Inskip et al., 2009). Chappell et al.’s (2013) multi-cohort prospective study indicated that 20 to 25% of pregnant women eat three to four portions of fruit a day, and 40 to 50% ate leafy vegetables each day pre-pregnancy.

Retrospective self-report indicates that 80% of pregnant women take Folic Acid (HSCIC, 2012a). Adherence to Vitamin D recommendations is less clear, but 42% of pregnant women self-report taking single Vitamin D or pregnancy multivitamin supplements (HSCIC, 2012a). This is consistent with sufficient blood serum levels of Vitamin D in 42% of 1,494 pregnant women in the Danish Birth Cohort study (Bjørn Jensen et al., 2013).

We can expect no more than 50% of women to adhere to five a day recommendations, 80% to take Folic Acid up to the end of the first trimester, and 42% to take Vitamin D.

BMI

Maternal height and weight data are not routinely collected by health care professionals. Anthropomorphic measurements taken from a representative sample of the UK population in 2013 indicated that 30% of British women of reproductive age were overweight, and 20% were obese (HSCIC, 2014a).

We can therefore expect 50% of women to have high BMI at conception.

Alcohol and smoking

According to 2013 national survey data, 52% of reproductive age women self-reported drinking alcohol, and 21% self-reported smoking (HSCIC, 2014b, 2014d). Fewer women drink or smoke during pregnancy. The prevalence of maternal alcohol and smoking is collected in two different ways. The Infant Feeding Survey (HSCIC, 2012b) is a retrospective self-report completed after giving birth. It reports that 41% of 30,760 women who gave birth between August and October 2010 drank some alcohol and that 12% smoked at some time during their pregnancy.

Cross-sectional data is collected from women who happen to be pregnant at the time when they take part in the annual lifestyle interview study conducted by the Office of National Statistics with a purposive, stratified sample of the UK population (ONS, 2013, 2015a). It reports that 28% of pregnant women drank alcohol in the last week, and that 8% smoked.

Both figures are lower than the highest prevalence reported in O’Keefe et al.’s (2015) prospective multi-cohort interview and repeated measures study, which reported that 40% to 82% of pregnant women drank, and that 20% to 90% smoked at some time during pregnancy. The variation indicates that maternal alcohol and smoking figures are unreliable.

Self-report is suggested to underestimate the prevalence of drinking alcohol whilst pregnant by up to four times in comparison to meconium testing (Lange et al., 2014), although the implication that all pregnant women must therefore drink alcohol at some time is not credible. Comparing self-report of smoking with saliva testing suggests that self-report is understated by 25% (Shipton et al., 2009). In both cases, the upper national survey figure may be more reliable.

We can therefore expect at least 41% of pregnant women to drink, and 12% to smoke.

Co-occurrence

Whilst it is not possible to clearly identify the UK prevalence of “unhealthy” maternal behaviours, it appears that a substantial proportion of British women do not adhere to the NICE and NHS maternal health behaviour guidance. Notably, the proposed prevalence figures total 211%. The implication is that that some women do not adhere to two or more guidelines, although we might also expect some women to adhere to all the guidance. In order to consider how to address the potential problem of non-adherence, it is important to understand the factors associated with these maternal health behaviours.

1.2.3 Factors associated with non-adherence to UK guidance for health behaviours during pregnancy

The evidence base for factors which appear to be associated with maternal health behaviours is drawn from national surveys, retrospective and prospective national and multinational cohort studies, and investigative studies. National health surveys conducted by the ONS and HSCIC report socio-demographic factors associated with general population and maternal health behaviours.

Factors associated with 5000 women’s diet were reported for the Southampton cohort (Crozier, Robinson, Godfrey, Cooper, & Inskip, 2009). Chappell et al.’s (2013) and O’Keefe et al.’s (2015) multinational prospective cohort studies report factors associated with maternal drinking, and the Danish Birth Cohort study with 100,000 women reported factors in binge drinking (Strandberg-

Larsen, Rod Nielsen, Nybo Andersen, Olsen, & Grønbaek, 2008). A Canadian cohort study with 3,021 women reported factors associated with maternal mental health (Bayrampour, McDonald, & Tough, 2015).

Factors associated with smoking were reported from a cross-sectional survey with 1,481 pre-pregnancy smokers from a cohort of 4,295 European pregnant women (Smedberg, Lupattelli, Mårdby, & Nordeng, 2014). A Cochrane systematic review indicated the characteristics of 29,000 women who take part in maternal smoking interventions (Chamberlain et al., 2013).

Capability, opportunity, and motivation factors, including attitudes and beliefs about maternal health behaviours have been investigated in qualitative and quantitative studies (Atkinson, Olander, & French, 2015; Currie et al., 2015; Olander & Atkinson, 2013; Olander, Berg, McCourt, Carlström, & Dencker, 2015; Olander, Darwin, et al., 2015; Peadon et al., 2011). Analysis of medical records and systematic reviews illustrates health behaviour and social factors associated with poorer mental health (Ban et al., 2012; Lancaster et al., 2010). Whilst the data may be subject to social desirability, recall and publication bias and utilise various quantitative and qualitative methods and measures, their large sample sizes support reliability and generalisability.

National surveys, systematic reviews, and prospective and retrospective birth cohort studies indicate that fixed factors may include women's socio-demographic, economic, and pregnancy characteristics, and pre-existing health habits.

Socio-economic factors

Diet quality appears to worsen as socio-economic factor deteriorate. This may be underpinned by ease of access to low-cost, energy-dense foods (Darmon & Drewnowski, 2008). Although there are inconsistencies across prospective and retrospective UK-cohort studies, maternal drinking may be more likely in older women, those who have completed tertiary rather than secondary education (college, university), and/or professional women (Chappell et al., 2013; HSCIC, 2012b, 2014d). Younger, well-educated women in the Danish National Birth Cohort appeared to be more likely to binge drink (six or more units in a sitting) during the unrecognised period of pregnancy. Being unskilled, single and unemployed were associated with binge drinking after recognition (Strandberg-Larsen et al., 2008).

More deprived women are more likely to smoke, despite the general downwards trend of smoking in more affluent countries such as the UK (Chamberlain et al., 2013). The Infant Feeding Survey indicated that maternal smoking was more common in younger, less educated, and less affluent British women in routine occupations, and that younger and unemployed women were least likely to quit smoking during pregnancy (HSCIC, 2012a).

Pregnancy characteristics

Nulliparous women, single women, and those whose pregnancy is unplanned are more likely to binge drink after recognition (Strandberg-Larsen et al., 2008). The American Center for Disease Control considers binge drinking as a potential predictor of unplanned pregnancy in adolescent and adult women (CDC, 2013). Given that at 16% of UK pregnancies are not planned and a further 29% of women are ambivalent about whether their pregnancy was planned or unplanned (Wellings et al., 2013), a large number of women may inadvertently expose their pregnancy to alcohol. Unplanned pregnancy is moderately to strongly associated with complex lifestyle, psychosocial, and lay epistemology factors, including having intercourse before the age of sixteen, smoking, drug use, lower educational attainment, depression, and receiving sex education from a source other than school (Wellings et al., 2013).

The physical effects of pregnancy, such as fatigue, discomfort, and digestive symptoms (nausea, acid reflux, constipation) may effect opportunity to buy and cook “healthy” foods, and exercise (Currie & Atkinson, 2015).

Pre-pregnancy health habits

Lifestyle is potentially modifiable prior to pregnancy, but pre-pregnancy habits can be regarded as fixed factors after conception. Whilst exercise appears to diminish (Atkinson et al., 2014), the Southampton Women’s cohort study reported that diet tended to remain stable across the pre-pregnancy to pregnancy period (Crozier et al., 2009). Only women who drank or smoked prior to conception are likely to drink or smoke during pregnancy.

Potentially modifiable factors

Whilst these factors are, at least to some degree, immutable, other factors may be amenable to change. Potentially modifiable factors associated with maternal health behaviours include risk appraisal, motivation, and psychological health and subjective wellbeing.

Risk appraisal

Risk appraisal is the extent to which an individual perceives that a risk applies to themselves. It appears to be influenced by “lay epistemology”, a heuristic system of beliefs, attitudes, and knowledge assimilated from various sources, including social networks, local norms, selective attention to media and anecdotal stories, and health behaviours in previous pregnancies. It may or may not reflect empirical evidence and professional guidance (Currie & Atkinson, 2015; Peadon et al., 2011). Smedberg et al. (2015) identified not attending childbirth preparation classes as a factor in higher likelihood of smoking. Whether stigma about smoking deters women from attending these classes is not known. Barriers to engaging in maternal health care interventions and missed opportunities to modify risk appraisal, are discussed below.

How women rationalise their health behaviours can influence their actions. Some appear to justify maintaining one health-adverse behaviour by giving up another (Taylor, Webb, & Sheeran, 2013). Qualitative research indicates that drinking alcohol and weight management during pregnancy may be particularly affected by low risk appraisal and mixed messages from health care professionals, the media, and social networks about the guidance (Campbell, Johnson, Messina, Guillaume, & Goyder, 2011; Crawford-Williams, Steen, Esterman, Fielder, & Mikocka-Walus, 2015).

Motivation

Risk appraisal may be a factor in determining initial motivation to change health behaviours on pregnancy discovery. Whilst health care professionals regard this as a window of opportunity to capitalise on women’s surge of motivation to improve their lifestyle (Bloch & Parascandola, 2014; Phelan, 2010), women’s experience of transition and change into pregnancy and imminent parenthood can have the inverse effect on motivation (Campbell et al., 2011). Initial motivation can diminish as pregnancy progresses. According to a cross-sectional “Theory of Planned Behaviour” (Ajzen, 1991) framed-study with 345 pregnant women, the intention to rest becomes more dominant, and perceived control of exercise is reduced (Newham, Allan, Leahy-Warren, Carrick-Sen, & Alderdice, 2015).

Women who were engaged in physical activity prior to pregnancy have already made time to exercise, and may also have greater physical capability and established automatic motivation to maintain exercise levels. However, Newham et al. (2015) indicated that motivational factors of

intentions and subjective norms about resting increase as pregnancy progresses, and that resting is prioritised over exercise. This study did not consider conception BMI, meaning that the findings may suggest that progressive changes in exercise motivation are consistent across BMI group. Diet and exercise motivation may be influenced by lay epistemology beliefs that pregnancy is a time to “put your feet up” and “eat for two” (NHS, 2015b, 2015c). Low or reducing perceived behavioural control for diet and exercise can hinder weight management (Campbell et al., 2011). A qualitative study acknowledged the role of women’s partners in determining drinking during pregnancy (Crawford-Williams et al., 2015).

Mental health and wellbeing

Psychological health and subjective wellbeing appear to be associated with self-care and health behaviours during pregnancy. Up to 18% of British pregnant women have a diagnosable mental health condition (5% depression, 3% to 13% anxiety) and many more have sub-clinical symptoms (Ayers & Shakespeare, 2015; Ban et al., 2014; Howard et al., 2014).

A prospective repeated interview study with 379 pregnant women indicated that pregnancy-specific stress was an exacerbating factor in: insufficient exercise, unhealthy eating, not taking supplements, smoking, high caffeine consumption, and prematurity (Lobel et al., 2008). A systematic review concluded that there are associations between binge drinking and psychological symptoms (Strandberg-Larsen et al., 2008). Cross-sectional surveys indicate associations between subclinical and clinical depression symptoms and smoking (Blalock, Fouladi, Wetter, & Cinciripini, 2005; Smedberg et al., 2014).

Analysis of UK general medical practice records indicated that older (35 to 45 years old) women from the most deprived group were up to 2.63 times more likely to be diagnosed with depression, anxiety, and serious mental illness in the pre- and post-natal periods than younger and more affluent women (Ban et al., 2012). A longitudinal Canadian pregnancy cohort study reported that depression and anxiety symptoms were associated with: low optimism, high perceived stress, low social support, history of mental health diagnoses, relationship difficulties, poor physical health, unplanned pregnancy, and assisted pregnancy (Bayrampour et al., 2015).

This reflects a systematic review of international studies from 1980 to 2008, which concluded that the factors in maternal mental health conditions consistently included maternal anxiety, life

stressors, history of depression, lack of social support, unplanned pregnancy, lower income and education, smoking, being single, and poor relationships including domestic violence (Lancaster et al., 2010). Further systematic reviews conclude that clinical level anxiety is associated with increased odds of low birth weight (50%) and prematurity (76%) (Ding et al., 2014), and that maternal depression is associated with increased odds of pre-eclampsia (35%), low birth weight (20%), and neonatal intensive care admission (43%) (Grigoriadis et al., 2013).

In the longer term, clinical and subclinical levels of maternal stress, anxiety and depression appear to be associated with increased vulnerability to childhood, adolescent, and adult mental illness in their children (Alderdice et al., 2013; Brennan et al., 2008; Yehuda et al., 2005). This may be an outcome of in-utero and childhood factors, including sustained and elevated cortisol exposure prior to birth (Brennan et al., 2008).

Limitations

Whilst studies conducted with large cohorts of pregnant women are likely to have sufficient power to detect relationships between health behaviours and diverse factors, and allow some comparison across cohorts, participation is voluntary and may therefore attract a non-representative sample of women who feel confident to complete surveys about their health behaviours and mental health. Large cohorts tend to be made up of nulliparous women, e.g. O’Keeffe et al. (2015), Chappell et al. (2013), meaning that health behaviour factors unique to, or more important for, multiparous women are not identified. A strength of examining GP records surveys is that this may capture data from “hard to reach” deprived women who might be less likely to participate in voluntary research (Bonevski et al., 2014).

The studies tend to rely on self-reported measures of health behaviours and mental health. They may be subject to social desirability bias, leading to under-report of “unhealthy” behaviours, overstatement of “healthy” behaviours, and under-report of psychological symptoms. Clinical and/or sensitive-topic measures may be unsuitable for anonymous cross-sectional surveys, as they may have some potential to impact mood without there being any capacity to offer support. This may mean that there are challenges in capturing salient factors in health behaviours during pregnancy, and it is notable that themes about domestic violence and relationship tensions tend to emerge from qualitative research rather than surveys.

Whilst quantitative surveys have potential to collect large amounts of data from large samples, qualitative work may be important in attaining a more nuanced understanding of sensitive-topic factors in maternal health behaviours.

Nonetheless, consistency between different cohorts and across systematic reviews suggests generalisable evidence of associations between maternal health behaviours, fixed factors, and potentially modifiable factors. A caveat is that identifying apparent factors does not imply mono-directional cause and effect relationships between health behaviours, risk appraisal, motivation, and mental health, and systematic reviews may compound reporting and publication biases.

1.2.4 Maternal health behaviour change

It is evident that maternal health behaviours are complicated. Although the discovery of pregnancy has been hailed as a “teachable moment” for health-care professionals to improve women's health behaviours whilst they are motivated to care for themselves and their baby (Bloch & Parascandola, 2014; Phelan, 2010), pregnancy is not a magic wand which consistently galvanises behaviour change.

In the UK, pregnant women's first contact with health care professionals is likely to be at the initial NHS midwife booking appointment, during which they are asked about their health behaviours; this may be followed up at subsequent appointments (NICE, 2008a). Women may have access to online NHS guidance on health behaviours during pregnancy (NHS, 2013a, 2015a, 2015b, 2015c, 2015f).

There are a number of NHS referral routes for women who are obese, who self-report smoking, drinking at high levels, and mental health symptoms. Obese pregnant women should be referred to specialist diet and exercise advisors and guided on how to manage GWG (NICE, 2010c). Health-care professionals can refer pregnant women into smoking cessation programmes (NICE, 2014c). Pathways for pregnant women who are drinking at high levels vary between NHS Trusts. Women who seek help for maternal mental health disorders may be referred into talking therapies or offered medication (NICE, 2014a).

The effectiveness of interventions is unclear. GWG interventions do not consistently recruit or retain eligible women (Olander & Atkinson, 2013). Quit rates in pregnant British smokers are lower than for other women of reproductive age (Bauld, Bell, McCullough, Richardson, & Greaves, 2010).

The impact of brief alcohol interventions during pregnancy is uncertain, as the matched controls in an experimental study also cut down (Nilsen, 2009).

Whilst dispelling lay epistemology and encouraging pregnant women to form knowledge-based intentions for their lifestyle during pregnancy is certainly a legitimate approach, it might be important to address the capability and/or opportunity barriers to realising these intentions. It is therefore important to understand the barriers to behaviour change during pregnancy.

1.2.5 Barriers and facilitators for maternal health behaviour change

There is an emergent interest in considering the factors which might impact on maternal behaviour change within the Behaviour Change Wheel (BCW), and its capability, opportunity, and motivation model of behaviour (COM-B), Theoretical Domains Framework (TDF), and the Behaviour Change Techniques Taxonomy (BCTT v.1) (Cane et al., 2012; Michie et al., 2014; Michie et al., 2013; Michie et al., 2011).

Barriers to engaging in interventions

Researchers are attempting to identify reasons why services which target obese women's gestational weight gain appear to be effective or do not recruit a high proportion of eligible women. Olander and Atkinson (2013) identified capability, opportunity, and motivation barriers to engaging in a group-based GWG service from thematic analysis of qualitative interviews with 16 obese women who were eligible for an intervention but did not attend. Physical capability factors included feeling unwell, and decreasing mobility. Practical opportunity barriers included factors of inconvenient time and location, and work commitments. Motivational factors included lack of interest, and not wishing to focus on weight during pregnancy (Olander & Atkinson, 2013).

The latter factor suggests that some obese women may regard pregnancy as an opportunity for some respite from normal weight and eating concerns. The opportunity findings were reflected in Currie et al.'s (2015) content analysis of 418 nulliparous sedentary women's reasons for not being interested or unable to participate in a maternal physical activity randomised controlled trial. 257 women registered interest, but 148 did not attend for reasons including work and time commitments, and sickness. 38% did not register interest due to: practical distance and time constraints, or no interest in taking part.

Focus groups suggested that overcoming practical barriers to attendance by offering one-to-one home visits appeared to be a potentially successful approach to engaging obese women in gestational and post-partum weight management (Atkinson et al., 2015). However, this model may involve higher per capita costs than a group intervention.

Barriers to seeking help

A potential barrier to behaviour change is that stigma about mental health, obesity, drinking, and smoking might deter pregnant women from seeking support from health care professionals to improve their mental health and/or to change their health behaviours. Qualitative and quantitative studies indicate that obese pregnant women experience marginalisation. They report more negative experiences of maternity care during pregnancy, including lack of respect, feeling accused, and feeling humiliated during examinations and scans (Arden, Duxbury, & Soltani, 2014; DeJoy & Bittner, 2015; Furber & McGowan, 2011; Furness et al., 2015).

Health care professionals' barriers to implementing recommendations

Potential barriers are not confined to pregnant women as, although there are NICE guidelines for mandatory mental health screening and taking the opportunity to talk to women about their lifestyles (NICE, 2008a, 2010c, 2014a), qualitative and quantitative studies suggests that midwives can feel inhibited about engaging with pregnant women on these issues. Barriers include fear of disengaging women from maternity care, practical obstacles such as lack of time in appointments, feeling that a woman is not motivated to manage gestational weight gain, and lack of smoking cessation training (Beenstock et al., 2012; Furness et al., 2015; Heslehurst et al., 2014). This may mean that maternal health behaviours risks remain undetected, behaviour change opportunities are missed, and treatable mental health conditions are not addressed.

Maternity care providers report having poorer opinions of obese women's self-management, and feeling some aversion towards caring for them (Furber & McGowan, 2011; Lindhardt, Rubak, Mogensen, Lamont, & Joergensen, 2013; Mulherin, Miller, Barlow, Diedrichs, & Thompson, 2013). Prejudice against obese people is not confined to pregnancy, but stigma about obesity is speculated to contribute to pregnancy complications (DeJoy & Bittner, 2015).

Beenstock et al's (2012) explained midwives' self-reported difficulties in implementing smoking cessation recommendations within the TDF (Cane et al., 2012). Propensity to act was mediated by

professional competency aspects of being in their main place of work, begin trained as a specialist smoking cessation advisor, and the duration of their career as a midwife. The authors suggested that frequent opportunities to offer smoking support were associated with greater ability to acquire knowledge, a sense of competency and support from colleagues, and develop capabilities over time (Beenstock et al., 2012).

Whilst Beenstock et al's (2012) study may have been limited by response bias in its cross-sectional survey, Heslehurst et al. (2014) also applied the TDF (Cane et al., 2012) to their systematic review of health care professionals' barriers and facilitators to implementing pregnancy weight management and obesity guidelines. Knowledge, beliefs about consequences, and environmental context and resources were the most commonly identified domains affecting implementation (Heslehurst et al., 2014).

These studies indicate that pregnant women's and health care professionals' capabilities, opportunities, and motivations might interact to facilitate and inhibit health behaviour change in pregnancy. Health care professionals' skills are beyond the influence of pregnant women, and could therefore be considered as a fixed, extrinsic factor in maternal health behaviour change.

1.2.6 COM-B factors which might be associated with non-adherence to UK guidance for health behaviours during pregnancy.

Considering the various potentially modifiable and fixed intrinsic and extrinsic factors in maternal health behaviours within the physical and psychological capability, physical and social opportunity, and reflective and automatic motivation model of behaviour (COM-B) (Michie et al., 2011) allows consideration of which common and unique aspects of maternal physical activity, diet, alcohol, and/or smoking might be amenable to change (Michie et al., 2014).

Table 1.2 illustrates the COM-B factors which might have potential to affect adherence to UK guidance for health behaviours during pregnancy. It appears that there are common aspects of all four health behaviours, particularly psychological capabilities, social opportunities and reflective and automatic motivations. These factors may be amenable to change during pregnancy, whereas physical capabilities and opportunities are perhaps less modifiable.

Table 1.2 *Capability, opportunity and motivation factors that might impact adherence to UK guidance for maternal health behaviours*

COM-B component	Factor	Activity	Diet	Alcohol	Smoking
Physical capability	Physical fitness	X			
	Body mass index	X			
	Pregnancy symptoms (pain, nausea, fatigue, mobility)	X	X		
	Higher risk pregnancy (blood pressure, diabetes, pre-eclampsia)	X	X		
	Physical addiction			X	X
Psychological capability	Mental health and wellbeing	X	X	X	X
	Established coping strategies	X	X	X	X
	Knowledge about guidelines	X	X	X	X
	Knowledge about how to change health behaviours	X	X	X	X
	Knowledge about seeking support	X	X	X	X
	Behavioural regulation	X	X	X	X
	Emotional regulation	X	X	X	X
Physical opportunity	Time commitments	X	X		
	Work commitments	X	X		
	Proximity	X	X		
	Financial resources	X	X	X	X

COM-B component	Factor	Activity	Diet	Alcohol	Smoking
Social opportunity	Local social norms	X	X	X	X
	Partner support	X	X	X	X
	Family support	X	X	X	X
	Peer support	X	X	X	X
	Social support	X	X	X	X
	Education	X	X	X	X
	Affluence/deprivation	X	X	X	X
	Employment status			X	X
	Age group			X	X
	Relationship status			X	
Reflective motivation	Risk appraisal	X	X	X	X
	Intentions	X	X	X	X
	Perceived behavioural control	X	X	X	X
	Self-efficacy	X	X	X	X
	Self-care	X	X	X	X
	Goals	X	X	X	X
	Lay epistemology, including stereotypes and stigmas	X	X	X	X
Automatic motivation	Pre-pregnancy and current health habits	X	X	X	X
	Emotional valence of health behaviours	X	X	X	X
	Feelings about the pregnancy	X	X	X	X

(Michie et al., 2011)

Summary

This section has considered the capability, opportunity, and motivation factors which appear to be associated with maternal health behaviours. The relationship with maternal mental health suggests that an intervention which improves maternal mental health might have some capacity to leverage health behaviours.

There is, at present, a lack of evidence for effective interventions to target a range of health behaviours in pregnant women. Given the links between mental health and health behaviours, it seems timely to explore the application of an approach that has shown promise in targeting mental health in this population and health behaviours in the general population: mindfulness training.

The following section reviews the evidence for mindfulness in this context. It begins by defining mindfulness as a natural psychological trait (disposition/characteristic). It reviews the literature on relationships between trait mindfulness and health behaviours, and between trait mindfulness and mental health. It illustrates the various ways in which mindfulness training courses appear to support health behaviour change and improvements in clinical and community mental health. The clinical mental health literature is more substantial; health behaviour research is more nascent.

Literature is beginning to emerge on the potential of mindfulness training to improve the mental health of pregnant women, particularly those with clinical symptoms. It has not been evaluated in the context of maternal health behaviour change. A caveat is that literature from 2012 onwards was not available to inform this project's studies.

1.3 Mindfulness

Mindfulness is an inherent psychological characteristic typified by certain types of awareness, attitude and intention. The awareness aspect entails an ability to be lucidly aware of present moment experience. The attitude aspect entails having an open, accepting, and curious engagement with present moment experience, irrespective of its emotional valence. The intention is to be non-judgemental, fully aware, self-accepting, and self-compassionate (J. Kabat-Zinn, 2003). As such, mindfulness is the inverse of "mindless" habit-driven automaticity, rumination, emotional and behavioural reactivity, avoidance, pre-occupation with past and future events, and a negative inner narrative (Brown & Ryan, 2003). Being more mindful than mindless might therefore obviate the

development of maladaptive cognitive and behavioural coping strategies and habits (Black, 2010; Loucks et al., 2015).

As with other psychological traits, people vary in their natural capacity and inclination towards being mindful (Brown & Ryan, 2003). Individual differences in trait mindfulness are suggested to arise from a combination of maternal mindfulness during pregnancy, secure attachment, and neuroplastic response to developmental experiences (Pepping & Duvenage, 2015; van den Heuvel, Johannes, Henrichs, & Van den Bergh, 2015). This suggestion is supported by differences in the insula structure of more and less naturally mindful adolescents (Friedel et al., 2015). Although self-reported mindfulness may be subject to reporting biases, the neurological finding may indicate different inherent propensities to embodied awareness and empathy.

Black (2010), Peters, Erisman, Upton, Baer, and Roemer (2011), and Loucks et al. (2015) propose that higher trait mindfulness reduces the translation of stress into maladaptive, impulsive behaviours, which appear to manifest in better mental health and health behaviours in people with naturally higher levels of mindfulness.

1.3.1 Trait mindfulness and mental health

Empirical studies and systematic reviews of clinical and non-clinical studies indicate that higher trait mindfulness is consistently associated with better psychological wellbeing in the forms of greater life and relationship satisfaction, optimism, sense of competence, empathy, positive affect, and quality of sleep; and lower emotional and cognitive reactivity, rumination, negative bias, and depression (Brown & Ryan, 2003; Keng, Smoski, & Robins, 2011; Paul, Stanton, Greeson, Smoski, & Wang, 2013; Pepping & Duvenage, 2015). According to a cross-sectional survey with non-clinical German adults, the positive relationships between trait mindfulness and wellbeing may be mediated by greater ability to self-regulate behaviours and emotions (Sauer, Walach, & Kohls, 2011).

A limitation with the studies and reviews is that they rely on self-report, use multiple quality of life and mental health measures, and employ various single and multi-faceted measures of mindfulness, and may therefore not be comparing like-with-like across studies. Report and publication bias may be compounded in systematic reviews.

An unanswered question is whether trait mindfulness is related to maternal mental health and wellbeing.

1.3.2 Trait mindfulness and health behaviours

Given the apparent associations between mental health and health behaviours, we might expect more mindful individuals to have healthier lifestyles. There is a lack of empirical evidence in this area and most studies are small scale, but a recent survey of almost 50,000 French women reported that the odds of them being overweight or obese were reduced by 16% and 29% respectively as trait mindfulness as measured by the Five Facet Mindfulness Questionnaire (FFMQ) (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006; Baer et al., 2008) increased, adjusting for age, education levels, smoking status, and exercise levels (Camilleri, Méjean, Bellisle, Hercberg, & Péneau, 2015). It would be interesting to know what, if any, associations existed between the women's trait mindfulness and their socio-demographic and health behaviour characteristics.

An American health insurance company survey of 382 middle-aged subscribers found that those with higher trait mindfulness (as measured by the single facet Mindful Attention and Awareness Scale (MAAS) (Brown & Ryan, 2003)) were more likely to have better cardiovascular health, to be sufficiently active, to not smoke, to have normal range body mass index, and/or to have normal fasting glucose levels. These health factors were mediated by lower depressive symptoms and higher behavioural self-efficacy (Loucks, Britton, Howe, Eaton, & Buka, 2014), which reflects the psychological capability factors in maternal health behaviours above.

Whilst Loucks et al.'s (2014) study relied on self-report of psychological factors and some behavioural factors, cardiovascular health, height, weight, and blood indicators were objectively measured by health care professionals. A further paper from this study also indicated that participants' who became obese as adults had lower trait mindfulness than those who were not obese in childhood or in adulthood. The authors speculate that higher trait mindfulness offers some protective effect for obesity and cardiovascular risks (Loucks, Britton, et al., 2016).

A study on trait mindfulness and diabetes indicated that higher trait mindfulness (measured by the short form of the FFMQ (Bohlmeijer, ten Klooster, Fledderus, Veehof, & Baer, 2011)) was associated with lower incidence of impulsive, emotional, and unrestrained eating in 634 Dutch women with Type 1 and Type 2 diabetes (Tak et al., 2015). Whilst these women already had diabetes diagnoses, the findings might suggest that higher trait mindfulness may offer some protection against exacerbation.

In lifestyle-specific studies with university students, trait mindfulness (single-and multi-faceted measures) was positively associated with: physical activity, exercise self-efficacy, healthier eating and adherence to five a day recommendations, fewer alcohol problems, not smoking, sleep quality, fewer physical health symptoms, and lower translation of low mood and stress into smoking in smokers (Black, 2012; Black, Milam, Sussman, & Johnson, 2012; Black, Sussman, Johnson, & Milam, 2012; Bodenlos, Noonan, & Wells, 2013; Gilbert & Waltz, 2010; Murphy, Mermelstein, Edwards, & Gidycz, 2012; Roberts & Danoff-Burg, 2010; Roos, Pearson, & Brown, 2015; Tsafou, De Ridder, van Ee, & Lacroix, 2015).

A limitation is that the generalisability is constrained by small and non-representative samples taking part in primarily cross-sectional, self-report surveys. However, the findings may support Brown, Ryan, and Creswell's (2007) proposal that trait mindfulness is associated with improved self-regulation.

The field is limited, but there is growing interest in whether trait mindfulness might be associated with various health behaviours and lifestyle-related diseases, and whether mindfulness training might therefore have any potential as a primary or remedial intervention to reduce health risks. Early indications from cross-sectional surveys are that single-facet and multi-facet trait mindfulness may be associated with some health behaviours.

An unanswered question is whether trait mindfulness is related to maternal health behaviours.

1.3.3 Mindfulness-based interventions

Mindfulness training courses, generically known as mindfulness-based interventions (MBIs), are structured programmes that aim to increase people's trait mindfulness levels, thereby increasing their propensity to think, feel and behave in the ways that characterise mindfulness. Mindfulness training is not a new phenomenon. It has its origins in insight meditation practices dating back 2,500 years, and its place in major religious and philosophical traditions, particularly in the East. Its journey into the West gathered momentum during the 1960s and, although it was initially seen as an eclectic pursuit, its potential in therapeutic and clinical contexts was realised in the 1970s.

The first remedial MBI was called Mindfulness-based Stress Reduction (MBSR). MBSR was developed by Jon Kabat-Zinn (1982) in an attempt to alleviate psychological stress in hospital patients with chronic, untreatable pain and physical health conditions. The self-reported and observed positive outcomes on stress and quality of life in patients for whom neither pharmacology nor surgery

alleviated suffering was seminal to the secular, skills-based, non-esoteric mindfulness trainings that now form the “third wave” of cognitive-behavioural therapies (Hunot et al., 2013).

MBSR was delivered as an eight week, 2.5 hours per week group course, and the patients were expected to do up to an hour of mindfulness practice per day. This has remained a standard format for clinical mindfulness courses, irrespective of the specific pathologies to which they have been adapted. Programmes include meditation and trainer-led enquiry into participants’ experience of doing this.

Practicing mindfulness meditation involves attempting to pay focused attention to moment-by-moment sensory sensations, such as the feelings of breathing, the body resting on the floor/chair, or gentle yoga movements. Over time, practice includes paying attention to sounds, to the physical effect of emotions, and to negative thoughts and their effect on the body. These exercises culminate in practicing open monitoring of all and any moment-by-moment experiences. Integral to these practices is attempting to be open and curious about these experiences, to notice any unnecessarily harsh self-judgemental or tendency towards emotional, cognitive and behavioural reactivity and maladaptive habits.

Mindfulness in daily life is encouraged by informal mindfulness practices, such as paying mindful attention to routine activities such as: teeth cleaning, eating, and walking. Some mindfulness courses include practices that explicitly aim to cultivate compassion and kindness for ourselves and for others. Most courses have a short practice designed to be used in moments of stress/reactivity or to focus attention on a task. Cultivating this type of attention and attitude tends to enhance the ability and propensity to be more naturally mindful, in accordance with Kabat-Zinn’s (2003) definition: “the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment”.

Mindfulness-based Cognitive Therapy (MBCT) was adapted from MBSR by Segal, Williams, and Teasdale (2002) to address the problem of relapse into recurrent clinical depression. This programme is the foundation of a non-clinical course called “Mindfulness: A Practical Path to Finding Peace in a Frantic World” (MaPP) (Williams & Penman, 2011; Williams, Penman, & Cullen, 2013). Other problem-specific adaptations include Mindfulness-based Eating-Awareness Training (MB-EAT) to reduce binge eating (Kristeller & Hallett, 1999), and Mindfulness-based Relapse Prevention (MBRP) to maintain abstinence after drug or alcohol rehabilitation (Bowen, Chawla, & Marlatt, 2011). These interventions integrate mindfulness training with effective, evidence-based cognitive, behavioural and relapse

prevention techniques. A strength of MBIs is that they are adaptable to specific problems in specific groups of people whilst maintaining a core set of principles and mindfulness practices (Teasdale, Segal, & Williams, 2003).

1.3.4 Mindfulness-based interventions for health behaviour change

The literature on MBIs for health behaviour change in non-clinical populations is limited to interventions for weight management and smoking cessation. The current evidence is generally limited to small pilot studies, which constrains the generalisability of the outcomes.

MBIs appear to have potential to increase tolerance of food cravings. Overweight or obese women engaged in a weight management plus MBI programme self-reported reduced food cravings in comparison to the control group (Alberts, Mulkens, Smeets, & Thewissen, 2010). This suggests that MBIs may have some potential to support eating regulation in non-clinical women who are motivated to management their weight.

Jenkins and Tapper (2013) evaluated the effects of brief, single-dimension mindfulness practices (cognitive diffusion v. acceptance v relaxation control) on the chocolate consumption over five days of women who were trying to cut down. Diffusion was more associated with cutting down. It is interesting that a single element of multi-faceted mindfulness programmes - awareness control - was effective in resisting cravings, whereas acceptance was not effective.

A complex “Mindful Restaurant Eating” programme for 35 perimenopausal women integrated planning what to eat when dining out, goal setting, and self-monitoring with mindful eating practices over eight weeks. The intervention group lost more weight and ate fewer calories, and reported greater changes in self-regulation and diet-related self-efficacy than the control group (Timmerman & Brown, 2012).

The essential commonality between these studies was that the women were motivated to manage their diet and/or weight. It seems unlikely that participation would have any effects for people who were not ready to change. Larger scale evaluations of these programmes do not appear to have occurred, although Ogden et al. (2013) propose a useful model of “mindless” distracted eating, and reported that inadvertently overeating is more frequent whilst watching television than for driving, social, or solitary eating. This may suggest that encouraging “mindful” focus on eating has potential to reduce unintended overeating, as in Timmerman and Brown (2012).

Sufficient evaluations of mindfulness-based interventions for smoking cut-down and cessation have been conducted for a systematic review of controlled pilot and feasibility trials to indicate that adaptations of MBRP have consistent positive effects on cutting down, cessation, and relapse. The mechanisms appear to involve moderating the strength of craving-smoking reactivity, and developing coping strategies to manage cravings (de Souza et al., 2015). Ability to tolerate cravings over time may therefore be associated with neuroplastic changes and consequent reductions in the automaticity of behavioural reactions to emotional and environmental triggers for smoking. Social-cognitive learning (Bandura, 1986) to behave differently in familiar contexts may also contribute to changes in smoking and in restaurant eating.

A study which assessed changes in self-rated sleep quality, exercise levels, diet quality, alcohol, and smoking in 174 people taking part in a routine MBSR programme reported significant improvements in sleep quality and dietary behaviours (more regular consumption of fruit and vegetables, fewer desserts, sweet drinks, fast food, and fats), small improvements in sedentary behaviour and physical flexibility, and small reductions in drinking (Salmoirago-Blotcher, Hunsinger, Morgan, Fischer, & Carmody, 2013).

This study offers some encouragement that becoming more mindful incidentally results in improved health behaviours, as the programme focused on stress management rather than being explicitly about health behaviour change. However, neither increases in mindfulness nor adherence to home practice recommendations were consistently related to improvements in lifestyle.

The implications were limited by self-reported data, the lack of control group, that the participants were predominantly “white collar” with high baseline health behaviour scores, and lack of follow-up (Salmoirago-Blotcher et al., 2013). This typifies the current research into MBIs and health behaviours, and it would be useful to replicate Salmoirago-Blotcher et al.’s (2013) research in a larger, longitudinal study.

The outcomes might suggest that change can happen without any overt motivation. However, people who voluntarily engage (and pay to take part) in mindfulness programmes are highly likely to be motivated to improve their psychological wellbeing. It may be that this commitment to psychological self-care generalises to reflective and automatic motivation for physical self-care, and that health behaviours improve. Alternative mechanisms might include that reductions in psychological symptoms

may alleviate reactive maladaptive behaviours, and/or increases in embodied awareness and acceptance impact on health behaviours.

A caveat is that MBIs are not panaceas, and are highly unlikely to be effective behaviour change interventions for people who do not have the capability, opportunity or motivation to change their behaviours, or who prefer an alternative type of intervention. Although MBIs have some impact on smoking cessation, preference for pharmaceutical treatments such as nicotine replacement therapy is likely to affect engagement and outcomes (Davis, Manley, Goldberg, Smith, & Jorenby, 2014). Furthermore, the acceptability and success of MBIs appears to be influenced by individuals' personality characteristics and psychological dispositions, including: openness, neuroticism, conscientiousness, and trait mindfulness (de Vibe et al., 2015; S. L. Shapiro, Brown, Thoresen, & Plante, 2011).

1.3.5 Mindfulness-based interventions for mental health

Clinical groups

There is a more convincing body of literature on MBIs for mental health in clinical contexts. Thousands of studies have been conducted in clinical contexts, and systematic reviews conclude that MBIs are effective for alleviating recurrent depression, physical pain, and chronic anxiety (Bohlmeijer, Prenger, Taal, & Cuijpers, 2010; Chiesa, Anselmi, & Serretti, 2014; Eberth & Sedlmeier, 2012; Fjorback, Arendt, Ornbøl, Fink, & Walach, 2011; Hempel et al., 2014; Keng et al., 2011; Khoury et al., 2013; Nyklíček & Kuijpers, 2008; Strauss, Cavanagh, Oliver, & Pettman, 2014).

Randomised controlled trials (RCT) led to NICE recommending that the NHS provide MBCT for patients with recurrent depression (NICE, 2009). Long-term RCTs demonstrate that MBCT is cost-effective, has fewer side-effects than medication, and appears to be no less effective in preventing relapse than medication (Kuyken et al., 2015). Although half of recurrent depression patients relapse after taking part, MBCT appears to offer most protection to chronically depressed participants, particularly to adults who were traumatised as children (Piet & Hougaard, 2011; J. M. G. Williams et al., 2014).

Potential cost benefits to health care systems were illustrated in a study with American mental health patients. 10,633 received MBCT, and 29,795 received non-MBCT group therapy. 4,851 of the MBCT group and 13,274 of the non-MBCT group were classified as frequent users of non-mental health care services. Non-mental health care seeking reduced more significantly in the MBCT higher user group

(Kurdyak, Newman, & Segal, 2014). This might indicate improved ability to attenuate distress, and/or to cope without seeking medical support.

Non-clinical groups

Mindfulness courses are increasingly accessed by the general public for psychological health and wellbeing (Pots, Meulenbeek, Veehof, Klungers, & Bohlmeijer, 2014). Consequently, there is a growing body of evidence on the benefits of mindfulness training for mental health in non-clinical populations. Khoury, Sharma, Rush and Fournier (2015) recently reviewed the evidence base for MBSR in studies which recruited universal populations, including health care professionals, students, teachers, and the general public. They concluded that MBSR had large effects on stress reduction, moderate beneficial effects on depression, anxiety, distress and quality of life, and small effects on burnout. Similar gains were found in UK school teachers who took part in an adapted, low dose mindfulness course (Beshai, McAlpine, Weare, & Kuyken, 2015).

Given that the people in these studies were not clinically diagnosed or in treatment, this suggests that mindfulness training has potential to improve day to day psychological functioning, and may offer some protection against subclinical symptoms deteriorating into clinical illnesses or burnout. Limitations in general population studies include lack of long term follow up to establish sustained effects, a wide array on measures, and highly heterogeneous samples (Khoury et al., 2015).

It appears that this type of intervention has potential to alleviate clinical and subclinical mental health symptoms, although they are not a good fit for every patient. Personality characteristics of neuroticism and conscientiousness appear to mediate the psychological health improvements in medical students who take part in mindfulness training (de Vibe et al., 2015). This might imply that people who are most in need of relief from their own thinking styles and/or are most diligent about practicing are most likely to benefit, as practice time is positively associated with benefits. There is uncertainty about how much practice is enough practice, and dose effects appear to be influenced by baseline psychological characteristics (Carmody & Baer, 2008, 2009; Zeidan, Johnson, Diamond, David, & Goolkasian, 2010).

Recent developments

Mindfulness training has clearly emerged from the clinical closet, and self-help books and apps proliferate. However, a recent review concluded that the majority of iPhone “mindfulness” apps do

not meet criteria for potential to increase levels of trait mindfulness or sufficient breadth of meditation practices and psycho-education (Mani, Kavanagh, Hides, & Stoyanov, 2015).

Emergent evidence indicates that low-dose, schools-based mindfulness training might have some protective effects on typical adolescents' mental health (Felver, Celis-de Hoyos, Tezanos, & Singh, 2014). Its potential to reduce adolescent risk behaviours, maladaptive health habit formation, and resultant harms is being explored as one aspect of a UK RCT on the effects of mindfulness training on young people's neurological development, mental health and academic performance (OMC, 2015).

An All Party Parliamentary Group on mindfulness presented an evidence-based case for the potential of mindfulness training to relieve endemic mental health problems in health, education, workplace and criminal justice contexts (MAPPG, 2015).

An important caution is that a recent review concluded that more randomised controlled clinical mindfulness-based therapy trials report positive outcomes than might be expected (Coronado-Montoya et al., 2016). The authors highlighted a lack of outcome specificity in trial registrations, and found that 62% of registered trials were unreported 30 months after completion. Identified problems in 36 eligible systematic reviews included lack of reporting of nil or negative effects; caveating nil or negative effects; no papers including only nil or negative outcomes; and no reviews identified or adjusted for potential reporting bias (Coronado-Montoya et al., 2016). This may have implications for the credibility of the evidence-base, and emphasises the timeliness of the AllTrials campaign, which seeks to mandate the registration and reporting of all clinical studies (AllTrials, 2014).

A further consideration is that there is a paucity of research into the effects of mindfulness training as a group activity, and its potential effects on social opportunity, peer-support, and feeling connected to others. These are established aspects of wellbeing (Ryan & Deci, 2000), and may contribute to gains. The consistency of reductions in depression relapse rates in the MBCT dismantling trial (MBCT v. cognitive psychoeducation v treatment as usual) (J. M. G. Williams et al., 2014) may indicate that participating in a group intervention or simply being involved in a trial is no less therapeutic than participating in MBCT.

1.3.6 Mindfulness-based interventions for maternal mental health

MBSR and MBCT have been adapted to the problem of clinical mental health conditions in pregnant women, and to alleviate their anxieties about childbirth and the transition into parenting. Although

this work began in the 1990s, the majority of the literature is very recent and from pilot studies. Although the evidence is not sufficient to confidently assert that MBIs alleviate maternal mental health conditions (Hall, Beattie, Lau, East, & Biro, 2015), their pertinence to the current project warrants a review of the research.

There have been a number of small scale assessments of the impact of MBSR, MBCT, and adaptations of both on the mental health and wellbeing of pregnant women. Whilst the studies have been conducted in America and Australia, Mindfulness-based Childbirth and Parenting (MBCP) (Duncan & Bardacke, 2010) is being evaluated and implemented within Oxfordshire NHS Trust (Bardacke & Dymond, 2015; Warriner, Williams, Bardacke, & Dymond, 2012). Early indications are that it is acceptable and effective for British parents-to-be (Warriner et al., 2012) and adaptations are planned for at-risk groups (Bardacke & Dymond, 2015).

Unless otherwise stated below, the courses adhere to the standard eight weeks 2.5 hours per week format, and are delivered to groups. Some have been adapted to address anxieties about pregnancy, childbirth, and parenting, and/or to target women who are suffering from or at risk of antenatal mental health conditions. Adaptations to standard mindfulness practices include paying attention to the belly and to the sensations of pregnancy, extending compassion practices to include the baby, and replacing hatha yoga with antenatal yoga.

Some courses include holding ice for increasingly prolonged periods of time in order to attenuate aversive relationships with unpleasant and painful sensations. The practices sit alongside psycho-education exercises which aim to reconceptualise the expected sensations of childbirth from feared pain to something that can be approached with mindful curiosity, greater confidence, and an array of practical mindfulness skills. MBCP and the “Mindfulness-based Childbirth Education” (MBCE) courses integrate pregnancy, childbirth, and parenting education with the mindfulness training and include fathers and/or birth partners in the classes and home practice.

The first published study was a small randomised controlled trial of the nine week “Mindful Motherhood” programme for women who had previously sought support for mental health conditions. It reported improved state anxiety and negative affect in 13 participants in comparison to 18 controls. This was not maintained at three month follow-up, but the intervention group retained some benefits from baseline (Vieten & Astin, 2008). The next published study was an uncontrolled pilot of the MBCP programme with 27 community sample women reported large improvements in pregnancy anxiety

and mindfulness, and moderate effects on perceived stress, negative affect and positive affect (Duncan & Bardacke, 2010).

A single armed pilot of MBCE reported moderate to large improvements in maternal self-efficacy and mindfulness, and reduced anxiety and fear about childbirth in 12 community sample women (Byrne, Hauck, Fisher, Bayes, & Schutze, 2014). Themes of empowerment, greater ability to make decisions about the birth process, and a sense of community with like-minded parents were derived from focus group data collected after the MBCE intervention (Fisher, Hauck, Bayes, & Byrne, 2012).

Dunn, Hanieh, Roberts and Powrie (2012) adapted and evaluated MBCT with 10 community sample pregnant women, five of whom provided complete data. There were significant reductions in antenatal stress and stress. Self-compassion and depression scores were significantly more improved than controls post-partum. Qualitative feedback indicated that the mindful “stop and breath” exercises, developing an accepting attitude, and coming into the present moment helped the women to cope with pregnancy, childbirth and parenting. However, the nine of the 10 volunteer participants' reported a history of anxiety or depression, whereas no one in the control group did. This might mean that the intervention group had greater potential for benefits, and/or that the intervention protected against declining mental health during pregnancy. The small sample size constrains any implications.

A small randomised controlled pilot of the six week, two hours per session “Mindful Awareness Practices” course was conducted with a community sample of 20 pregnant women. The 23 controls were assigned to read a pregnancy education book which included ideas for stress management. In comparison to controls, self-reported pregnancy-specific and pregnancy-related anxiety decreased, but there were no meaningful differences in mindfulness, state anxiety, or perceived stress, as both groups' scores improved. Benefits were not sustained at six week follow up (Guardino, Dunkel Schetter, Bower, Lu, & Smalley, 2014). The implication that mindfulness might increase naturally during pregnancy might warrant further investigation, and the drop off in benefits after the intervention might suggest that pregnant women require sustained interventions.

What distinguishes Guardino et al. (2014) from the Mindful Motherhood, MBCE and MBCE studies is that there were no adaptations for pregnancy or childbirth education. The Mindful Awareness Practices classes were also open to University of California students, staff and member of the public. This study might suggest that standard mindfulness training and open group MBIs can be useful for pregnant women, but that consideration should be given to how to sustain benefits.

A clinical study assessed the effectiveness of the “Coping with Anxiety through Living Mindfully” (CALM) programme during pregnancy. This course is adapted from MBCT to target General Anxiety Disorder (GAD). A non-controlled pilot with 23 pregnant women with clinical or near-clinical GAD reported significant alleviation of anxiety, worry and depression symptoms, and increased self-compassion and mindfulness. All but one of 17 women who were diagnosable at baseline fell below clinical cut-off for GAD. Feedback indicated that these benefits may have been related to building skills, connecting to and learning from others, learning that experience were shared, acceptance, self-kindness, decreased reactivity, and cognitive shifts and insight (Goodman et al., 2014). This might suggest that MBIs have potential to reduce clinical anxiety symptoms in pregnancy, although no follow up data was reported.

This suggestion was evaluated in a small wait-list controlled trial of the “MindBabyBody” intervention with 20 women who were experiencing or at risk of perinatal stress, anxiety, or depression. Eleven women who returned data reported significant improvements in self-reported depression, anxiety and mindfulness. A non-clinical assessment of the course was conducted in a randomised controlled study with 32 lower-risk women. The 23 women who returned data reported significant improvements in self-reported anxiety and mindfulness in comparison to controls (Woolhouse, Mercuri, Judd, & Brown, 2014). Higher risk and lower risk women reported improved anxiety and mindfulness, whereas the higher risk women also reported reductions in depressive symptoms, Retention rates for at-risk women were poorer than for lower risk women (Woolhouse et al., 2014). No follow up data was reported, meaning that sustained effects are not known.

Four participants took part in post-intervention interviews. The group was identified as an enjoyable aspect of the intervention. Preferences for and engagement with the portfolio of different mindfulness practices varied across the group, but there was recognition of the value of being able to pick and choose, and to find the “best fit” techniques. A common theme was developing greater ability to regulate emotions, thoughts and behaviours, and to “reign in destructive patterns”, which improved interpersonal relationships. Improved sleep, reduced resistance to previously disliked tasks, and being more at ease with pregnancy and impending motherhood contributed to improved quality of life (Woolhouse et al., 2014). The themes indicate that the group, developing skills, and reduced reactivity were mechanisms by which benefits accrued.

One woman described herself as a former heavy drinker for whom this was “no longer an option”, and said that she joined in order to find “new ways of dealing with things” (Woolhouse et al., 2014). Whilst one person’s expectation that mindfulness practice might be a feasible alternative to a potentially risky coping behaviour does not imply that this might naturally occur in other women, it might suggest that it is worth exploring whether maternal mindfulness programmes have any potential to support an intention to stop drinking, and/or to maintain abstinence.

Another adaptation of MBCT, MBCT-PN (perinatal), was evaluated in a non-controlled clinical study with 49 pregnant American women at risk for antenatal and postnatal depression due to a history of clinical depression, but who did not have co-morbid psychopathologies. Forty two women supplied pre-post data, and reported significant reductions in antenatal depression. Follow up data indicated that 18% relapsed postnatally, but this was 40% less than normal relapse in at-risk post-natal women (Dimidjian et al., 2015). This suggests that the intervention provided some protection against relapse, which reflects Kuyken et al’s (2015) findings on the effects of MBCT for adults with a history of recurrent clinical depression.

Feedback from the “at-risk” participants suggested that gains were underpinned by a toolkit of ways to deal with depressive symptoms, such as being better equipped to cope with depressive thoughts, recognising and responding positively to early warning signs of depressive relapse, and using mindfulness techniques to disengage from negative thoughts and mood (Dimidjian et al., 2015). This differs from the potential mechanism described by non-clinical participants in Woolhouse et al. (2014), and suggests that clinical and non-clinical groups of pregnant women may value mindfulness training for different reasons. However, the different themes may reflect the different problem-targets of the MindBabyBody and the MBCT-PN interventions.

There are a number of limitations on these studies. There is a tendency to recruit a distinct subsample of highly educated, White, affluent, married or co-habiting, older pregnant women. Whilst this may be phenomena of university-based research and/or advertising studies on-campus, Woolhouse et al.’s (2014) direct recruitment in antenatal clinics and large-scale post and email campaign did not result in a diverse sample.

It may be that mindfulness training in some way excludes non-White, younger, less affluent, and/or less educated women, which may imply that it is not an equitable health care intervention. However, focus groups with ethnically diverse overweight and obese American women from deprived

backgrounds indicated that a mindfulness-based intervention to manage gestational weight gain would be acceptable (Thomas et al., 2014). The only study to assess an antenatal MBI with a different subsample of pregnant women was Zhang and Emory's (2015) evaluation of the Mindful Motherhood programme (Vieten & Astin, 2008) with low-income African-American women from deprived urban backgrounds. Eight groups ran over two years with 34 intervention participants and 31 controls. Attrition was almost 50%, but the intervention was associated with improved mindfulness, and reduced depression, pregnancy worries, and cortisol response. This objective measure of stress response is a useful addition to the field.

Open recruitment has tended to attract women with higher than typical psychological symptoms. This suggests that mindfulness-based pregnancy intervention attract women who are suffering in some way and may be seeking non-pharmacological treatment. Their typical socio-demographic and mental health characteristics may represent the profile of pregnant women who are willing to take part in university-based research studies and/or who are interested in mindfulness-based interventions. Further research is required to test this assumption, but public mindfulness courses tend to attract people who score higher than typical on baseline symptoms of depression and anxiety and lower than typical on resilience and life satisfaction (Lyssenko et al., 2015).

Limitations

The generalisability of the findings is hampered by small sample sizes, and tendency to focus on specific subgroups of women with subclinical or clinical mental health conditions. All the published studies report some benefits, which might reflect the publication bias indicated in randomised controlled trials (Coronado-Montoya et al., 2016).

The mental health measures employed in each study are diverse; some are pregnancy-specific, whereas others are clinical or community measures. This is appropriate to the different research objectives, but does not support ease of comparison between the outcomes of different approaches to delivering mindfulness to pregnant women. Different measures of mindfulness, and/or the selection of particular subscales of broader measures, means that changes in mindfulness are not comparable.

Some studies recruited women in specific trimesters of pregnancy in order to address gestation-salient problems, whereas others were open to women from conception to the latter stages of pregnancy.

The papers do not include fully specified interventions, which constrains replication in different contexts.

Whilst this the nature of emergent research fields, it is challenging to understand why different interventions have produced different findings, and what the mechanisms of change were. The qualitative studies provide some insights into this; learning new skills, acquiring practical knowledge (psychological capability), developing a greater sense of competency (automatic motivation), and peer support from the group (social opportunity, reflective motivation) appear to be common themes.

The studies were appropriate to test whether the MBIs were feasible and had any potential to benefit pregnant women. They fit into the Step II stage of the MRC guidance for developing new complex interventions or testing existing complex interventions in new contexts (MRC, 2000, 2008), although only the Woolhouse, Mercuri, Judd and Brown (2014) study identified itself as being within the first MRC steps with an intention to inform a randomised controlled trial.

Emergent public interest in the potential of mindfulness during pregnancy has manifest in the publication of self-led courses including the MBCP-based “Mindful Birthing: Training the Mind, Body, and Heart for Childbirth and Beyond” with accompanying CD’s (Bardacke, 2012), and “A Headspace Guide to Mindful Pregnancy” (Puddicombe, 2015) with accompanying subscription-only app-based mindfulness practices.

No studies have been reported for the app-based or book-based antenatal mindfulness courses, although the Headspace package, which includes options for sleep, attention, stress, creativity, etc. as well as pregnancy, scored most highly on the recent review of “mindfulness” apps (Mani et al., 2015). A current study is evaluating the effectiveness of the Mental Health Foundation’s online BeMindful course on perinatal mental health, further to Krusche et al’s (2013) study with a general population sample. These programmes differ from those in the literature because they self-led rather than group-based. This may have advantages for accessibility, flexibility, and cost, but will not include group/peer support.

Maternal MBIs have focused on developing psychological resources for pregnancy, childbirth, and parenting, and on mental health. This is understandable given the evidence for the salutary effects of MBIs on mental health, and the burden of perinatal anxiety and depression on maternal and child

health. There does not appear to have been an evaluation of incidental or targeted changes in maternal health behaviours.

The apparent relationships between mindfulness, mental health and health behaviours might suggest that an intervention which has potential to improve mindfulness and antenatal mental health might improve maternal health behaviours.

1.3.7 Shared limitations of the evidence base for health behaviour and maternal mindfulness

Limitations are typical to the generally exploratory nature of the evidence base, which entails small samples, diverse measures, and unspecified interventions. A further issue is the use of different measures of mindfulness (van der Velden et al., 2015). The multi-dimensional FFMQ (Baer et al., 2006; Baer et al., 2008) was used in studies to evaluate associations between mindfulness and BMI (Camilleri et al., 2015), eating behaviours (Adams et al., 2012; 2014), and problematic drinking (Vinci et al., 2014; Vinci, Spears, Peltier, & Copeland, 2016). It was also used in a study of the incidental effects of MBSR on activity levels, alcohol consumption, smoking, diet, and sleep quality (Salmoirago-Blotcher et al., 2013).

The uni-dimensional MAAS (Brown & Ryan, 2003) was used in several cross-sectional trait mindfulness and health behaviour studies, including Eric Loucks and colleagues' papers on trait mindfulness and cardiovascular disease risk (Loucks et al., 2014; Loucks, Britton, et al., 2016; Loucks, Gilman, et al., 2016; Loucks et al., 2015) and prospective studies, including Murphy et al.'s (2012) study on the benefits of dispositional mindfulness on physical health in 441 female college students.

Antenatal mindfulness-based intervention studies have employed various measures of mindfulness, including the MAAS and whole or subscale FFMQ. For example, Woolhouse et al. (2014) used the FFMQ, Goodman et al. (2014) used the MAAS, and Duncan and Bardacke (2010) used the acting with attention and awareness, non-judging, and non-reactivity subscales of the FFMQ. These differences hinder the comparison of outcomes across maternity and health behaviour studies.

1.4 Conclusion

Women's health behaviours during pregnancy contribute to both their own and their infants' outcomes. The review illustrated the potential consequences of not adhering to guidance for these

behaviours. The benefits of improving health behaviours might include improved maternal outcomes, and improved birth, childhood, and adulthood outcomes for infants.

Factors associated with maternal health behaviours appear to include some which may be amenable to change, and others which are fixed. These factors can be described within the capability, opportunity, and motivation model of behaviour (COM-B) (Michie et al., 2011). Although there are apparent differences between factors which contribute to being inactive, poor diet, drinking alcohol, and smoking during pregnancy, there are common aspects of psychological capability, social opportunity, and reflective and automatic motivation. Interventions which affect capability, opportunity, and motivation and include established behaviour change techniques appear to have potential to improve maternal health behaviours.

Mindfulness training appears to improve psychological health and wellbeing in clinical and non-clinical groups, and there are early indications that this may extend to pregnant women. Group-based antenatal mindfulness programmes might create peer support (social opportunity) for pregnant women. Mindfulness-based interventions appear to have potential to improve psychological and physical self-regulation and self-care, which may indicate effects on reflective and automatic motivation. Targeted mindfulness-based behaviour change interventions appear to have some impact on smoking cessation and weight management in people who are motivated to change their behaviours. This suggests that a targeted mindfulness programme might have potential as a maternal behaviour change intervention for women who are motivated to improve their lifestyle. The potential mechanisms of change are considered in chapter five.

This chapter raised three questions: whether trait mindfulness is related to maternal health behaviours, whether it is related to antenatal mental health, and whether a mindfulness-based intervention might have some potential to alleviate adverse maternal health behaviours. The following chapters describe the steps taken to investigate these possibilities, beginning with the methodology.

2

Chapter Two: Methodology.

2.1 Introduction

The overall aim of this PhD project was to find out whether or not it was feasible to develop and deliver an intervention which integrated mindfulness training and health-related behaviour change techniques to pregnant women. It took a pragmatic approach to investigating and intervening in maternal health behaviours, rather than developing or adding to current theories of behaviour change.

There were two principal research questions:

To what extent is trait mindfulness related to women's health behaviours during pregnancy?

Is mindfulness training a feasible behaviour change intervention for pregnant women?

Although their applicability was constrained by the a priori decision to evaluate a mindfulness-based intervention, the research was guided by MRC, NICE, BCW, and National Institute of Health Research (NIHR) recommendations for developing and evaluating the feasibility of complex and behaviour change interventions (Michie et al., 2014; MRC, 2000, 2008; NICE, 2007, 2014b; NIHR, 2015).

These recommendations instruct researchers/developers to try to understand the aetiology of the problem before developing the intervention, and to describe the factors related to behaviour change within the capability, opportunity, and motivation aspects of behaviour (Michie et al., 2014; MRC, 2000, 2008; NICE, 2007, 2014b). Accordingly, step one of this project was the review of maternal health behaviours (chapter one). It raised the questions as to whether trait mindfulness was associated with antenatal mental health and health behaviours, and developed a rationale for suggesting that mindfulness training might have some potential to alleviate adverse maternal health behaviours.

Two studies were conducted to answer these questions. The aim of the first study was to test the proposal that trait mindfulness was related maternal health behaviours and mental health. The next step was to develop the intervention. This entailed adapting a standard mindfulness programme to the problem (health behaviours) and the participants (pregnant women), in accordance with NICE and BCW guidance for developing behaviour change interventions (Michie et al., 2014; NICE, 2007). The second study assessed the intervention's feasibility, in accordance with the MRC, NICE and NIHR principles for evaluating health and behaviour change interventions (MRC, 2008; NICE, 2007; NIHR, 2015). The project is situated within the preclinical (review the evidence), Step I (development), and

Step II (feasibility testing) stages of the MRC's guidance for developing new complex interventions and testing existing complex interventions in new contexts (MRC, 2000, 2008).

The five stages of the project were: (1) identify the evidence and identify potentially modifiable factors in adverse maternal health behaviours (literature review), (2) test the proposal (study one), (3) theorise and (4) develop the intervention, (5) feasibility testing (study two), (6) integrate the outcomes.

The steps are illustrated in Table 2.1.

Table 2.1 Steps taken in the current study: objective, method, and purpose

Step	Objective	Method	Purpose	Chapter
1 Identify the evidence	Understand maternal health-related behaviours. Identify potentially modifiable factors. Defining mindfulness and mindfulness training. Identify known effect on health behaviours, mental health, and antenatal mental health.	Literature review.	Developing a rationale for researching maternal health behaviours, applying the COM-B model Developing a rationale for mindfulness in the context of adverse maternal health behaviours.	1
2 Test proposals	Investigate relationships between trait mindfulness and maternal health behaviours, and trait mindfulness and COM-B factors.	Cross-sectional survey.	To what extent is trait mindfulness related to women’s health behaviours during pregnancy?	3 and 4
3 Theorise the intervention	Develop a logic model of the ways in which mindfulness training might impact on maternal health behaviours	BCW guidance, COM-B & TDF	Underpin the intervention with theory, identify potential mechanisms of change	5

Step	Objective	Method	Purpose	Chapter
4 Develop the intervention	Select the mindfulness course. Adapt to context and problem. Define the intervention.	BCW and NICE guidance.	Develop and specify the intervention.	6
5 Feasibility testing	Recruitment, adherence, costs, safety, indicative effects, acceptability.	Objective and subjective Repeated measures.	Is mindfulness training a feasible behaviour change intervention for pregnant women?	7 and 8
6 Integrate findings	Summarise findings, illustrate how they inform the evidence base, suggest future steps.			9

MRC, NICE and BCW guidance (Michie et al., 2014; MRC, 2000, 2008; NICE, 2007, 2014b). COM-B: capability, opportunity, motivation model of behaviour. TDF: Theoretical Domains Framework.

The methods for each of the two studies are detailed in the subsequent chapters. The following section discusses the over-arching ethical considerations in this project, and how the research questions determined recruitment, sampling, data collection, and selection of measures. It considers the potential for biases and describes some of the inherent problems of researching mindfulness.

2.1.1 Ethical considerations

Recruiting participants into research requires consideration of health and safety risks. The first study adhered to National Health Service (NHS) ethical guidance, which focuses on conducting health research with humans (NHS, 2015d). Low risk studies are allowed to apply for “proportionate” NHS Research Ethics Group (REC) review. The second adhered to British Psychological Society (BPS) (2014) and Oxford Brookes University ethical guidelines. The BPS guidance (2014) focuses on psychological research. This section outlines the ethical principles, followed by ethical considerations in studies one and two.

The NHS and BPS ethical principles include respecting the participants, ensuring integrity and social responsibility, and maximising the potential benefits to participants whilst minimising potential harms. Respect entails fully explaining the nature of the research, avoiding discriminatory content and practice, allowing participants to withdraw without giving a reason, and anonymising the data. Social responsibility entails protecting vulnerable groups (such as children), and ensuring that research contributes to the “common good”. Maximising benefits whilst avoiding harm entails the consideration of the risks of investigating potentially sensitive topics, avoiding deception, minimising psychological stress, anxiety, or humiliation; and weighing up potential longer term benefits against any immediate risks (BPS, 2014; NHS, 2015d).

Participants’ consent must be obtained on the basis of adequate information in the participant information sheet (PIS) and having an opportunity to ask questions. The PIS should include sufficient information about what is involved in taking part, including the aims of the research, time commitment, how data will be collected, and any risks and potential benefits. It must avoid deception (BPS, 2014; NHS, 2015d).

The first study was an anonymous cross-sectional survey. The low risk of harm allowed a proportional rather than full review by an NHS Research Ethics Committee. The PIS explained the study, and the women could contact the researcher and/or stop completing the survey at any time. Its anonymous

nature meant that participants could not withdraw once they had submitted their answers electronically, or posted the paper survey; this was stated in the PIS.

The potential ethical risk of taking part in the survey was that the topics may have had some potential to cause participants to feel concerned about their health behaviours and/or their mental health. The choice to use valid and reliable subjective wellbeing and perceived stress measures rather than clinical mental health measures was intended to minimise the risk of psychological distress. Where possible, brief versions of measures were selected in order to reduce the time burden of completing the survey; section 2.1.5 describes how measures were selected. The debrief sheet at the end of the survey included links to information about health behaviour guidance and support, and advice to contact their GP if they felt concerned.

For the second study, consideration was given to how the mindfulness-based programme fitted with BPS (2014) ethics.

Informed consent

MBIs are complex, multi-component interventions. An MBI begins with “benign” meditation practices which have low risk of causing distress, although attending to the breath can sometimes trigger anxiety if participants begin to try to control the breath, or think they should be breathing differently. The mindfulness teacher should be alert to this and respond by giving instruction to shift the focus of attention or to stop the practice. Regular practice has potential to increase psychological capability for sustained and controlled awareness and attention, and “unhooking” from judgements. These foundational attention practices are sometimes referred to as “scaffolding” for the subsequent “insight” and open awareness practices (Z.V. Segal, Williams, & Teasdale, 2013).

Inherent challenges in initiating a mindfulness practice might include disparities between early expectations with experience of mind wandering, lack of relaxation, and heightened awareness of physical discomforts (Williams & Penman, 2011). Participants also have to dedicate time to do daily practices. Midway through the programme, by which point participants are expected to have engaged in many hours of scaffolding practices, MBIs include insight practices, which might deliberately focus on areas of physical discomfort, and/or on noticing the effects of bringing difficulties to mind (Z.V. Segal et al., 2013). An ethical risk is that the participants will not have done the expected amount of

scaffolding practices, and may therefore be at higher risk of psychological distress from the practices which focus on aversive sensations and experiences.

Providing full information about the content of a mindfulness-based intervention in the PIS might not alert participants for the challenges of initiating and sustaining a regular mindfulness practice, or of the risk of distress. Similarly, providing full information about a behaviour change intervention might not alert participants to the requirement for self-monitoring, or the potential psychological effect of gaps between their intentions and realised behaviours. Given the complexity of mindfulness interventions, it may be difficult to ensure that consent is fully informed.

Vulnerabilities

Whilst pregnant women are not a “vulnerable” group, and the majority have uncomplicated pregnancies (Chappell et al., 2013), chapter one illustrated that they may have pregnancy-specific vulnerabilities. Pregnant women may be at risk of anxiety about the significant transition of pregnancy and parenthood, and the psychological impact of any physical symptoms of pregnancy (NHS, 2010). Women with or without a history of depression may be vulnerable to ante and post-natal depression (Ayers & Shakespeare, 2015; Ban et al., 2014; Howard et al., 2014).

Marginalisation of women who are overweight

Women who feel marginalised due to obesity or stigmatised health behaviours may be vulnerable to feeling judged or to self-recrimination, which might deter them from engaging in maternal health behaviour change interventions (Atkinson et al., 2015; Furber & McGowan, 2011; Lindhardt et al., 2013; Mulherin et al., 2013; Olander & Atkinson, 2013).

There may therefore be some potential for the intervention to “do harm” to pregnant women by provoking psychological discomfort or self-judgements, particularly if participants have not engaged in the recommended amount of scaffolding practices. A further risk is that behaviour change interventions may have potential to trigger unintended harms from rebound or compensatory behaviours (Ogden, 2016b).

Monitoring for negative effects

Minimising potential harms entails being alert for negative effects. In the current study, weekly mindfulness classes provided an opportunity for the researcher to observe evident low mood. Routine

enquiry into the experience of doing the mindfulness practices and lifestyle goals provided an opportunity for participants to discuss negative effects. Participants also had the opportunity to speak to or email the researcher outside of normal contact times.

However, lack of face-to-face contact during the eight-week follow-up period impaired the researcher's ability to monitor for negative effects. There was no compunction for participants to disclose unintended consequences, and negative effects might have been unnoticed. Asking participants to complete weekly mental health and health behaviour questionnaires would improve the researcher's ability to monitor negative effects. However, this would be burdensome, not anonymous, and might not detect harms or ensure disclosure.

Participating in the intervention study entailed the completion of repeated health behaviour, mindfulness, subjective wellbeing, clinical mental health, and feasibility questions. The potential burden was greater than the cross-sectional survey because the questionnaire was longer, and it had greater potential to cause concern. Face-to-face contact with the researcher meant that there was greater capacity to address any subsequent concerns. However, the women may have felt inhibited about discussing their experiences, concerns, and/or health behaviours in the group.

The women's health and safety whilst on Oxford Brookes campus was considered; rooms with level access were selected. The women's emergency contact details were collected, along with written permission to contact emergency services if anyone became unwell. My professional competency to teach mindfulness may have been a factor in the potential for maximising benefits and minimising harms; I adhered to the voluntary good practice framework for teaching mindfulness (UKNMBT, 2011).

The ethical issues for the intervention study were complex. The risks were considered to be offset by potential gains from improving the women's health behaviours and psychological capabilities, including: mental health, practical skills to manage stress, and self-regulation.

2.1.2 Recruitment considerations

Two recruitment approaches were available to the current project. Recruiting pregnant women through the NHS allows access to potentially thousands of women as they attend routine antenatal appointments in NHS hospitals and health centres. This requires appropriate NHS ethical approval. The other option is to recruit participants directly, using any combination of face-to-face approaches,

posters, online advertisements, email and social media. This type of recruitment requires university ethics board approval, but it is not allowed to recruit on NHS property or via its services.

The approach taken in each study was appropriate to recruiting sufficient women to answer the research questions. The first study recruited via the NHS in order to improve the opportunity to recruit pregnant women with diverse health behaviours. The pragmatic decision to recruit women who were at least 13 weeks pregnant in the first study was determined because we had access to women who were attending week 12 onwards NHS antenatal appointments.

The second study used direct methods to recruit a smaller sample of pregnant women who were able to take part in nine consecutive weekly mindfulness classes at Oxford Brookes University. The recruitment details for each study are included in the methods sections of the subsequent chapters.

2.1.3 Sampling considerations

Sample sizes must be sufficient to gather enough data to answer the research questions. The first study required sufficient pregnant women to test for relationships between trait mindfulness and maternal health behaviour risks (defined by non-adherence to UK guidance). Expected prevalence and required power was used to calculate how many women were required to provide sufficient data to conduct analyses. The anticipated return rate was used to calculate how many invitations were required to yield sufficient responses.

The second study required sufficient women to report the feasibility of recruitment and adherence, and the intervention's indicative effects and acceptability. The sample size was determined by reviewing other similar studies, and by the practicality of delivering and evaluating the nine-week intervention within a constrained timeframe.

2.1.4 Approaches to data collection

The project employed mixed methods. Quantitative data was collected using anonymous self-reported questionnaires. This was a suitable means of collecting a large amount of data on a wide range of psychological and behavioural measures. The benefits included relatively easy and inexpensive data collection from a potentially large and diverse sample using reliable and valid measures. The main disadvantage of the questionnaire approach was the potential under-reporting of antenatal drinking and smoking (Lange et al., 2014; Shipton et al., 2009), but there was no reason to believe that the

current studies would suffer more from this than previous studies. The length and content of surveys should consider participant burden (BPS, 2014).

A cross-sectional survey was appropriate to test the proposal that trait mindfulness was related to pregnant women's health behaviours and mental health in the first study. The feasibility study included objective recruitment and attrition data, and repeated quantitative measures of self-reported adherence, acceptability, health behaviours, mindfulness, and mental health. Written qualitative feedback data were collected. This approach to evaluating the feasibility of a novel intervention was consistent with NICE (2007) and NIHR (2015) recommendations, and with other pilot/feasibility antenatal mindfulness studies.

2.1.5 Review of potential measures

Previous mindfulness and pregnancy studies were reviewed in order to select appropriate measures for the two studies. There were no resources to pay to use licenced measures, meaning that free to use scales were selected for the current study. Ethical considerations included the time burden and the potential to cause distress to the participants (BPS, 2014).

Mindfulness measure

The selection of the mindfulness questionnaire included reviewing previous pregnancy mindfulness studies, and consideration of the length and content of valid and reliable measures. A number of measures of mindfulness which have been shown to be valid and reliable with "community" (also known as universal/non-clinical) samples of non-meditators. What distinguishes one from another is the ways in which they operationalise and consequently empirically measure mindfulness. The following comparison focuses on two widely used measures: the single-facet Mindful Awareness and Attention Scale (MAAS) (Brown & Ryan, 2003), and the multi-facet Five Facet Mindfulness Questionnaire (FFMQ) (Baer et al., 2006; Baer et al., 2008). Other valid and reliable scales are available, but are not much used in the nascent health behaviour or pregnancy fields.

The MAAS (Brown & Ryan, 2003) is designed to measure dispositional mindfulness by assessing individual propensity to experience mindful states. It focuses on a single aspect of mindfulness: being open or receptive awareness of, and attention to, whatever is happening in the present moment. The MAAS uses 15 negatively framed "mindlessness" items such as "It seems I am "running on automatic," without much awareness of what I'm doing", and "I snack without being aware that I'm eating". The

MAAS has recently been validated with a sample of 1,375 pregnant women (O' Leary, Dockray, & Hammond, 2016), but this post-dates the design of the current study.

The FFMQ (Baer et al., 2008) was produced from factor analysis of five independently developed measures of mindfulness, including the MAAS. The process supported the authors' conceptualisation of mindfulness as a multifaceted construct. It includes five aspects: ability to label and describe moment by moment experience; non-reactivity to inner experience; non-judging of inner experience; ability and inclination to observe experiences; and acting with awareness. It has been validated in non-meditating community samples (Baer et al., 2008) and was therefore suitable to the current project.

When this study was designed, the FFMQ appeared to be the more widely used measure in the emergent body of health behaviour and pregnancy studies. The majority of its items are positively scored, unlike the MAAS. Although longer than the MAAS, the FFMQ appeared to have less potential to cause participants concern. A shorter 24 item version of the FFMQ had been shown to be reliable and valid (Bohlmeijer et al., 2011). This version was selected in order to reduce the time burden.

Mental health measures

Ethical considerations for the cross-sectional survey resulted in a decision to use subjective wellbeing and not clinical measures of mental health. I ensured that the items were evenly balanced between positive and negative aspects of mental health. A review of free-to-use, reliable, and valid measures validated in community settings and used in mindfulness studies was conducted.

The Positive and Negative Affect Scale (PANAS) (Watson, Clark, & Tellegen, 1988), Warwick Edinburgh Mental Wellbeing Scale (WEMWBS) (Tennant et al., 2007), Perceived Stress Scale (PSS) (S. Cohen, Kamarck, & Mermelstein, 1983) were selected for the cross-sectional survey. PANAS and PSS are balanced between positive and negative items, and WEMWBS is a positive item scale. This meant that the mental health questions were more positive than negative, and were felt to have lower risk of causing distress or concern. The four measures included 44 items in all, which was a good fit with the time burden consideration.

There was greater capacity to address any questionnaire-related concerns in the intervention study. The time commitment given to the intervention and potential to support the common good allowed for the inclusion of valid and reliable clinical and pregnancy-specific measures which had been used in other antenatal mindfulness studies. Previous non-clinical mindfulness studies, such as Byrne et al.

(2014), Dunn et al. (2012), and Woolhouse et al. (2014), utilised a number of clinical and pregnancy-specific mental health measures, including the Edinburgh Postnatal Depression Scale (EPDS) (Cox, Holden, & Sagovsky, 1987), the Tilberg Pregnancy Distress Scale (TPDS) (Pop et al., 2011), the Centre for Epidemiologic Studies Depression Scale Revised (CESD-R) (Van Dam & Earleywine, 2011), the Depression Anxiety and Stress Scale (DASS21) (Lovibond & Lovibond, 1995), and the State-Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). A clinical study (Goodman et al., 2014) used the General Anxiety Scale (GAD-7) (Spitzer, Kroenke, Williams, & Löwe, 2006).

The EPDS and TPDS were selected to identify pregnancy-specific issues. The STAI is a licenced measure; the GAD-7 was selected to identify anxiety levels.

Compassion appears to be a factor in benefits from mindfulness-based interventions (Kuyken et al., 2010). The self-compassion and compassion for others scales (Neff, 2003; Pommier, 2010) were included in order to identify any changes. Neff's (2003) scale was employed in Dunn et al's (2012) maternal mindfulness intervention study. Other studies included measures of self-efficacy for birth and parenthood, but they were not appropriate to this project's research aims.

Health behaviour measures

Exercise

The U.K. guidance focuses on time spent on moderate leisure time activity, which can include brisk walking, swimming, cycling, exercise classes, and active hobbies (Table 1.1). A reliable and valid pregnancy-specific measure, the Pregnancy Physical Activity Questionnaire (PPAQ) (Chasan-Taber et al., 2004) was identified. It asks women to indicate how much time they spend on various domains of sedentary, low, moderate and vigorous intensity activities, including: sports and exercise, occupational, and caregiving. The time options range from nil, up to 30 minutes, up to an hour, one to two hours, two to three, and three or more. The PPAQ includes detailed information on each activity's intensity and typical metabolic energy consumption, and how to calculate total energy expenditure.

A limitation of the PPAQ as a way to estimate adherence to guidance is that it is designed to calculate energy expenditure, and the time parameters are not highly compatible with calculating whether women are adhering to guidance to exercise for at least two or 3.5 hours per week in blocks of 30 minutes. However, time spent on sedentary, low, moderate, and vigorous intensity activities can be

estimated from responses, and it is adequate for estimating adherence to UK guidance. A strength is that it is designed for and validated with pregnant women.

The leisure time subsection of the PPAQ was chosen for the cross sectional survey, as it was sufficient to detect leisure time activities. The full measure was selected for the intervention study in order to allow evaluation of how activity changed over time.

Other studies, such as Rousham, Clarke, and Gross (2006) and van Hees et al. (2011) have collected activity data using accelerometers. This was not available in the cross-sectional survey, and was beyond the budget of the intervention.

Diet

UK guidance is to adhere to the Eatwell plate, avoid contra-indicated foods, not exceed 2000/2300 calorie per day, depending on the trimester, and to supplement Folic Acid in the first trimester and Vitamin D throughout pregnancy (Table 1.1). The decision to use supplement adherence as proxy for diet in the cross-sectional survey was determined by the burden of completing food frequency questionnaires, which require complex recall of diet over the previous 24 hours. The items developed for the cross-sectional survey reflected supplement guidance (NHS, 2010); those for the intervention study were intended to measure frequency of adherence to the Eatwell Plate guidance (NHS, 2013b). The potential effect of using idiosyncratic frequency measures rather than standard Likert agreement scales on the findings is discussed in the limitation sections of both studies.

Alcohol

The UK guidance is to avoid alcohol, and women who chose to drink were advised to not exceed two units twice per week (Table 1.1). Burns, Gray and Smith (2010) demonstrated that the AUDIT (Bradley et al., 2003) measure was sufficient to detect drinking during pregnancy. However, the disadvantage of the AUDIT is that it asks about quantity and frequency of whole drinks each week or month, and related harms, meaning that it is not a good match to UK guidance regarding units of alcohol per week and during pregnancy. Nonetheless AUDIT scores can be used to indicate low risk and high risk pre-pregnancy drinking, and a score of 1 or more would indicate drinking any amount of drinking during pregnancy.

An alternative would be to ask women to estimate the number of units of alcohol they drank in a typical week prior to and during pregnancy, and an open text box for any information they chose to

provide about this. This would require the provision of information about the number of units of alcohol in a range of alcoholic drinks, and for women to accurately recall amount and frequency of drinks in a typical week. However, pregnancy alcohol consumption is particularly prone to under-reporting (Lange et al., 2014; Morleo et al., 2011), and idiosyncratic measures might not have been more effective.

O’Keeffe et al’s (2015) multi-cohort study assessed alcohol consumption during face to face interviews. Post-birth meconium testing can detect alcohol consumption (Lange et al., 2014). These approaches were not available to the current project.

Smoking

The UK guidance is to avoid smoking (Table 1.1). We were not aware of any validated and reliable pregnancy-specific smoking measures, and the Oxfordshire Smoking Cessation team advised that asking about quantity, frequency and how soon after getting up people smoked their first cigarette was sufficient to identify light, moderate and heavy smoking. We decided that quantity of cigarettes per day was sufficient to identify non-adherence to guidance.

O’Keeffe et al’s (2015) multi-cohort study assessed smoking during face to face interviews. Objective measures of smoking include saliva sample cotinine testing (Shipton et al., 2009) and carbon monoxide breathe testing (Radley et al., 2013). These measures were not available to the current studies.

Items about knowledge of health behaviour guidelines were not included in the surveys in order to avoid prompting answers on the behaviour measures.

Motivation

Reliable and valid measures of motivation exist for health behaviours. The Treatment Self-Regulation Questionnaire (C. S. Levesque et al., 2007) evaluates the extent to which reasons for stopping or not smoking, start or maintain a healthy diet, start to or maintain regular exercise, and control alcohol use are true on a seven-point scale of *not at all true* to *very true*. The items ask about intrinsic factors such: as taking responsibility, making autonomous choices, self-appraisal, and extrinsic factors, in accordance with Self-Determination Theory (Ryan & Deci, 2000). However, this questionnaire includes 60 questions, which was too long for the current study.

Bandura and Locke (2003) advise asking about confidence to enact a specific behaviour in a specific context on a 10 point scale from *not at all* to *very*. A questionnaire to assess confidence to exercise, eat a healthy diet, to abstain from drinking and from smoking in different contexts was expected to include too many items.

A decision was made to create brief idiosyncratic measures of intention, confidence, and temptation to act in ways which adhered to the guidance for exercise, diet, alcohol, and smoking during pregnancy. The guidance is for frequency of behaviours (weekly exercise, regular healthy diet, abstinence from alcohol and smoking). The measure asked about the frequency of intention, confidence, and temptation on a five-point scale of *every day* to *no days*. A five or seven point *none* to *high* Likert scale, or the extent of agreement with statements about intentions, confidence and temptation, would have been alternative ways to capture levels of motivation. This was considered to be a poorer fit to the frequency-based UK guidance.

2.1.6 Potential biases

Research studies are subject to a number of potential design, data collection, and reporting biases. Design bias arises from researchers not accounting for the inherent bias of their studies, such as any tendency to use measures that are more likely to give sought after outcomes. Experimenter bias can arise when researchers consciously or subconsciously influence the results of their studies towards favourable outcomes. Sampling bias can result from purposefully recruiting from a subsample of the population whilst purporting to recruit a representative sample. It may also result from the non-representative characteristics of the people who volunteer to take part in research studies. Measurement bias can occur if there are errors in the data collection, such as missing questions or miscoded data. Social desirability bias can contribute to measurement bias if participants give what they believe to be socially acceptable answers to questions. Sensitive topics such as health behaviours and mental health are particularly prone to this type of bias, although it can be ameliorated by anonymity (Ong & Weiss, 2000).

Quantitative studies can be subject to procedural bias if participants feel under time pressure to complete questionnaires. In qualitative studies, interviewers' subconscious responses to their interviewees' words and non-verbal communication may influence the dialogue. Both quantitative and qualitative methods can be subject to response bias if participants consciously or subconsciously answer questions in ways that they believe the researcher would like or would expect, and this may be more

likely in researcher-led intervention studies. Reporting biases can arise if not all the outcomes are reported and/or treated as having equal importance, whether or not they were statistically significant.

The intervention study had greater potential for bias due to my investment in the intervention, which I devised, delivered, and evaluated. I addressed the biases wherever possible; details are included in the subsequent chapters. The design, procedures and data analysis were intended to obtain representative outcomes, data was interpreted with caution, and the studies' limitations were reported.

2.1.7 Inherent problems in researching mindfulness

Whilst there is a significant body of research and literature on the effects of mindfulness-based interventions, there is some controversy as to how define mindfulness, and how to measure it, if at all. The much quoted definition of mindfulness proposed by Jon Kabat-Zinn “the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment” (2003) seems to describe an aspect of consciousness rather than a operationalised and measurable psychological characteristic.

The measure used in this project, the Five Facet Mindfulness Questionnaire Short Form (FFMQ-SF) (Bohlmeijer et al., 2011) is one of several that claims to measure mindfulness whilst depending on different constructs of what it is and which aspects of it can be measured. Its parent measure, the FFMQ (Baer et al., 2008) was derived from a factor analysis of other measures which arrived at five facets of mindfulness (observe, act with awareness, non-judgement, describe, non-reactive) as a consensus of how other researchers operationalised mindfulness and decided how it could be measured.

There are controversies as to whether contemporary definitions, measurements and interventions denature the traditional conception of mindfulness as a way to introspectively cultivate various aspects of heart and mind within Buddhism and other traditions (Bodhi, 2011). This is somewhat incompatible with the clinical and research uses of these words, which are restricted to the psychological trait of mindfulness, practices that enhance mindfulness, and mindfulness-based interventions (Vago & Silbersweig, 2012), and with the assimilation of “mindful” into current use to mean awareness and/or consideration of ourselves, other people, and events.

These scientific and philosophical debates do not undermine the credibility of research into the effects of mindfulness-based interventions, but they do highlight a difficulty around researching something

that was conceived more as a way of life than an eight-week intervention, and for which there is no unified definition in either its traditional roots or contemporary applications. This study adhered to conventional empirical approaches to researching mindfulness, whilst recognising the limitations of this approach.

This chapter set out the current project's methodology and the stages of this PhD. The following chapters report the studies outlined above, and they are integrated in chapter nine.

3

Chapter Three: Relationships between trait mindfulness and maternal health behaviours.

3.1 Introduction

The overall aim of this project was to develop and evaluate the feasibility a mindfulness-based intervention to target adverse maternal health behaviours. Step one was to review the evidence about potential effects, prevalence and factors associated with non-adherence to UK guidance for health behaviours during pregnancy. This raised the question of whether trait mindfulness might be a factor in health behaviours during pregnancy.

Step two of this project was an investigation of whether maternal health behaviours were related to trait mindfulness. It addresses the first primary research question:

To what extent is trait mindfulness related to women's health behaviours during pregnancy?

This chapter is the first of two to report the outcomes of this study. It reports the direct and indirect relationships between trait mindfulness and single maternal health behaviour risks within the context of immutable pregnancy-related and socio-demographic factors. The next chapter reports the relationships between trait mindfulness and the co-occurrence of maternal health behaviour risks.

The rationale for conducting separate analyses on single and co-occurring risks was that the literature on pregnancy health behaviours and intervention tends to focus separately on: exercise and diet factors in obesity and gestational weight gain during pregnancy; alcohol; and smoking, rather than co-occurring risks. UK guidance similarly focuses separately on exercise, diet, conception BMI, alcohol, and smoking. Likewise, the literature on trait mindfulness and mindfulness-based interventions tends to address questions about discrete health behaviours, even when they collect broader health and lifestyle data and report associations between health behaviours and with socio-demographic, economic and pregnancy factors. For example, whilst the UK's national Infant Feeding Survey gathered retrospective data on various health behaviours during pregnancy, it reported them separately (HSCIC, 2012b). O'Keeffe et al.'s (2015) large scale international prospective pregnancy study reported the associations between lifestyle and drinking during pregnancy within a multitude of other factors, but not co-occurrence of the risks themselves.

Chapter one identified that there may be some common capability, opportunity, and motivation factors associated with exercise, diet, alcohol, and smoking during pregnancy, and proposed a rationale for why mindfulness training might have some potential to improve maternal health behaviours. The review of retrospective and prospective pregnancy studies and general population

health data in chapter one suggested that the expected prevalence of non-adherence to UK pregnancy health behaviour guidance might be: exercise (50%), Vitamin D (58%), conception BMI (50%), alcohol (41%) and smoking (12%). It was evident that these risks must co-occur, as these figures total 211%. However, it is difficult to identify the prevalence of single and co-occurring maternal health-risk behaviours in the current literature.

This study was intended to inform the behaviour change intervention design. It was useful to separately conduct analyses for single risks (chapter three) and co-occurring risks (chapter four) in order to discuss the findings for single risks in comparison to the single risk-focused literature; to investigate whether there was any potential for an intervention which might improve trait mindfulness or mental health to alleviate single and/or co-occurring risks; to identify the expected prevalence of co-occurring risks in pregnant women who might be interested in taking part in the feasibility study; and to identify the characteristics of women in whom single and co-occurring risks might be more likely to occur. This chapter focuses on single risks.

3.1.1 Aim and objectives

The aim of this study was to investigate whether trait mindfulness was related to maternal health behaviours. It also investigated whether trait mindfulness was related to the potentially modifiable factors in health behaviours (mental health, reflective motivation) within the context of fixed factors (pre-pregnancy health behaviour habits, socio-economic/demographic factors, parity, planned pregnancy) identified in chapter one. The rationale was that the maternal mental health and motivation were potential foci of a mindfulness-based intervention, and might be levers for improving maternal health behaviours. The specific objectives of the study were to evaluate:

- 1) Whether trait mindfulness was related to or made a difference to individual maternal health behaviour risks.
- 2) Whether trait mindfulness was related to or made a difference to maternal mental health, behavioural motivation, and socio-demographic characteristics.
- 3) The extent to which this sample of pregnant women reflected established associations between maternal health behaviour risks and mental health, motivation factors, and socio-demographic factors.

4) The extent to which trait mindfulness, mental health, motivation, pre-pregnancy health behaviours, and socio-demographic and pregnancy characteristics were associated with the likelihood of maternal health behaviour risks.

3.2 Method

A cross-sectional survey was undertaken.

3.2.1 Participants

The study was conducted with a convenience sample of pregnant women recruited as they attended routine NHS maternal appointments. Women were eligible to take part if they were at least 16 years old, and at least 13 weeks pregnant. There was no scope to translate and revalidate the measures from English, which excluded women who did not speak or read English fluently.

Sample size

The study intended to recruit a sample of at least 375 pregnant women. The objective was to recruit enough women to conduct analyses on relationships between mindfulness and behaviours. The lowest expected prevalence of non-adherence to guidance was between 8% and 12% (smokers). Power analysis conducted in the G*Power computer programme (Faul, Erdfelder, Buchner, & Lang, 2009) indicated that for 12% prevalence, a sample size of 332 would recruit 36 smokers; for 8% prevalence, a sample of 460 women would recruit 34 smokers; and this would be sufficient for 80% power to detect medium sized differences ($d = 0.50$, J.Cohen, 1988) between smokers and non-smokers using independent t-tests at alpha .05, meaning that there was a 5% chance of indicating significant relationships between variables where none existed (Type I errors) (A. P. Field, 2013). A sample of 375 was expected to recruit at least 30 women, 95% CI [27, 33], and at most 45 women, 95% CI [40, 50] who would report smoking during pregnancy. The expected prevalence of other risks was 50% inactive, 42% no Vitamin D, 50% high BMI, 41% drinking (chapter one). A sample of 375 was expected to include 187 women who would report being inactive (less than two hours of moderate exercise per week), 95% CI [182, 192], 158 women who were not taking Vitamin D, 95% CI [154, 162], 187 women who were overweight or obese at conception (BMI of 25 or over), 95% CI [182, 192], and 154 women who would report drinking alcohol, 95% CI [150, 158].

Recruitment

Recruitment occurred via Community Midwives based in four central clinics in Oxfordshire. Midwives were provided with recruitment packs; each pack was enclosed in a prepaid envelope and contained a paper questionnaire and an invitation letter (Appendix B) which included information and instructions about the option to complete the password-protected online copy of the questionnaire. Consent was implied by completing the online questionnaire or by returning the paper questionnaire.

3.2.2 Data collection

Valid and reliable measures were employed for exercise, alcohol, mindfulness and mental health. Unless otherwise stated, the measures used five point Likert scales. The consideration of measures is described in chapter two (2.1.5).

The questionnaire was piloted with ten female post-graduate researchers, and this led to minor modifications to instructions and content. It took approximately 20 minutes to complete. The questionnaire was anonymous in order to alleviate socially desirable responses to potentially sensitive questions about maternal mental health and lifestyle (NICE, 2014d; Ong & Weiss, 2000). The questionnaire (in Appendix B) included the following measures:

3.2.3 Characteristics

Women were asked to provide information about their pregnancy characteristics (parity, gestation, pregnancy recognition, whether their pregnancy was planned or assisted with IVF) and socio-demographic/economic characteristics (age group, employment, family income, education, and ethnicity).

3.2.4 Health behaviours

Exercise

Exercise was measured using the leisure time section of the Pregnancy Physical Activity Questionnaire (PPAQ) (Chasan-Taber et al., 2004). This scale measures walking, dancing, swimming, running, exercise classes, and “other exercise”, on a six-point scale of *none, less than 15 minutes to 3 or more hours* per week. An item about cycling was added as it is a recommended moderate intensity activity during

pregnancy (NHS, 2015b). It did not compromise the validity of the questionnaire as the women could have reported cycling time the “other” section. The PPAQ identifies which activities are low, moderate, or vigorous intensity.

Diet

The women were asked to indicate whether they were taking pregnancy-specific multivitamins, Folic Acid, and Vitamin D supplements. Dietary intake was not included because a dietary recall questionnaire would have added considerably to the participant burden.

Body mass index and gestational weigh gain

Women were asked to provide information about their height in feet and inches or metres, and their pre-pregnancy and current weight in stones and pounds or kilogrammes.

Alcohol

Pre-pregnancy and current alcohol consumption were measured using two copies of the three item Alcohol Use Disorders Identification Test Consumption scale (AUDIT-C) (Bradley et al., 2007). This measure has been used in other antenatal studies. It asks about the frequency and quantity of alcohol consumption. An AUDIT-C score of three or more identifies higher risk drinking in the general population (Bradley et al., 2007).

Smoking

Pre-pregnancy and current smoking was measured by asking the women to indicate how many cigarettes they smoked each day.

3.2.5 Mindfulness

The women were asked if they practiced mindfulness or another form of meditation.

Mindfulness was measured using the Five Facet Mindfulness Questionnaire (Short Form) FFMQ-SF (Bohlmeijer et al., 2011), which is a short version of the Five Facet Mindfulness Questionnaire (FFMQ). The FFMQ was developed from factor analysis of five independently validated mindfulness questionnaires (Baer et al., 2008), and has been used in other antenatal studies.

The five domains are: describing, such as “I’m good at finding the word to describe my feelings”; non-reactivity to inner experience: “I watch my feelings without getting carried away by them”; non-judging of inner experience: “I think some of my emotions are bad or inappropriate and I shouldn’t feel them”; observing: “I notice visual elements in art or nature, such as colours, shapes, textures, or patterns of light and shadow”; and acting with awareness: “I find it difficult to stay focused on what’s happening in the present moment”. Higher scores indicate higher levels of trait mindfulness. The short form was selected in order to reduce participant burden.

3.2.6 Mental health

Affect

Affect was measured using the Positive and Negative Affect Schedule (PANAS), which evaluates tendency towards positive and negative frames of mind (Watson et al., 1988). It asks how frequently participants experience 10 positive and 10 negative mood states, such as “interested” and “scared”. PANAS has been shown to have moderately good validity, and good test-retest reliability. There are two total scores, one for positive affect and one for negative affect. Higher scores indicate better positive mood and worse negative mood.

Wellbeing

Wellbeing was measured using the Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS) (Tennant et al., 2007). It asks about the frequency of experiencing 14 positive states, such as “I’ve been feeling optimistic about the future” on a scale of *none of the time* to *all of the time*. WEMWBS has been shown to have good validity, internal consistency, and test-retest reliability with a general population sample (N = 2075). Higher scores indicate better wellbeing and lower distress.

Perceived stress

Stress was measured using the Perceived Stress Scale (PSS) (S. Cohen et al., 1983). It evaluates tendency to view life events over the previous month as stressful and beyond ability to cope using a 10 question scale of items, such as “How often have you been upset because of something that happened unexpectedly?” on a scale of *never* to *very often*. This scale has demonstrated good reliability, validity and sensitivity to change (Hewitt, 1992). Higher scores indicate higher perceived stress.

General female population median scores are 31 for positive affect and 15 for negative affect (Crawford & Henry, 2004). General population median score for wellbeing is 51 (Tennant et al., 2007). A stress score of 13 is average, and 20 indicates high stress levels (S. Cohen et al., 1983).

3.2.7 Motivation factors

Motivation for health behaviours was measured using single item idiosyncratic questions for intention and confidence in ability to exercise, to eat healthily, to not drink alcohol, and to not smoke, and for temptation to not exercise, to eat unhealthily, to drink alcohol, and to smoke on a scale of *no days* to *every day*.

3.2.8 Debrief

The survey concluded with a debrief sheet which explained the purpose of the research and how to access support and information about lifestyle and mental health during pregnancy.

3.2.9 Ethical approval

Ethical approval was granted by the NHS National Research Ethics Service (NREC) and Oxford University Hospitals NHS Trust (Appendix A). The NREC waived its normal requirement of parental consent for 16 to 17 year olds to allow for recruitment from 16 whilst maintaining participants' anonymity.

3.2.10 Data Analysis

Data were checked and cleaned in Excel. Body mass index (BMI) at conception was calculated using height and weight data. Leisure time physical activities were classified as low, moderate, and vigorous intensity in accordance with PPAQ instructions (Chasan-Taber et al., 2004). Low level exercise was disregarded, and weekly moderate and vigorous leisure time physical activity hours were totalled to give total weekly moderate exercise hours.

Data were imported into SPSS 22. Mindfulness and mental health scores were treated as continuous.

Adherence to guidance for antenatal leisure time physical activity, Vitamin D supplementation, conception BMI, alcohol, and smoking were assessed using the recommendations in Table 1.1. Table

3.1 illustrates the criteria for maternal health behaviour risks, defined by non-adherence to the guidance.

Table 3.1 *Criteria for maternal health behaviour risks*

Factor	Risk	Name
Exercise	Less than two hours of moderate activity per week	Activity risk
Vitamin D	Not taking Vitamin D supplements	Vitamin D risk
BMI	BMI score of 25 or over	BMI risk
Alcohol	Any alcohol during pregnancy	Alcohol risk
Smoking	Any smoking during pregnancy	Smoking risk

Guidance (NHS, 2013a, 2015b, 2015f; NICE, 2008a, 2008b, 2010b, 2010c; RCOG, 2015).

Pre-pregnancy health behaviour risks were identified by non-adherence to UK guidance for alcohol and smoking, illustrated in Table 3.2.

Table 3.2 *Criteria for pre-pregnancy health behaviour risks*

Behaviour	Risk	Name
Alcohol	AUDIT-C three or more	Pre-pregnancy alcohol risk
Binge drinking	AUDIT-C q3 one or more	Pre-pregnancy binge risk
Smoking	Any	Pre-pregnancy smoking risk

AUDIT-C alcohol risk (Bradley et al., 2007).Guidance (NICE, 2010b)

Motivation for health behaviours was defined in accordance with UK guidance (Table 1.1). Women are advised to exercise regularly and to eat a balanced diet. Intending to exercise/eat healthily on *most days* or *all days* was defined as higher intention, as were higher exercise/diet confidence and higher exercise/diet temptation. The guidance for alcohol and smoking is to abstain, meaning that intending to abstain from alcohol and to abstain from smoking on *all days* was defined as higher intention, and feeling tempted to drink alcohol/smoke on *some, most, or all days* was defined as higher temptation.

Analyses were conducted on the whole sample (N = 318) to answer the principal research question of whether mindfulness was associated with maternal health behaviours. These questions had no face

validity for women who did not drink or smoke prior to pregnancy, and additional subsidiary analyses were conducted on the subsamples of women who reported pre-pregnancy drinking and smoking.

The data was analysed using a combination of descriptive and inferential statistics. Independent univariate analyses tested differences in mean mindfulness and mental health scores for maternal health behaviour risks. Independent t-tests were used to compare differences between groups. Parametric tests were conducted on the basis that the Central Limit Theorem asserts that samples of 30 or more tend towards normal distribution (Lumley, Diehr, Emerson, & Chen, 2002). Phi correlation tests analysed associations between dichotomous values. Pearson's moment-by-moment correlations analysed associations between continuous variables. Associations between mindfulness, mental health, motivation and socio-demographic and pregnancy characteristics and the likelihood of each maternal health behaviour risk were analysed using binary logistic regression, using the "Enter" approach.

There were insufficient pregnant women drinking more than two units of alcohol twice per week ($n = 6$) to assess differences with women who drank within this amount, insufficient pregnant smokers ($n=16$) to estimate predictors of smoking, and too few meditators ($n = 10$) to assess difference between meditators and non-meditators.

Significance was set at $p < .05$. The alpha level was not adjusted for the number of comparisons as this was an exploratory study that interpreted the results with caution. Effect sizes were calculated using the formula $r = \sqrt{t^2 / (t^2 + df)}$ and categorised as $< 0.1 =$ trivial; 0.1 to $0.3 =$ small; 0.4 to $0.5 =$ moderate; $> 0.5 =$ large (J. Cohen, 1988). The strength of correlation coefficients was defined as 0.00 to 0.20 very weak, 0.20 to 0.39 weak, 0.40 to 0.59 moderate, 0.60 to 0.79 strong, and 0.80 to 1.00 very strong (A. P. Field, 2013).

3.3 Results

Recruitment occurred from February 2013 to February 2014. 286 questionnaires were returned from 1,500 issued to community midwives, a return rate of 19%. The majority (97%) were returned on paper. 32 additional questionnaires were obtained from baseline data for study two, totalling 318.

3.3.1 Demographic and pregnancy characteristics

The demographic and pregnancy characteristics of the women are shown in Table 3.3. A majority of women were White British, native English speakers, aged 26 to 35, university educated, employed, and had family income of £40,000 or more. Half of the women were in the second trimester (13 to 26 weeks), and half were nulliparous. The majority of the pregnancies were planned, naturally conceived, and identified early. A small number of women had a meditation or mindfulness practice.

Ethnicity reflected national norms, but the women were more likely to be first time mothers, and were older, more highly educated, more likely to be working, and more affluent than a representative sample (NHS, 2014; ONS, 2014a, 2014b, 2014c, 2014d, 2015b; Wellings et al., 2013).

Table 3.3 *Socio-demographic and pregnancy characteristics of the women, N = 318*

Characteristic	Group	Sample		National norms
		Number	%	%
Ethnicity	White British	243	76	74
	White Irish	7	2	
	White non-British	45	15	
	Mixed	5	2	
	Asian	16	5	
	Black	2	-	
Native English speaker		267	84	-
Age group	16 to 20	7	2	8
	21 to 25	30	10	15
	26 to 30	86	27	28
	31 to 35	136	42	30
	36 to 40	53	17	15
	41 and over	6	2	4

Characteristic	Group	Number	Sample		National norms
			%	%	%
Education	Nil & GCSE's	35	11		15
	A levels & vocational	94	30		52
	Bachelor's degree	107	33		
	Master's degree/Chartership	57	18		} 37
	Doctorate	25	8		
Employment	Full-time	207	65		} 66
	Part-time	37	12		
	Unemployed	17	5		
	Student	7	2		
	Full-time mother	50	16		
Annual Family Income	£10,000 to £40,000	137	43		60
	£40,000 to £80,000	147	46		30
	£80,000 & over	34	11		10
Trimester	Second	151	48		-
Nulliparous		151	47		37
Planned pregnancy		272	85		83
Natural conception		304	96		97
Recognised by six weeks		270	85		N/A
Meditation practice		10	3		-

Norms from NHS and ONS reports (NHS, 2014; ONS, 2014a, 2014b, 2014c, 2014d, 2015b; Wellings et al., 2013).

3.3.2 Maternal health behaviour risks

Table 3.4 illustrates weekly leisure time physical activity and GWG. Average activity was higher than the two hour recommended minimum per week; 43% (n = 137) met minimum guidance to exercise for two to 3.5 hours per week, and 9% (n = 29) met the guidance to exercise for at least 3.5 hours per week, but 48% (n = 153) exercised for less than two hours per week, and 10% (n = 31) were inactive (nil hours). Average GWG to week 26 was 0.20 kg (SD = 0.20) and to week 40 was 0.30 kg (SD = 0.20).

Table 3.4 Activity and gestational weight gain, N = 318

Maternal health factor	Unit	Mean	SD	Range
Activity	Hours per week	2.59	2.21	0.00 to 9.50
Gestational weight gain	Kg per week	0.25	0.21	-1.39 to 2.15

Table 3.5 illustrates that average BMI at conception was in the normal range (18.5 to <25). The majority of women had normal range BMI at conception, a small proportion were underweight (less than 18.5), and a total of 28% (n = 88) were overweight (25 to <30) or obese (30 or more).

Table 3.5 Conception BMI: category prevalence, N = 318

BMI category	Number	%	Mean	SD	Range
Mean	318	100	24.26	5.20	14.26 to 47.51
Underweight	20	6	17.43	1.07	14.26 to 18.49
Normal	210	66	22.02	1.80	18.60 to 24.99
Overweight	47	15	27.09	1.35	25.05 to 29.80
Obese	41	13	34.67	3.80	30.02 to 47.51

Antenatal risk prevalence is illustrated in Figure 3.1. Forty five percent of women (n = 145) were insufficiently active, 31% (n = 97) were not taking Vitamin D, 28% (n = 88) were overweight/obese at conception, 26% (n = 82) were drinking some alcohol, and 5% (n = 16) were smoking. Six women exceeded one to two units of alcohol once or twice a week.

Risk prevalence was lower than expected norms for low activity (50%), high BMI (50%), not taking Vitamin D (58%), drinking alcohol (41%), and smoking (12%) (HSCIC, 2012a, 2012b, 2014a, 2014e).

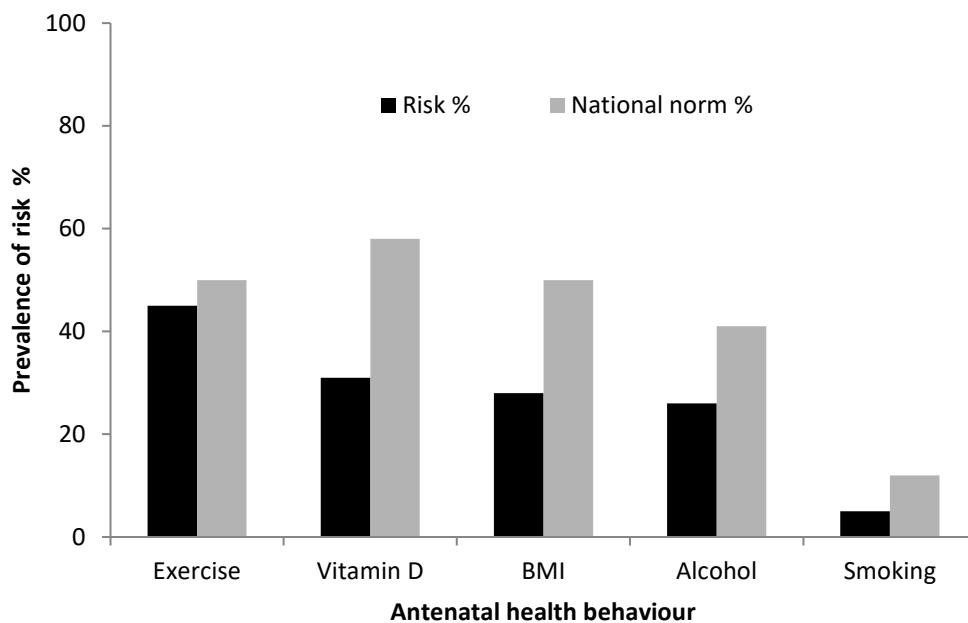


Figure 3.1 Antenatal risk prevalence: comparison to national norms N = 318

3.3.3 Pre-pregnancy risk prevalence

Figure 3.2 illustrates pre-pregnancy risks. A minority of the women (12%, n = 38) did not drink alcohol prior to conception; 29% (n = 92) drank at lower risk levels, and 59% (n = 188) drank at higher risk levels. Fifty three percent (n =167) drank at binge levels. Fifteen percent of the women (n = 49) smoked prior to pregnancy. Drinking was higher than UK norms for drinking (52%), higher risk drinking (28%), and binge drinking (13%). Smoking was lower than UK norms (21%) (HSCIC, 2014b, 2014d).

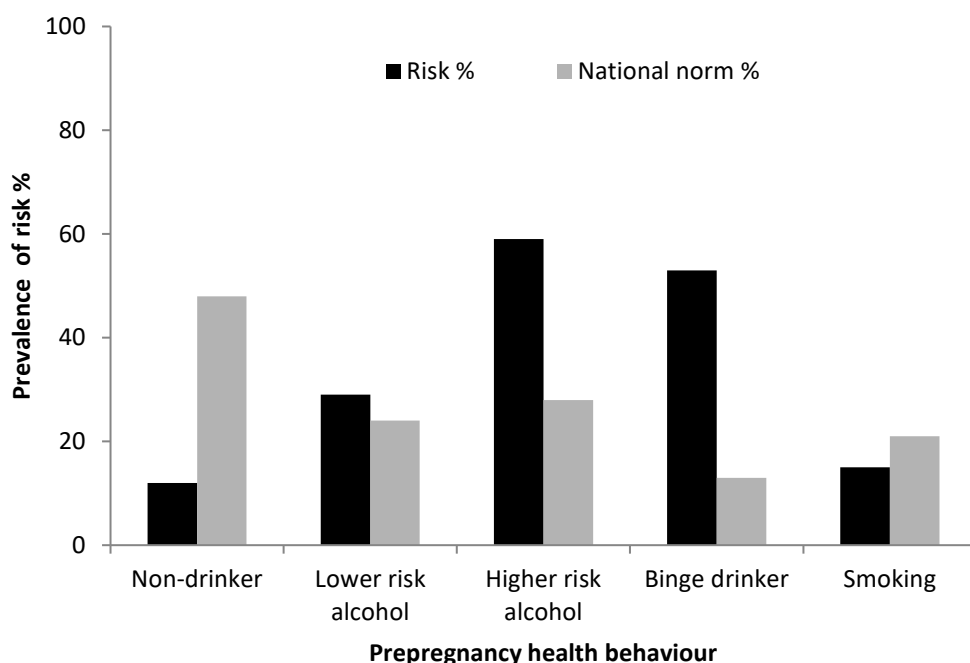


Figure 3.2 Pre-pregnancy risk prevalence: comparison to national norms N = 318

The majority of women who drank or smoked prior to pregnancy reported that they were abstaining (71% quit drinking, 67% quit smoking). Quit rates for drinking were considerably higher than the 47% UK norms, whereas quit rates for smoking were slightly higher than the 62% UK norm (HSCIC, 2012b).

3.3.4 Trait mindfulness

Means and standard deviations of total and subscale mindfulness scores were calculated. Scores were higher than the midpoint for each scale, per Table 3.6. Normal mindfulness scores are not available for either the general population or for pregnant women.

Table 3.6 Means and standard deviations for trait mindfulness, *N* = 318

Mindfulness	Mean (SD)	Observed range	Potential range	Midpoint
Total	82.08 (10.85)	51 - 111	24 - 120	72
Non-reactive	15.68 (3.50)	7 - 25	5 - 25	15
Observing	13.50 (2.76)	5 - 20	4 - 20	12
Acting with awareness	17.37 (3.42)	7 - 25	5 - 25	15
Describing	18.62 (3.42)	8 - 25	5 - 25	15
Non-judging	16.91 (3.44)	9 - 25	5 - 25	15

3.3.5 Mental health

Means and standard deviations of maternal mental health scores were calculated, illustrated in Table 3.7. The affect, wellbeing and stress scores were higher than the midpoints for each of the scales (30, 42, 30 respectively). No normative data exists for pregnant women, but average positive affect was commensurate with general population means, average negative affect was higher than population norms, average wellbeing was slightly below population means, and average perceived stress was higher than the cut-off score for clinical level. A considerable proportion of the women had higher than population mean negative affect, and half of the women scored for clinical levels for perceived stress. Overall, these pregnant women reported that their psychological health was worse than general population norms.

Table 3.7 Means and standard deviations for maternal mental health, N = 318

Psychological health	Mean (SD)	Observed range	Potential range	Population mean	Worse than mean/cut-off
Positive affect	31.87 (7.53)	10 - 49	10 - 50	31*	40%
Negative affect	20.13 (6.93)	10 - 42	10 - 50	15*	69%
Wellbeing	48.56 (8.80)	24 - 69	14 - 70	51*	54%
Perceived Stress	20.45 (3.49)	9 - 32	10 - 50	20**	51%

* general population mean **cut off for clinical level of stress.

3.3.6 Motivation

The number and proportions of women with higher and lower intention, confidence and temptation are illustrated in Table 3.8. Half the women intended to exercise regularly, and slightly more were confident about their ability to do this. The majority had higher intentions to eat healthily, and were highly confident about their ability to do so. Less than a third of the women felt tempted to not exercise or to eat unhealthy foods.

Amongst women who drank or smoked pre-pregnancy, nearly all intended to abstain from drinking, and two thirds intended to abstain from smoking. Confidence in ability to abstain was lower than intention to abstain, but at least half felt confident about this. A minority of the women who drank alcohol prior to pregnancy were tempted to drink, and a quarter of pre-pregnancy smokers were tempted to smoke.

Table 3.8 *Prevalence of lower and higher intention, confidence and temptation for maternal health behaviours*

Health behaviour	Motivation Factor	Number	Lower		Higher	
			n	%	n	%
Exercise	Intention	285	141	49	144	51
	Confidence		123	43	162	57
	Temptation		201	71	84	29
Diet	Intention	285	28	10	257	90
	Confidence		43	15	242	85
	Temptation		205	72	80	28
Alcohol	Intention	251	12	5	239	95
	Confidence		9	3	242	97
	Temptation		229	91	22	9
Smoking	Intention	49	16	33	33	67
	Confidence		20	41	29	59
	Temptation		24	48	25	52

Motivation for exercise and diet indicates intention and confidence to enact, temptation to be inactive/eat unhealthy foods; for alcohol and smoking indicates intention and confidence to abstain, temptation to drink/smoke.

3.3.7 (Objective 1.1) To investigate whether maternal health behaviour risks were related to trait mindfulness.

Table 3.9 illustrates correlations between mindfulness and weekly exercise hours and body mass index. BMI was significantly negatively associated with observing, but the effect was small. This means that trait mindfulness had no effects on activity during pregnancy, and no more than trivial effects on body mass index at conception.

Table 3.9 *Pearson’s correlations between trait mindfulness and activity, trait mindfulness and BMI, N= 318*

Mindfulness	Weekly exercise		BMI	
	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
Total	.018	.758	-.088	.130
Non-reactive	-.041	.465	-.020	.733
Observing	.048	.401	-.128	.028
Acting with awareness	-.063	.274	-.048	.410
Describing	.047	.411	-.049	.397
Non-judging	.046	.426	-.061	.292

Exercise: moderate leisure time physical activity. BMI: body mass index. Significant p values in bold.

Table 3.10 illustrates the differences in trait mindfulness between the high and low risk maternal health behaviour groups. There were no significant differences in the levels of trait mindfulness, and the differences were very small. There was a weak relationship between smoking and the describing subscale of mindfulness, but the small number of smokers means that this should be interpreted with caution. The results mean that trait mindfulness made no difference to individual maternal health behaviour risks.

Table 3.10 Mean differences in trait mindfulness between high and low risk health behaviour groups, N = 318

Health behaviour	Mindfulness	Risk			No risk			Mean difference	95% CI		t	df	p
		M	SD	n	M	SD	n		Lower	Upper			
Exercise	Total	81.86	11.20	145	82.26	10.57	173	-0.40	-2.81	2.00	-0.33	316	.741
	Non-reactive	15.61	3.47		15.73	3.52		-0.12	-0.90	0.66	-0.31		.760
	Observing	13.42	2.82		13.56	2.72		-0.14	-0.75	0.47	-0.45		.653
	Acting with awareness	17.60	3.12		17.17	3.65		0.43	-0.33	1.18	1.11		.269
	Describing	18.45	3.68		18.77	3.19		-0.32	-1.08	0.44	-0.83		.406
	Non-judging	16.77	3.53		17.02	3.26		-0.25	-1.01	0.51	-0.65		.518
Vitamin D	Total	81.39	10.66	97	82.38	10.94	221	-0.98	-3.58	1.62	-0.74	316	.457
	Non-reactive	15.61	3.56		15.71	3.48		-0.10	-0.94	0.74	-0.24		.811
	Observing	13.46	3.03		13.51	2.64		-0.05	-0.71	0.61	-0.14		.888
	Acting with awareness	17.40	3.13		17.35	3.55		0.05	-0.77	0.87	0.12		.906
	Describing	18.11	3.30		18.85	3.42		-0.73	-1.55	0.08	-1.77		.079
	Non-judging	16.80	3.48		16.95	3.43		-0.15	-0.98	0.68	-0.36		.720

Health behaviour	Mindfulness	Risk			No risk			Mean difference	95% CI		<i>t</i>	df	<i>p</i>
		M	SD	n	M	SD	n		Lower	Upper			
BMI	Total	81.68	11.35	88	82.23	10.67	230	-0.54	-3.22	2.13	-0.40	316	.690
	Non-reactive	15.65	3.56		15.69	3.48		-0.04	-0.91	0.82	-0.10		.921
	Observing	13.25	2.73		13.59	2.77		-0.34	-1.02	0.34	-0.99		.324
	Acting with awareness	17.30	3.42		17.40	3.43		-0.10	-0.95	0.75	-0.23		.816
	Describing	18.82	3.63		18.55	3.34		0.27	-0.57	1.12	-0.63		.529
	Non-judging	16.67	3.46		17.00	3.44		-0.33	-1.18	0.52	-0.76		.446
Alcohol	Total	81.74	11.13	82	82.19	10.77	236	-0.45	-3.19	2.29	-0.32	316	.748
	Non-reactive	15.74	3.56		15.66	3.48		0.08	-0.80	0.97	0.19		.846
	Observing	13.57	2.49		13.47	2.85		0.10	-0.59	0.80	0.29		.772
	Acting with awareness	16.83	3.36		17.56	3.43		-0.73	-1.59	0.14	-1.66		.098
	Describing	18.91	3.27		18.52	3.47		0.39	-0.47	1.26	0.90		.370
	Non-judging	16.68	3.41		16.99	3.46		-0.30	-1.17	0.56	-0.69		.491

Health		Risk			No risk			Mean	95% CI				
behaviour	Mindfulness	M	SD	n	M	SD	n	difference	Lower	Upper	<i>t</i>	df	<i>p</i>
Smoking	Total	77.38	7.45	16	82.32	10.95	302	-4.95	-10.41	0.56	-1.79	316	.075
	Non-reactive	14.75	3.70		15.73	3.48		-0.98	-2.74	0.79	-1.09		.276
	Observing	12.63	2.39		13.54	2.77		-0.92	-2.31	0.47	-1.30		.195
	Acting with awareness	16.31	2.41		17.42	2.41		-1.11	-2.84	0.61	-1.27		.206
	Describing	17.00	3.80		18.71	3.80		-1.71	-3.43	1.01	-9.96		.051
	Non-judging	16.69	3.40		16.92	3.40		-0.23	-1.97	1.51	-0.26		.792

3.3.8 (Objective 1.2) To investigate whether trait mindfulness differed between the groups who maintained or quit drinking or smoking.

Table 3.11 illustrates the differences in trait mindfulness between the groups who drank or smoked prior to pregnancy and continued to do so (risk) and the groups who were now abstaining from alcohol or smoking (no risk). Mindfulness was not significantly different between groups who quit and did not quit. This means that trait mindfulness made no difference to quitting drinking or smoking during pregnancy.

Table 3.11 Mean differences in trait mindfulness between high and low risk drinking and smoking groups: women who drank or smoked pre-pregnancy

Health behaviour	Mindfulness	Risk			No risk			Mean difference	95% CI		t	df	p
		M	SD	n	M	SD	n		Lower	Upper			
Alcohol	Total	81.74	11.13	82	82.17	10.65	198	-0.42	-3.21	2.37	-0.30	278	.766
	Non-reactive	15.74	3.56		15.73	3.42		0.01	-0.88	0.91	0.03		.980
	Observing	13.57	2.49		13.53	2.89		0.05	-0.67	0.77	0.13		.896
	Acting with awareness	16.83	3.36		17.44	3.40		-0.62	-1.49	0.26	-1.39		.167
	Describing	18.91	3.27		18.51	3.48		0.41	-0.47	1.29	0.91		.362
	Non-judging	16.68	3.41		16.96	3.38		-0.28	-1.15	0.60	-0.62		.534
Smoking	Total	77.38	7.45	16	77.70	9.41	33	-0.21	-5.73	5.09	-0.12	47	.905
	Non-reactive	14.75	3.70		14.75	2.86		-0.40	-2.33	1.53	-0.42		.678
	Observing	12.63	2.39		12.63	2.77		-1.11	-2.64	0.62	-1.25		.217
	Acting with awareness	16.31	2.41		16.31	2.97		0.07	-1.65	1.79	0.08		.935
	Describing	17.00	3.80		17.00	3.27		-0.33	-2.49	1.78	-0.32		.753
	Non-judging	16.69	3.40		16.69	2.89		1.35	-0.52	3.23	1.45		.153

Risk = continued to drink/smoke; No risk = quit. Alcohol and smoking n = 280 & 48. Higher scores indicate higher levels of mindfulness.

3.3.9 (Objective 2.1) To investigate whether there were associations between trait mindfulness and antenatal mental health.

Table 3.12 illustrates correlations between trait mindfulness and mental health. Positive affect, negative affect, wellbeing and perceived stress were highly significantly correlated with total and all subscales of mindfulness, with weak to moderate effects. Mindfulness was associated with higher positive and lower negative aspects of mental health. Ability to describe experience was more associated with greater positive mental health, and non-judging of experience was more associated with lower negative symptoms. These findings indicate that higher levels of mindfulness were weakly to moderately associated with better mental health.

Table 3.12 Pearson's correlations between trait mindfulness and mental health, *N* = 318

	Mental health							
	Positive				Negative			
	Positive affect		Wellbeing		Negative affect		Perceived stress	
Mindfulness	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
Total	.499	<.001	.622	<.001	-.568	<.001	-.339	<.001
Non-reactive	.384	<.001	.417	<.001	-.413	<.001	-.306	<.001
Observing	.276	<.001	.281	<.001	-.103	.066	.074	.186
Awareness	.354	<.001	.402	<.001	-.369	<.001	-.252	<.001
Describing	.397	<.001	.528	<.001	-.428	<.001	-.248	<.001
Non-judging	.215	<.001	.388	<.001	-.495	<.001	-.326	<.001

Significant *p* values in bold

3.3.10 (Objective 2.2) To investigate whether trait mindfulness differed between higher and lower motivation groups

Tables 3.13 to 3.16 illustrate differences in trait mindfulness for higher and lower maternal health behaviour motivation. Mindfulness was significantly higher for the higher intention, higher confidence and lower temptation for exercise and healthy diet groups (Table 3.13 and 3.14); to higher intention and confidence for abstaining from alcohol groups (Table 3.15); to higher intention and lower temptation for smoking groups (Table 3.16) with small effects throughout. Acting with awareness was consistently higher in higher exercise motivation groups. Non-reactivity was consistently higher in higher diet motivation groups. Acting with awareness and describing were consistently higher in higher drinking motivation groups. The differences in trait mindfulness were greater for health promoting activities (exercise and diet) than for abstinence from potentially health depleting activities (drinking alcohol and smoking). The findings mean that trait mindfulness was slightly higher in groups with higher health behaviour intentions, greater confidence, and fewer temptations.

Table 3.13 Mean differences in trait mindfulness between lower and higher exercise motivation groups, $n = 285$

Exercise Motivation	Mindfulness	Group						Mean difference	95% CI		t	df	p	r
		Lower			Higher				Lower	Upper				
		M	SD	n	M	SD	n							
Intention	Total	81.63	10.62	141	84.53	9.70	144	-2.90	-5.27	-0.53	-2.41	283	.017	.14
	Non-reactive	15.44	3.70		16.38	3.19		-0.94	-1.74	-0.13	-2.29		.023	.13
	Observing	13.45	2.74		13.65	2.71		-0.19	-0.83	0.44	-0.60		.553	
	Awareness	17.14	3.04		18.36	3.22		-1.22	-1.95	-0.49	-3.28		.001	.19
	Describing	18.59	3.54		19.09	3.10		-0.50	-1.28	0.27	-1.28		.203	
	Non-judging	17.01	3.39		17.06	3.32		-0.05	-0.83	0.73	-0.12		.903	
Confidence	Total	80.13	10.70	123	85.35	9.32	162	-2.22	-7.56	-2.88	-4.39	283	<.001	.25
	Non-reactive	15.13	3.48		16.51	3.36		-1.38	-2.18	-0.57	-3.37		.001	.19
	Observing	13.37	2.60		13.69	2.81		-0.32	-0.97	-1.90	-1.00		.318	
	Awareness	17.10	3.16		18.26	3.13		-1.16	-1.90	-0.42	-3.09		.002	.18
	Describing	18.04	3.51		19.45	3.05		-1.41	-2.22	-0.64	-3.62		<.001	.21
	Non-judging	16.50	3.47		17.44	3.20		-0.95	-1.73	-0.16	-2.37		.020	.14

Exercise		Group						Mean difference	95% CI		<i>t</i>	df	<i>p</i>	<i>r</i>
		Lower			Higher				Lower	Upper				
Motivation	Mindfulness	M	SD	n	M	SD	n							
Temptation	Total	80.67	10.95	84	84.11	9.80	201	-3.44	-6.04	-0.85	-2.61	283	.010	.15
	Non-reactive	15.65	3.21		16.02	3.58		-0.37	-1.25	0.52	-0.81		.419	
	Observing	13.18	2.58		13.71	2.77		-0.53	-1.22	0.17	-1.50		.136	
	Awareness	17.06	3.13		18.05	3.18		-0.99	-1.80	-0.18	-2.41		.017	.14
	Describing	18.30	3.78		19.07	3.10		-0.77	-1.62	0.08	-1.79		.074	
	Non-judging	16.48	3.50		17.26	3.27		-0.79	-1.64	0.07	-1.82		.070	

Significant *p* values in bold

Table 3.14 Mean differences in trait mindfulness between lower and higher diet motivation groups, $n = 285$

Diet	Motivation	Mindfulness	Group					Mean difference	95% CI		t	df	p	r	
			Lower			Higher			Lower	Upper					
			M	SD	n	M	SD	n							
Intention	Total		75.56	10.50	28	83.93	9.90	257	-8.46	-12.36	-4.56	-4.27	283	<.001	.25
	Non-reactive		13.32	4.02		16.19	3.30		-2.88	-4.19	-1.55	-4.28		<.001	.25
	Observing		12.11	2.22		13.71	2.73		-1.60	-2.65	-0.55	-3.00		.003	.18
	Awareness		17.04	3.84		17.84	3.10		-0.80	-2.05	-0.45	-1.26		.207	
	Describing		16.75	3.81		19.07	3.20		-2.32	-3.60	-1.05	-3.58		<.001	.21
	Non-judging		16.25	3.36		17.12	3.34		-0.87	-2.18	0.44	-1.30		.194	
Confidence	Total		76.44	10.84	43	84.28	9.70	242	-7.84	-11.05	-4.62	-4.79	283	<.001	.27
	Non-reactive		14.00	4.06		16.25	3.25		-2.25	-3.36	-1.15	-4.02		<.001	.23
	Observing		12.14	2.65		13.80	2.66		-1.66	-2.53	-0.80	-3.78		<.001	.22
	Awareness		16.88	3.47		17.91	3.12		-1.03	-2.06	0.00	-1.96		.051	
	Describing		17.42	3.64		19.10	3.21		-1.68	-2.74	-0.61	-3.09		.002	.18
	Non-judging		16.00	3.43		17.21	3.31		-1.22	-2.30	-0.13	-2.21		.028	.13

		Group						Mean difference	95% CI		<i>t</i>	df	<i>p</i>	<i>r</i>
Diet	Mindfulness	Lower			Higher				Lower	Upper				
Motivation		M	SD	n	M	SD	n							
Temptation	Total	80.49	9.98	80	84.11	10.20	205	-3.63	-6.26	-0.99	-2.71	283	.007	.16
	Non-reactive	15.01	3.55		16.26	3.39		-1.25	-2.14	-0.36	-2.76		.006	.16
	Observing	13.04	2.86		13.75	2.64		-0.71	-1.42	-0.01	-2.00		.046	.12
	Awareness	17.09	3.14		18.02	3.18		-0.93	-1.75	-0.11	-2.23		.026	.13
	Describing	18.55	3.39		18.96	3.30		-0.41	-1.27	0.46	-0.93		.754	
	Non-judging	16.80	3.23		17.12	3.40		-0.32	-1.19	0.55	-0.73		.401	

Significant p values in bold

Table 3.15 Mean differences in trait mindfulness between lower and higher alcohol motivation groups, *n* = 251

Alcohol Motivation	Mindfulness	Group						Mean difference	95% CI		<i>t</i>	df	<i>p</i>	<i>r</i>
		Lower			Higher				Lower	Upper				
		M	SD	n	M	SD	n							
Intention	Total	76.17	6.39	12	83.44	10.17	239	-7.27	-13.11	-1.42	-2.45	249	.015	.15
	Non-reactive	14.92	10.16		16.04	3.45		-1.13	-3.12	0.87	-1.11		.267	
	Observing	12.75	3.44		13.62	2.74		-0.87	-2.46	0.72	-1.08		.282	
	Awareness	15.08	2.88		17.76	3.12		-2.68	-4.49	-0.87	-2.91		.004	.18
	Describing	17.00	3.49		18.94	3.27		-1.94	-3.86	-0.03	-2.00		.047	.13
	Non-judging	16.42	2.15		16.42	3.32		-0.65	-2.56	1.25	-0.68		.500	
Confidence	Total	75.44	6.25	9	83.37	10.14	242	-7.93	-14.64	-1.21	-2.33	249	.021	.15
	Non-reactive	15.00	1.73		16.02	3.47		-1.03	-3.31	1.26	-0.88		.379	
	Observing	12.78	2.49		13.61	2.74		-0.83	-2.65	0.99	-0.90		.371	
	Awareness	15.22	2.86		17.72	3.14		-2.50	-4.59	-0.41	-2.36		.019	.15
	Describing	16.56	1.94		18.93	3.32		-2.38	-4.57	-0.19	-2.14		.034	.13
	Non-judging	15.89	1.90		17.08	3.31		-1.19	-3.38	0.99	-1.08		.283	

Alcohol		Group						Mean difference	95% CI		<i>t</i>	df	<i>p</i>	<i>r</i>
		Lower			Higher				Lower	Upper				
Motivation	Mindfulness	M	SD	n	M	SD	n							
Temptation	Total	82.09	10.30	22	83.25	10.17	229	-1.16	-5.64	3.33	-0.51	249	.612	
	Non-reactive	15.91	3.09		16.05	3.49		-0.14	-1.66	1.39	-0.18		.860	
	Observing	14.09	2.11		13.59	2.74		0.50	-0.68	1.68	0.83		.405	
	Awareness	16.64	3.09		17.71	3.12		-1.07	-2.44	0.30	-1.54		.126	
	Describing	19.27	3.55		18.81	3.32		0.46	-1.01	1.93	0.62		.536	
	Non-judging	16.18	3.11		17.09	3.26		-0.91	-2.34	0.52	-1.26		.210	

Significant *p* values in bold

Table 3.16 Mean differences in trait mindfulness between lower and higher smoking motivation groups, $n = 49$

Smoking Motivation	Mindfulness	Group						Mean difference	95% CI		t	df	p	r
		Lower			Higher				Lower	Upper				
		M	SD	n	M	SD	n							
Intention	Total	75.00	7.51	16	78.75	9.25	33	-3.75	-9.12	1.62	-1.41	47	.167	
	Non-reactive	14.13	2.71		15.44	3.31		-1.32	-3.24	0.61	-1.37		.177	
	Observing	12.63	2.1		13.53	2.83		-0.91	-2.53	0.72	-1.12		.267	
	Awareness	16.00	2.76		16.53	2.75		-0.53	-2.23	1.16	-0.63		.531	
	Describing	15.75	4.22		17.97	2.79		-2.22	-4.27	-0.17	-2.18		.034	.31
	Non-judging	16.50	3.03		15.28	3.05		1.22	-0.66	3.10	1.31		.198	
Confidence	Total	76.00	7.28	20	78.62	9.70	29	2.66	-7.98	2.74	-0.99	47	.330	
	Non-reactive	14.56	3.43		15.28	3.06		0.96	-2.66	1.22	-0.75		.458	
	Observing	12.61	2.23		13.66	2.87		0.79	-2.64	0.55	-1.32		.195	
	Awareness	15.94	2.51		16.66	2.91		0.83	-2.38	0.96	-0.86		.396	
	Describing	16.56	3.52		17.72	3.43		1.04	-3.26	0.93	-1.12		.267	
	Non-judging	16.33	3.46		15.31	2.84		0.93	-0.85	2.89	1.10		.276	

		Group						Mean difference	95% CI		<i>t</i>	df	<i>p</i>	<i>r</i>
Smoking Motivation	Mindfulness	Lower			Higher				Lower	Upper				
		M	SD	n	M	SD	n							
Temptation	Total	75.00	7.69	24	79.80	9.28	25	-4.80	-9.78	0.18	-1.94	47	.058	
	Non-reactive	14.83	3.10		15.16	3.26		-0.33	-2.19	1.52	-0.36		.718	
	Observing	12.57	2.35		13.84	2.79		-1.78	-2.78	0.23	-1.70		.095	
	Awareness	15.52	2.45		17.12	2.80		-1.60	-3.13	-0.05	-2.10		.042	.30
	Describing	16.13	3.82		18.24	2.79		-2.11	-4.04	-0.18	-2.20		.033	.31
	Non-judging	15.96	3.52		15.44	2.63		0.52	-1.28	2.31	0.58		.566	

Significant p values in bold

3.3.11 (Objective 2.3) To investigate whether trait mindfulness differed between higher and lower socio-demographic groups.

Table 3.17 illustrates the differences between trait mindfulness and higher and lower socio-demographic groups. The significant effects were small. Describing was significantly higher in the women who were aged 30 and over. Trait mindfulness was not significantly different between the employed and unemployed groups. Total, non-reactive, describing, and non-judging aspects of mindfulness were significantly higher in the higher family income group. Non-reactivity and describing were significantly higher in the more educated group. Describing, the ability to label inner experiences with words, was consistently higher in the higher socio-demographic groups than the other aspects of mindfulness.

Family income was highly collinear with age and with education; family income over £40,000 per annum was twice as likely in women over 30 (odds ratio = 2.03, $p = .007$, 95% CI [1.21, 3.41]), and five times more likely in graduates (odds ratio = 5.03, $p < .001$, 95% CI [3.01, 8.39]).

These findings mean that the older, more affluent and more educated pregnant women had slightly higher levels of trait mindfulness than their younger, less affluent, and less well educated peers, but the collinearity of these factors means that the results should be interpreted with caution.

Table 3.17 Mean differences in trait mindfulness between lower and higher socio-demographic groups, N = 318

Socio-demographic	Mindfulness	Group						Mean difference	95% CI		<i>t</i>	df	<i>p</i>	<i>r</i>
		Lower			Higher				Lower	Upper				
		M	SD	n	M	SD	n							
Age group	Total	80.87	10.44	123	82.80	11.07	195	-1.93	-4.39	0.53	-1.58	316	.116	
	Non-reactive	15.43	3.60		15.85	3.39		-0.42	-1.21	0.37	-1.01		.315	
	Observing	13.49	2.84		13.52	2.72		-0.04	-0.67	0.59	-0.05		.963	
	Awareness	17.15	3.10		17.45	3.64		-.030	-1.07	0.48	-0.92		.360	
	Describing	18.08	3.49		18.96	3.36		-0.88	-1.66	-0.11	-2.26		.025	.14
	Non-judging	16.72	3.50		17.02	3.43		-0.29	-1.08	0.49	-0.76		.447	
Employment	Total	80.65	10.21	74	82.63	11.10	244	-1.94	-4.84	0.87	-1.27	316	.205	
	Non-reactive	15.09	3.49		15.89	3.50		-0.80	-1.71	0.12	-1.65		.101	
	Observing	13.22	2.62		13.58	2.81		-0.33	-1.09	0.36	-1.19		.234	
	Awareness	17.42	3.17		17.39	3.53		0.95	-0.87	0.94	-0.09		.993	
	Describing	18.00	3.09		18.85	3.51		0.06	-1.74	0.05	-1.68		.095	
	Non-judging	16.92	3.46		16.93	3.48		0.98	-0.92	0.90	0.30		.766	

Socio-demographic	Mindfulness	Group						Mean difference	95% CI		<i>t</i>	df	<i>p</i>	<i>r</i>
		Lower			Higher				Lower	Upper				
		M	SD	n	M	SD	n							
Income	Total	80.01	10.27	137	83.64	11.03	181	-3.63	-6.02	-1.25	-3.00	316	.003	.17
	Non-reactive	15.15	3.45		16.08	3.49		-0.94	-1.71	-0.16	-2.38		.018	.13
	Observing	13.33	2.89		13.62	2.66		-0.30	-0.91	0.32	-0.95		.344	
	Awareness	17.15	3.13		17.53	2.62		-0.38	-1.14	0.39	-0.97		.331	
	Describing	17.94	3.32		19.14	3.41		-1.20	-1.95	-0.45	-3.13		.002	.17
	Non-judging	16.44	3.41		17.27	3.43		-0.83	-1.59	-0.07	-2.14		.034	.12
Education	Total	80.82	10.54	129	82.91	11.01	189	-2.09	-4.54	0.35	-1.67	316	.097	
	Non-reactive	15.14	3.49		16.07	3.44		-0.93	-1.71	-0.15	-2.42		.016	.13
	Observing	13.29	2.83		13.62	2.83		-0.33	-0.96	0.29	-1.00		.319	
	Awareness	17.72	2.63		17.12	3.26		0.50	-0.17	1.37	1.59		.113	
	Describing	18.00	3.52		19.02	3.52		-1.02	-1.78	-0.25	-2.50		.013	.14
	Non-judging	16.67	3.47		17.08	3.42		-0.42	-1.19	0.36	-1.10		.271	

Significant p values in bold. Age group: under 30 v 30 and over; Employment: not v full/part-time; Income: less than £40k per annum v £40,000k or more; Education: university no v yes.

3.3.12 (Objective 3.1) To investigate whether maternal health behaviour risks were related to antenatal mental health.

Activity levels were significantly positively correlated with positive affect, wellbeing, and perceived stress, with small effects. Body mass index was significantly negatively correlated with positive affect and wellbeing, and positively correlated with negative affect. The effects were small, illustrated in Table 3.18. This finding means that positive aspects of mental health were weakly associated with being active and having lower BMI at conception. Higher stress was weakly associated with being more active, whereas low mood was weakly associated with higher BMI. The correlations do not imply that better mood and/or mental health are causal factors in activity and BMI, rather that feeling more positive and being sufficiently active/having normal range BMI co-occur more often than lower mood and sufficient activity/normal BMI.

Table 3.18 *Pearson’s correlations between mental health, activity and BMI, N = 318*

Mental health	Weekly exercise		BMI	
	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
Positive affect	.233	<.001	-.122	.036
Negative affect	-.056	.333	.128	.028
Wellbeing	.165	.004	-.186	.001
Perceived Stress	.114	.047	-.038	.510

Exercise: leisure time physical activity time. BMI: body mass index. Significant p values in bold.

Table 3.19 illustrates differences between mental health and high and low risks. Positive affect and wellbeing were significantly higher in the group which was sufficiently active, and in the group which was not smoking. Perceived stress was significantly higher in the group who drank alcohol during pregnancy. The effect sizes were small for exercise and alcohol, and moderate for smoking. There were no significant differences in mental health between the Vitamin D groups or between the BMI groups. These findings mean that positive aspects of mental health were higher in the groups which adhered to exercise and smoking guidance, whereas perceived stress was higher in the group who did not adhere to alcohol guidance.

Table 3.19 Mean differences in mental health between high and low risk health behaviour groups, N = 318

Health behaviour	Mental health	Risk			No risk			Mean difference	95% CI		<i>t</i>	df	<i>p</i>	<i>r</i>
		M	SD	n	M	SD	n		Lower	Upper				
Exercise	Positive affect	30.00	8.16	145	33.44	6.58	173	-3.44	-5.07	-1.81	-4.16	316	<.001	.23
	Negative affect	20.63	7.19		19.71	6.69		0.92	-0.61	2.46	1.18		.238	
	Wellbeing	46.88	9.11		49.97	8.29		-3.09	-5.01	-1.17	-3.16		.002	.18
	Perceived Stress	20.12	3.52		20.73	3.46		-0.60	-1.38	0.17	-1.53		.126	
Vitamin D	Positive affect	31.58	7.70	97	32.00	7.46	221	-0.42	-2.23	1.38	-0.46	316	.645	
	Negative affect	20.55	7.29		19.94	6.77		0.61	-1.06	2.27	0.72		.474	
	Wellbeing	47.55	9.81		49.00	8.30		-1.45	-3.56	0.65	-1.36		.175	
	Perceived Stress	20.20	3.74		20.56	3.38		-0.37	-1.21	0.47	-0.86		.388	
BMI	Positive affect	31.61	7.37	88	31.97	7.60	120	-0.36	-2.21	1.50	-0.38	316	.707	
	Negative affect	21.11	7.42		19.75	6.71		1.37	-0.34	3.07	1.58		.116	
	Wellbeing	47.13	9.07		49.10	8.65		-1.98	-4.14	0.18	-1.80		.073	
	Perceived Stress	20.53	3.24		20.42	3.59		0.12	-0.75	0.98	0.26		.794	

Health behaviour	Mental health	Risk			No risk			Mean difference	95% CI		<i>t</i>	df	<i>p</i>	<i>r</i>
		M	SD	n	M	SD	N		Lower	Upper				
Alcohol	Positive affect	31.67	7.17	82	31.94	7.66	236	-0.27	-2.17	1.63	-0.28	316	.780	
	Negative affect	20.70	7.06		19.93	6.89		0.77	-0.98	2.52	0.86		.388	
	Wellbeing	48.28	9.40		48.65	8.60		-0.37	-2.59	1.85	-0.33		.742	
	Perceived Stress	21.20	3.07		20.19	3.60		1.00	0.13	1.88	2.26		.025	.13
Smoking	Positive affect	27.31	8.57	16	32.11	7.40	302	-4.80	-8.57	-1.03	-2.51	316	.013	.32
	Negative affect	22.44	7.58		20.00	6.88		2.43	-1.06	5.93	1.37		.171	
	Wellbeing	42.19	9.73		48.89	8.63		-6.71	-11.09	-2.32	-3.01		.003	.35
	Perceived Stress	20.63	4.23		20.44	3.46		0.18	-1.58	1.95	0.20		.838	

Higher scores indicate higher levels of affect, wellbeing and stress. Significant p values in bold.

3.3.13 (Objective 3.2) To investigate whether mental health differed between maternal alcohol and smoking groups in the subsamples of pre-pregnancy drinkers and smokers.

Differences in mental health between the groups of women who quit drinking or smoking and the groups who maintained these health risk behaviours in pregnancy are illustrated in Table 3.20. Perceived stress was higher in the women who continued to drink. Mental health did not differ between the quit and maintain smoking groups. These findings indicate that continuing to drink during pregnancy was related to higher stress, whereas mental health made no difference to continuing to smoke.

Table 3.20 Mean differences in mental health between high and low risk drinking and smoking groups: women who drank or smoked pre-pregnancy

Health behaviour	Mental health	Risk			No risk			Mean difference	95% CI		<i>t</i>	df	<i>p</i>	<i>r</i>
		M	SD	n	M	SD	n		Lower	Upper				
Alcohol	Positive affect	31.67	7.17	82	31.95	7.54	198	-0.28	-2.21	1.64	-0.29	278	.771	
	Negative affect	20.70	7.06		20.01	6.80		0.69	-1.09	2.46	0.76		.449	
	Wellbeing	48.28	9.40		48.72	8.50		-0.44	-2.71	1.83	-0.38		.702	
	Perceived Stress	21.20	3.07		20.18	3.68		1.02	0.11	1.93	2.21		.028	.13
Smoking	Positive affect	27.31	8.57	16	30.91	8.03	33	-3.60	-8.62	1.43	-1.44	47	.157	
	Negative affect	22.44	7.58		22.15	6.51		0.29	-3.92	4.49	0.14		.891	
	Wellbeing	42.19	9.73		45.73	9.72		-3.54	-9.50	2.42	-1.20		.238	
	Perceived Stress	20.63	4.23		20.88	3.99		-0.25	-2.75	2.24	-0.21		.839	

Risk: did not quit; no risk: quit. Higher scores indicate higher levels of affect, wellbeing and stress. Significant *p* values in bold.

3.3.14 (Objective 3.3) To investigate associations between motivation factors and the likelihood of health behaviour risks

Associations between intention, confidence and temptation and the likelihood of maternal health behaviour risks are shown in Table 3.21. The likelihood of exercise risk was 2.5 to three times higher in women with lower exercise intention and with higher temptation to not exercise, with significant effects. The results mean that lower exercise motivation was associated with being less active.

The likelihood of Vitamin D risk not significantly associated with motivation.

BMI risk was 76% less likely in women with lower dietary intentions, and 3.9 times higher in women with lower confidence about ability to eat healthily, with significant effects. Diet temptation and exercise motivation were not significantly associated with the likelihood of BMI risk. This means that the BMI risk was more likely in women with lower diet motivation, but not with exercise motivation.

The likelihood of alcohol risk was 5.07 times higher in women with higher temptation to drink; this effect was significant. Intention and confidence were not associated with the odds. This means that drinking was associated with temptation, and not with the other aspects of motivation.

The effects of intention, confidence, and temptation were not consistent across the health behaviour risks. The associations do not imply cause and effect.

The number of smokers was too small for regression analysis, but smoking during pregnancy was significantly and strongly associated with lower intention to abstain, lower confidence in ability to abstain, and high temptation to smoke, per Table 3.22.

Table 3.21 Binary logistic regression: associations between lower motivation and the likelihood of health behaviour risk.

Risk	Health		Odds ratio	<i>p</i>	95% CI	
	Behaviour	Characteristic			Lower	Upper
Exercise	Exercise	Low Intention	2.52	.005	1.33	4.78
		Low Confidence	1.42	.318	0.76	2.80
		High Temptation	2.66	.002	1.42	5.00
Vitamin D	Diet	Low Intention	1.14	.820	0.38	3.45
		Low Confidence	0.72	.318	0.27	1.89
		High Temptation	1.31	.358	0.74	2.32
BMI	Diet	Low Intention	0.24	.021	0.07	0.81
		Low Confidence	3.90	.006	1.47	10.39
		High Temptation	0.86	.630	0.45	1.61
	Exercise	Low Intention	0.93	.828	0.45	1.87
		Low Confidence	1.68	.177	0.79	3.55
		High Temptation	0.89	.728	0.46	1.72
Alcohol	Alcohol	Low Intention	2.37	.312	0.45	12.58
		Low Confidence	1.05	.957	0.16	6.97
		High Temptation	5.07	.001	2.01	12.79

Exercise, Vitamin D, BMI n = 285, alcohol n = 251. Significant p values in bold

Table 3.22 Phi coefficients between higher smoking risk and lower motivation, n = 49

Motivation	<i>r_φ</i>	<i>p</i>
Intention	.719	<.001
Confidence	.820	<.001
Temptation	.649	<.001

Significant p values in bold.

3.3.15 (Objective 4) To what extent were trait mindfulness, mental health, motivation, and socio-demographic and pregnancy characteristics associated with the likelihood of maternal health behaviour risks?

Associations between trait mindfulness, antenatal mental health, motivation, pregnancy factors, and socio-demographic characteristics and the likelihood of maternal health behaviour risks are illustrated in Tables 3.23 to 3.26.

Point increases in acting with awareness were significantly associated with 16% higher likelihood of exercise risk (Table 3.23). Point increases in positive affect were significantly associated with 8% lower likelihood. Other aspects of mindfulness and mental health were not significantly associated with the likelihood of exercise risk.

Lower exercise intention and higher inactivity temptation significantly increased the likelihood of exercise risk by 3.89 and 2.48 times. Exercise confidence did not affect the odds.

Pregnancy and socio-demographic factors were not significantly associated with the likelihood of exercise risk.

This means that acting with awareness was associated with increased likelihood of exercise risk, whereas better mood and higher motivation were associated with lower likelihood of exercise risk. The associations do not imply cause and effect.

Table 3.23 Binary logistic regression: associations between trait mindfulness, mental health, motivation, pregnancy and socio demographic factors and the likelihood of exercise risk, n = 284

Factor	Odds ratio	p	95% CI	
			Lower	Upper
Total mindfulness	1.03	.085	0.99	1.07
Non-reactive	1.06	.227	0.96	1.17
Observing	1.03	.575	0.92	1.15
Awareness	1.16	.007	1.04	1.29
Describing	0.96	.484	0.86	1.07
Non-judging	0.97	.529	0.87	1.07
Positive affect	0.92	.003	0.87	0.97
Negative affect	1.03	.327	0.97	1.10
Wellbeing	1.01	.804	0.95	1.07
Perceived stress	0.97	.488	0.88	1.06
Lower intention	3.89	<.001	1.85	8.24
Lower confidence	1.02	.970	0.46	2.11
Higher temptation	2.48	.010	1.27	5.04
Nulliparous	0.90	.725	0.49	1.65
Unplanned pregnancy	0.95	.897	0.41	2.19
White ethnicity	0.53	.090	0.26	1.10
Aged under 30	0.84	.584	0.45	1.58
Not working	0.95	.886	0.46	1.97
Lower income	1.47	.277	0.73	2.95
Not university	1.36	.363	0.70	2.65

Significant p values in bold. Lower income = less than £40,000 per annum.

Associations with the likelihood of Vitamin D risk are illustrated in Table 3.24. The effects of trait mindfulness, mental health, and diet motivation on the likelihood of Vitamin D risk were non-significant.

Unplanned pregnancy was significantly associated with 2.23 times higher likelihood of Vitamin D risk.

White British or Irish ethnicity was significantly associated with 2.86 times higher likelihood of Vitamin D risk. Other socio-demographic factors were not significantly associated with the likelihood of this risk.

This means that the likelihood of Vitamin D risk was significantly positively associated with White British or Irish ethnicity and with unplanned pregnancy.

Table 3.24 Binary logistic regression: associations between trait mindfulness, mental health, motivation, pregnancy and socio demographic factors and the likelihood of Vitamin D risk, n = 284

Factor	Odds ratio	p	95% CI	
			Lower	Upper
Total mindfulness	0.98	.246	0.94	1.02
Non-reactive	0.98	.648	0.89	1.07
Observing	1.02	.728	0.91	1.14
Awareness	1.00	.973	0.91	1.11
Describing	0.91	.080	0.82	1.01
Non-judging	1.00	.919	0.90	1.10
Positive affect	1.00	.938	0.95	1.06
Negative affect	1.01	.665	0.95	1.08
Wellbeing	1.03	.320	0.97	1.09
Perceived stress	0.98	.643	0.89	1.07
Lower diet intention	0.63	.462	0.18	2.17
Lower diet confidence	0.61	.343	0.22	1.70
Lower diet temptation	1.43	.285	0.74	2.77
Nulliparous	0.57	.065	0.31	1.04
Unplanned pregnancy	2.23	.048	1.01	4.94
White ethnicity	2.86	.011	1.27	6.45
Aged under 30	0.88	.689	0.48	1.64
Not working	1.13	.735	0.57	2.24
Lower income	1.27	.489	0.65	2.49
Not university	1.80	.078	0.94	3.44

Significant p values in bold. Lower income = less than £40,000 per annum.

Associations with the likelihood of BMI risk are illustrated in Table 3.25. Point increases in the describing aspect of mindfulness were significantly associated with 13% increases in the likelihood of BMI risk. Other aspects of mindfulness and mental health were not significantly associated with the likelihood of BMI risk.

Lower diet intentions and confidence were significantly associated with 76% decrease and 3.34 times increase in the odds of BMI risk. Diet temptation, exercise motivation, pregnancy and sociodemographic factors were not significantly associated with the odds.

This means that the likelihood of BMI risk was significantly associated with: higher levels of the describing aspect of mindfulness, higher intention to eat healthily, and lower confidence in ability to do this.

Table 3.25 Binary logistic regression: trait mindfulness, mental health, motivation, and pregnancy and socio demographic factors and the likelihood of BMI risk, n = 284

Factor	Odds ratio	p	95% CI	
			Lower	Upper
Total mindfulness	1.03	.172	0.99	1.07
Non-reactive	1.01	.808	0.92	1.11
Observing	0.94	.267	0.84	1.05
Awareness	1.02	.757	0.92	1.13
Describing	1.13	.031	1.01	1.27
Non-judging	0.99	.830	0.89	1.10
Positive affect	1.01	.719	0.96	1.07
Negative affect	1.00	.914	0.94	1.07
Wellbeing	0.97	.328	0.92	1.03
Perceived stress	1.05	.311	0.96	1.15
Lower diet intention	0.24	.030	0.07	0.87
Lower diet confidence	3.34	.023	1.18	9.47
Higher diet temptation	0.74	.382	0.37	1.46
Lower exercise intention	0.95	.905	0.44	2.07
Lower exercise confidence	1.86	.131	0.83	4.14
Higher exercise temptation	0.76	.441	0.38	1.53
Nulliparous	0.73	.324	0.40	1.36
Unplanned pregnancy	1.23	.621	0.54	2.82
White ethnicity	1.95	.099	0.88	4.29
Aged under 30	1.03	.929	0.54	1.96
Not working	0.92	.819	0.45	1.89
Lower income	1.23	.563	0.61	2.49
Not university	1.16	.673	0.58	2.30

Significant p values in bold. Lower income = less than £40,000 per annum.

Associations with the likelihood of alcohol risk are shown in Table 3.26. Neither mindfulness nor mental health was significantly associated with changes in the likelihood of alcohol risk.

Higher temptation to drink was significantly associated with 3.41 times higher likelihood of alcohol risk. Neither intention nor confidence to abstain were significantly associated with changes in risk likelihood.

Pregnancy and sociodemographic factors were not significantly associated with changes in the likelihood of alcohol risk. Neither higher risk pre-pregnancy drinking nor binge drinking made a difference to the odds.

This means that the likelihood of drinking during pregnancy was significantly and positively associated with higher temptation to drink.

There were too few smokers to conduct this analysis, but smokers were more likely to be younger, non-graduates, with family income below £40,000 per annum.

Table 3.26 Binary logistic regression: associations between trait mindfulness, mental health, motivation, pregnancy and socio demographic factors and the likelihood of alcohol risk, n = 244

Factor	Odds ratio	p	95% CI	
			Lower	Upper
Total mindfulness	1.03	.144	0.99	1.08
Non-reactive	1.05	.444	0.93	1.17
Observing	1.03	.659	0.91	1.17
Awareness	1.00	1.00	0.89	1.12
Describing	1.06	.380	0.94	1.19
Non-judging	1.01	.890	0.90	1.13
Positive affect	1.01	.715	0.95	1.08
Negative affect	1.01	.844	0.94	1.08
Wellbeing	0.97	.431	0.91	1.04
Perceived stress	1.11	.068	0.99	1.23
Lower abstinence intention	2.90	.282	0.42	20.29
Lower abstinence confidence	1.04	.969	0.12	8.92
Higher alcohol temptation	3.41	.019	1.22	9.53
Nulliparous	0.77	.466	0.39	1.54
Unplanned pregnancy	0.61	.367	0.21	1.77
White ethnicity	0.94	.895	0.39	2.28
Aged under 30	0.66	.268	0.31	1.38
Not working	1.00	.996	0.43	2.34
Lower income	0.96	.719	0.39	1.92
Not university	0.78	.537	0.35	1.72
Prepreg alcohol risk	2.13	.052	0.99	4.55
Prepreg binge risk	1.15	.777	0.43	3.06

Significant p values in bold. Lower income = less than £40,000 per annum.

3.4 Discussion

This study was the first to investigate whether trait mindfulness was associated with pregnant women's adherence to UK guidance for health behaviours. The main finding was that there were no consistent or meaningful relationships between trait mindfulness and adherence. One facet of mindfulness significantly increased the likelihood of exercise risk, and another significantly increased the likelihood of BMI risk. Trait mindfulness was related to better antenatal mental health, and to higher motivation to enact potentially health-promoting behaviours and to abstain from potentially health-adverse behaviours.

The findings indicated that trait mindfulness was not a consistent psychological capability factor in health behaviours during pregnancy. They confirmed that antenatal mental health (psychological capability), intention and confidence (reflective motivation), and temptation (automatic motivation) were associated with maternal health behaviours. The effects of fixed socio-demographic/economic, parity and habit factors on the likelihood of risks indicated that they affected capability, opportunity and/or motivation aspect of maternal health behaviours.

The following discussion begins by describing the pregnant women who took part in the study, and comparing them to population characteristics and adherence to guidance for maternal health behaviours. It addresses the four objectives of the study in turn before considering the limitations of the study. I will discuss the implications for a mindfulness-based intervention for maternal health behaviours, and draw conclusions.

Participants

The women who took part in the study tended to be older, well-educated, employed White women with moderate to high family incomes. They were representative of UK norms for ethnicity, parity, and planned and natural conceptions.

Prevalence of health behaviours

The women tended to be sufficiently active and to be in the normal range for body mass index, meaning that fewer women than expected were inactive, or in the overweight or obese body mass index categories. Adherence to Vitamin D guidance was higher than expected, and may reflect increasing awareness of this requirement since the Infant Feeding Survey in 2010 (HSCIC, 2012a).

Drinking alcohol during pregnancy was relatively common, although at 26% it was marginally below the Office of National Statistics figure of 28% (ONS, 2015a) and considerably below the retrospective Infant Feeding Survey figure of 41% (HSCIC, 2012b). Conversely, the prevalence of pre-pregnancy drinking, higher risk drinking and binge drinking were higher than UK norms, and the quit rate was higher than normal. This suggests that the study may have suffered from the common problem of under-report of drinking during pregnancy (Lange et al., 2014). Fewer women smoked than expected but quit rates were close to national norms, meaning that the reported prevalence of smoking was more reliable.

Mindfulness and mental health scores

The women tended to have higher than mid-point trait mindfulness scores, but lack of norms means that this cannot be described within the context of average population scores. The variation in the scores, from low to high, confirms Brown and Ryan's (2003) finding that people vary in their inherent level of mindfulness, although their Mindfulness Awareness and Attention Scale (MAAS) (Brown & Ryan, 2003) conceptualises and measures mindfulness somewhat differently to the short form of Five Facet Mindfulness Questionnaire (Bohlmeijer et al., 2011) used in the current study.

Average mental health scores were higher than midpoint, but the women had noticeably worse negative affect than general population norms. It is interesting that the women's positive mental health was much closer to general population norms, whilst negative aspects were worse, although we cannot speculate whether this represented deterioration from pre-pregnancy mental health. It was surprising to find that half of the women scored above the cut-off for clinical levels of perceived stress and that so many scored high on negative affect. We did not measure antenatal depression or pregnancy distress, but the high prevalence of stress and low mood might reflect pregnant women's vulnerability to clinical and subclinical mental health symptoms (Ayers & Shakespeare, 2015; Ban et al., 2014; Howard et al., 2014).

Motivation for health behaviours

There were interesting differences between the women's reflective motivations for the different health behaviours. Although half of the women intended to exercise regularly and felt confident about their ability to do so, more women had higher motivation for healthy diet and for avoiding alcohol. This might mean that the women were focusing more on eating healthily and abstaining from alcohol,

and/or that the women found it easier to eat healthily and to avoid alcohol than to exercise. This might be due to practical differences between opportunities to eat well and to not drink in comparison to opportunities to exercise, which commonly include lack of time, the costs of getting to and taking part in antenatal exercise classes, and childcare and commitments (Atkinson et al., 2015; Olander & Atkinson, 2013; Olander, Darwin, et al., 2015). In comparison to diet, physical ability to exercise might also be more affected by pregnancy-related fatigue, nausea and pain, and motivation may be more affected by concerns about miscarriage risk, or beliefs about pregnancy being a time to rest and relax (Atkinson et al., 2014; Currie & Atkinson, 2015; Currie et al., 2015; Newham et al., 2015).

The differences in exercise, diet and alcohol motivations might suggest that exercise was either less possible and/or a lower priority than healthy diet and abstaining from alcohol, which may reflect Taylor et al.'s (2013) finding that pregnant women sometimes justify not giving up one known unhealthy behaviour by giving up another(s).

It was interesting to find that there was a clear distinction between the smoking-related motivations of women who had stopped smoking and those who had not. The former group had high intention and high confidence to abstain, and reported little temptation, whereas the women who had not stopped smoking had low intention and low confidence to abstain and higher temptation. This suggests that intentions and confidence represented post-hoc rationalisation of actualised behaviours, which may explain the similarity between the proportion of women who had higher intentions and higher confidence for each of the health behaviours measured in this study. It is not uncommon for people to make post-hoc rationalisations of their failure to realise early intentions, as it alleviates the consequent cognitive dissonance (Festinger, 1962) and protects them from feeling less competent and motivated in other aspects of their behaviour (Ryan & Deci, 2000).

Objective one

The following section discusses the relationships between maternal health behaviour risks and trait mindfulness (objective one). It was apparent that trait mindfulness was not meaningfully or consistently related to maternal health behaviour risks. There were no differences between higher and lower risk groups. The only significant correlational relationship was between ability to mindfully observe experiences with slightly lower BMI at conception. This reflects evidence that higher trait mindfulness reduces the likelihood of being overweight or obese by 16% and 29% respectively (Camilleri et al., 2015), although the association in the current study appeared to be smaller. However,

this finding has limited implications as BMI is not in itself a maternal health behaviour, although high BMI can elevate maternal and infant risks during pregnancy and have lifetime implications for the children (DoH, 2015; NICE, 2010c).

The lack of relationships between trait mindfulness and adherence to guidance means that the study provided no evidence to suggest that virtuous relationships between trait mindfulness and general population activity levels, BMI, problematic drinking, and smoking exist during pregnancy (Black, Milam, et al., 2012; Black, Sussman, et al., 2012; Bodenlos et al., 2013; Gilbert & Waltz, 2010; Loucks et al., 2014; Murphy et al., 2012; Roos et al., 2015). That there were no differences in trait mindfulness between the groups of women either quit or did not quit drinking or smoking indicates that mindfulness was not associated with improvements in these health behaviours during pregnancy. Although existing research indicates that trait mindfulness protects against impulsive behaviours, and proposes that it might therefore prevent the formation of maladaptive coping behaviours (Black, Milam, et al., 2012; Brown & Ryan, 2003; Peters et al., 2011), there was no evidence to suggest that it might be related to giving up maladaptive habits during pregnancy.

These findings were unexpected, but this is an emergent field, and current evidence for associations between trait mindfulness and health behaviours, including exercise, diet, alcohol, and smoking, is primarily from studies with university students. The lack of relationships suggests that other factors may be far more salient during pregnancy.

Objective two

The following section discusses the findings on relationships between trait mindfulness, antenatal mental health, motivation, and socio-demographic characteristics (objective two). It was evident that higher levels of trait mindfulness were consistently associated with higher levels of positive mental health and with lower levels of negative aspects of mental health. This means that the women with higher trait mindfulness appeared to have better mental wellbeing, although the weak to moderate strength of the relationships indicated that other factors were important too.

Whilst this study was limited to evaluating relationships between trait mindfulness and affect, wellbeing, and perceived stress, this finding indicates that established associations between trait mindfulness and general population mental health also appeared to exist in these pregnant women (Brown & Ryan, 2003; Keng et al., 2011; Paul et al., 2013; Pepping & Duvenage, 2015). This is the first

study to report these trait associations, as other pregnancy-period research has focused on the effects of mindfulness-based interventions on antenatal mental health (Hall et al., 2015).

Chapter one identified reflective and automatic motivation factors in maternal health behaviours (Table 1.3) including intentions, the influence of lay epistemology and risk appraisal, self-efficacy, habits, the effect of stigma on seeking opportunities to improve health behaviours, the influence of local social norms and partners' influences on health behaviours, and whether women had positive or negative feelings about health behaviours. This study did not have the capacity to investigate all of these aspects of motivation, but it did gather simplistic data on motivation in the form of intentions, confidence, and temptation for exercise, healthy diet, drinking, and smoking. It also gathered information on existing pre-pregnancy drinking and smoking levels, which might affect automatic motivation during pregnancy if they reflected established maladaptive coping mechanisms (Peters et al., 2011).

There were positive relationships between trait mindfulness and the intention, confidence, and temptation aspects of reflective motivation for maternal health behaviours apart from smoking, although the small effect sizes mean that mindfulness was not a dominant factor. Exercise and diet motivation were consistently related to total mindfulness and to non-reactivity, which suggests that the women who had better emotional regulation were more likely to be motivated to be active and to eat well. That exercise motivation was consistently related to acting with awareness suggests that exercise was a deliberate action, rather than the result of a habit. Previous research suggests that pre-pregnancy exercise habits predict activity levels during pregnancy (Gaston & Cramp, 2011), so it was interesting to find that exercising may have been related to awareness rather than to automaticity in this sample of women. A suggestion is that trait mindfulness may have offered some protection against the normal tendency of exercise to reduce during pregnancy (Atkinson et al., 2014; Gaston & Cramp, 2011; Newham et al., 2015), although we cannot make any assertions about this given the lack of relationship between mindfulness and exercise risk.

Diet motivation was consistently related to the observing aspect of mindfulness, which implies that the women who were more able to observe their thoughts and emotions were more likely to want to eat healthily. This suggests that the women who were more aware of their inner processes were more likely to have higher intentions and confidence about their diet during pregnancy, which suggests higher self-efficacy (Bandura, 1977). It might also mean that women who were more aware were less

likely to be tempted by unhealthy foods, and/or that consistently tolerating temptation attenuated it over time. This reflects the consistent associations between trait mindfulness with lower impulsivity and with higher emotional and behavioural self-regulation (Brown et al., 2007; Creswell & Lindsay, 2014; Peters et al., 2011; Raes, Dewulf, Van Heeringen, & Williams, 2009).

Motivation to abstain from alcohol and from smoking was less consistently and more weakly related to trait mindfulness than motivation for exercise and diet. Women with higher levels of the acting with awareness and describing aspects of mindfulness were more likely to have higher intention to abstain from drinking or smoking, and to feel confidence in their ability to do so. This suggests that antenatal drinking was driven by automatic habits and was perhaps related to inability to articulate thoughts and emotions. This automatic, habit-driven aspect of drinking and smoking during pregnancy is different to the non-reactivity and observing aspects of mindfulness that were related to motivation for exercise and diet. This implies that motivation to engage in health promoting activities may be distinct from motivation to refrain from health adverse behaviours, which may endorse Suaer et al.'s (2011) finding that behavioural inhibition mediates the relationships between trait mindfulness and mental wellbeing. However, these positive small relationships between trait mindfulness and reflective health behaviour motivation did not manifest in any direct beneficial relationships between trait mindfulness and maternal health behaviour risks. This means that any potential implication that trait mindfulness was a factor in maternal health behaviour motivation must be treated with caution.

Although pregnant women's socio-demographic characteristics are beyond the scope of behaviour change or mindfulness-based interventions, it was interesting to find that the pregnant women's trait mindfulness differed between higher and lower socio-demographic factors, albeit with small effects. Baer et al.(2008) also identified associations between trait mindfulness (as measured by the full FFMQ) and age and education in a sample which included 552 non-meditators and meditators, the majority of whom were described as "highly educated". There is no pregnancy-specific evidence base against which to compare these findings, and any implication that women might become more mindful as they become older or that trait mindfulness is related to education cannot imply any cause and effect.

We cannot assume that trait mindfulness is a stable characteristic and/or that pregnancy does not have an effect on it. Indeed Guardino et al. (2014) found that the trait mindfulness of women who were in the control arm of their community sample | mindfulness-based intervention increased in line with that of the participants. This finding is nonetheless useful as higher trait mindfulness seems to be

one of the predictors of “goodness of fit” of mindfulness-based interventions (S. L. Shapiro et al., 2011). This might explain the tendency of open recruitment into antenatal mindfulness studies such as Woolhouse, Mercuri, Judd, and Brown (2014) to attract older, educated, and more affluent women, despite effort to recruit representative samples.

Objective three

The next part of the study (objective three) was to investigate whether the health behaviours of the women in this sample reflected established associations with antenatal mental health, motivation factors, and socio-demographic characteristics. It appeared that this was the case, as positive affect and wellbeing were positively correlated with exercise, whereas perceived stress was negatively correlated with exercise. Positive affect and wellbeing were also higher in the group who adhered to exercise guidance. This study did not collect data on psychopathologies, but these findings confirm known links between inactivity and antenatal mood disorders (Gaston & Prapavessis, 2013; Poudevigne & O'Connor, 2006).

Although the current study cannot make assertions about cause and effect, Gaston and Prapavessis (2013) and Daley et al. (2015) found that exercise can protect against or alleviate antenatal depression, reduce maternal anxiety and fatigue, and improve women’s energy levels. It may also be that women who feel happier and more energetic are more likely to feel able and/or willing to exercise. This suggestion is supported by the higher adherence to UK guidance for exercise in women who reported higher positive affect and wellbeing. Either way, there appears to be a reciprocal positive relationship between being active and mental wellbeing during pregnancy.

Higher positive affect and wellbeing were negatively correlated with BMI, and negative affect was positively correlated with BMI, but they did not make a difference to adherence to guidance. This means that there were no meaningful differences in the mental health of women who were in the normal or higher BMI range. The current finding somewhat reflects evidence that high BMI is associated with antenatal depression and with low mood in the general population (Lancaster et al., 2010; Nolen-Hoeksema, 2006). However, poorer affect and wellbeing do not indicate antenatal depression, so this implication is very constrained.

Mental health did not differ between Vitamin D groups. This is more likely to be a knowledge gap than a mood-related problem, as NICE recently acknowledged that public awareness about Vitamin D recommendations is emergent (2014d).

It was interesting to find that the women who were drinking alcohol were more stressed than women who were not drinking, both in the whole sample and amongst those who drank prior to pregnancy. The differences were small, which limits the significance of the finding, but the relationship between mental health and antenatal drinking is supported by known associations between stress and continuing to drink during pregnancy (Strandberg-Larsen et al., 2008), and suggests that alleviating stress might reduce alcohol consumption. However, most of the women who were drinking reported doing so within the maximum recommended limit of two units twice per week (NICE, 2008a), although the UK Chief Medical Officers now recommend complete abstinence (DoH, 2016).

Whilst there were significant differences in the positive affect and wellbeing of women who smoked in comparison to all other women, there were no meaningful differences between the mental health of the women who had quit smoking and the women who were still smoking. The inference is that the women who did not smoke prior to pregnancy had better mental health than the women who smoked prior to pregnancy, irrespective of whether or not they quit. This is inconsistent with previous findings that smoking during pregnancy is associated with lower antenatal mood and with higher stress (Blalock et al., 2005), but it does reflect associations between smoking and poorer mental health in the general population (NICE, 2014c). Any implications are limited by the small number of smokers.

The current findings largely reflected established associations between antenatal mental health and health behaviours. This suggests that the self-reporting of maternal health behaviours and antenatal mental health was consistent with other studies, although comparison is constrained by different measures of mental health and lifestyle. That antenatal mental health had small effects on health behaviours implies that other factors were important.

The next step was to investigate the effect of motivation on adherence to UK guidance for maternal health behaviours. It was notable that lower exercise intention and higher temptation to not exercise were associated with more than doubled odds of exercise risk. This suggests that women who were less active were considerably less likely to be motivated to engage in sufficient exercise, although intentions may have reflected actualised exercise.

There appeared to be no significant differences between exercise motivation in women with higher and normal range body mass index. This might mean that body mass index was not an exercise factor, or that there was no differentiation in exercise motivation between higher and lower weight women. However, the presence and absence of significant associations between exercise motivation and the likelihood of exercise and/or BMI risk does not imply any cause and effect relationships.

Nonetheless, Atkinson, Olander, et al. (2015) reported that obese women encounter physical and belief-driven barriers to managing gestational weight gain through exercise. This might be related to the finding that the likelihood of higher BMI was associated with higher intention to eat healthily but lower confidence in ability to do so, and/or indicate that the women with high body mass index recognised that diet is particularly important during pregnancy. It could also be an outcome of health care professionals advising the women with high body mass index on how to manage their gestational weight gain, per the NICE recommendations (2010c).

The likelihood of Vitamin D risk was not associated with dietary motivation. This may suggest that adherence to supplements guidance is independent of motivation to eat a healthy diet during pregnancy. The subsequent implication is that Vitamin D supplementation was not an adequate proxy for healthy diet.

It was interesting that the likelihood of BMI risk was not significantly associated with exercise motivation, and this might suggest that the women were focused on managing their weight gain via diet rather than through exercise.

The likelihood of alcohol risk was not significantly associated with intention or by confidence to abstain. Temptation to drink increased the likelihood of risk by fivefold. The implication is that a significant proportion of the women who drank during pregnancy reported that they intended to abstain, and felt confident to do this, but that drinking was triggered by temptation. The finding may conflict with previous research that drinking during pregnancy is predicted by intention to do so (Peadon et al., 2011). However, it must be taken in the context that only 22 of the 82 women who drank reported higher temptation to drink, and even fewer reported lower intentions and lower confidence. This may mean that the result is misleading, and that intention is a dominant factor. Moreover, presence or lack of significant associations with increased likelihood does not imply predictive relationships.

A potential explanation for the disparity between the current study and previous research is that the majority of the women who drank did so within the NICE (2008a) two units twice per week if “you chose to drink”, and that women therefore did not perceive a risk of giving into temptation occasionally, even if they generally intended to abstain. The current study did not gather data about the women's risk-related knowledge or appraisal, but Crawford-Williams et al.(2015) found that pregnant women can rely on lay epistemology, underestimate the risks of drinking, and are confused by mixed and inconsistent messages. It is not difficult for pregnant women who wish to drink to find research or related media headlines that give the impression that drinking small to moderate amounts of alcohol throughout pregnancy does not elevate risks, e.g. the recent Guardian newspaper headline “Is it wrong to drink alcohol while pregnant? Even the experts disagree” (Siddique, 2015) and it remains to be seen what, if any, effect the new Department of Health abstinence guideline has on knowledge, risk appraisal, and prevalence (DoH, 2016).

Smoking was strongly associated with not intending to abstain, low confidence about ability to abstain, and high temptation to smoke. In fact, as above, all the women who smoked reported that they intended to smoke, did not feel confident about their ability to abstain and felt tempted to smoke, whereas those who had quit did not intend to smoke and generally felt confident, although some experienced temptation to smoke. This implies that smoking was a conscious decision and/or that motivation was the result of post-hoc rationalisation. It might also reflect the addictive nature of smoking, which is distinct from exercise, diet, and non-dependent drinking, although any implication is limited by the small number of smokers.

Overall, motivation appeared to be a factor in maternal health behaviours, but some of the findings are unreliable and require further investigation.

Objective four

The last stage of the analysis (objective four) was an investigation of the associations between potentially modifiable factors (mindfulness, mental health, and motivation) and fixed factors (socio-demographic and pregnancy factors, pre-pregnancy drinking) with the likelihood of maternal health behaviour risks. The associations with motivation were consistent with the previous analyses. That the acting with awareness aspect was associated with increased odds of being less active than advised may indicate that exercise was positively associated with habits, and reflects Gaston and Cramp's (2011)

finding that exercise during pregnancy is predicted by exercise prior to pregnancy, although activity levels and motivation tends to diminish over time (Newham et al., 2015).

The ability to articulate experiences (describing) was associated with increased likelihood of being overweight or obese, but it is difficult to make a rational proposal for why being able to verbalise thoughts and emotions might be related to higher or lower conception body mass index. The finding contradicts Camilleri et al.'s (2015) finding that higher trait mindfulness was related to lower likelihood of being overweight and obese, and does not reflect the significant negative correlation between BMI risk and the observing facet of mindfulness or the non-significant negative correlation between describing and BMI risk shown in Table 3.9. The findings on exercise and BMI therefore appear to be unreliable, and may be phenomena of the analysis.

Mental health was not consistently associated with the likelihood of risks, although positive mood was associated with increased likelihood of being sufficiently active. This indicates that the women who were active appeared to report better mental wellbeing. This reflects established associations between being active and better mood during pregnancy (Daley et al., 2012; Gaston & Prapavessis, 2013). Lower exercise intention and higher temptation were the dominant factors of low activity, which reflects known relationships between reflective and automatic motivations and health behaviours (Michie et al., 2011).

Socio-demographic factors did not significantly affect the likelihood of exercise risk, which does not reflect other studies' findings about the effects of socio-demographic factors on women's capability, opportunity, and/or motivation to exercise during pregnancy (HSCIC, 2015; Olander, Darwin, et al., 2015). The findings indicated that pregnancy exercise levels were most strongly influenced by motivation. The lack of consistency with other studies might indicate that the current findings are unreliable; potential reasons are discussed in the limitations section below.

The likelihood of not taking Vitamin D was significantly associated with White British or Irish ethnicity and unplanned pregnancies. There is a paucity of research on why women do or do not take Vitamin D during pregnancy. Professional women are more likely to adhere to and to know the reasons for Folic Acid guidance (HSCIC, 2012a), but neither education nor income significantly affected the likelihood of Vitamin D risk. The association between White ethnicity and Vitamin D risk may be due the fact that people who have darker skins are more likely to require routine Vitamin D supplementation (HSCIC, 2012a) and that normalised intake continues into pregnancy.

The association with unplanned pregnancy suggests that the women who did not plan their pregnancies may have been less familiar with the recommendation, or perhaps that missing the optimal window in which to take Folic Acid reduced their inclination to take Vitamin D. This study is the first to find that taking Vitamin D during pregnancy is associated with ethnicity and planned pregnancy.

The likelihood of BMI risk was most strongly affected by dietary motivation; low intention was associated with reduced likelihood, whereas low confidence was associated with increased likelihood. This suggests that women with higher BMI might have higher intentions to eat healthily, perhaps due to concerns about high GWG, but that historical factors that contribute to being overweight might impact on perceived dietary control and confidence, per Atkinson, Olander, et al. (2015).

Pregnancy and socio-demographic factors were not significantly associated with the likelihood of higher BMI. However, women in higher BMI groups were under-represented in the sample, meaning that these findings are not reliable. The associations do not infer cause and effect.

The likelihood of drinking was significantly affected only by temptation to drink. Neither intention nor confidence in ability to abstain impacted the likelihood of drinking. This may suggest that urges and/or established maladaptive coping mechanisms underpin drinking during pregnancy. However, the finding does not reflect evidence that mental health is a psychological capability factor in maternal drinking; that older women are more likely to drink, albeit at lower levels, during pregnancy; and that unplanned pregnancy is a factor in binge drinking (Strandberg-Larsen et al., 2008). This may suggest that the finding is unreliable. The potential impact of the idiosyncratic motivation measures is discussed in the limitation section, below. However, this cross-sectional study cannot draw cause and effect conclusions, and the women who were drinking reported small amounts.

It was not possible to assess how fixed and potentially modifiable capability, opportunity and motivation factors interacted on smoking, but smokers were more likely to be younger, less educated, less affluent, and to have lower motivation to abstain. This reflects social norms for antenatal smoking (HSCIC, 2012b), and factors in continuing to smoke during pregnancy (Smedberg et al., 2014). Whether lower intention to abstain was a trade-off with changing another health behaviour or a post-hoc rationalisation of not being able to quit is not known (Taylor et al., 2013).

Overall, the associations between psychological and fixed factors and health behaviours reflected the capability, opportunity and motivation factors illustrated in Table 1.2. Non-modifiable socio-

demographic, pregnancy and habit characteristics were associated with the likelihood of risks. Trait mindfulness was apparently an aggravating rather than a protective factor for exercise and BMI, and had no significant effect on other risks. However, the lack of direct relationship between trait mindfulness and adherence to guidance constrains any implications. Better mental health was somewhat related to better adherence to guidance, but did not have consistent significant associations with likelihood. Motivation was a consistent factor in maternal health behaviours, although it may have reflected actualised behaviours rather than early intentions.

3.4.1 Future steps

This study raised more questions as to whether and how trait mindfulness is related to women's lifestyles during pregnancy. Future studies could investigate whether trait mindfulness is associated with adherence to UK health behaviour guidance in the general population, as an absence of relationship would be likely to translate into pregnancy. It may be possible to access the large amount of data collected in France on trait mindfulness and health behaviours, as the report was limited to associations with BMI group (Camilleri et al., 2015). It would be useful to establish whether trait mindfulness is stable across the pre-pregnancy to pregnancy period, and/or whether it changes during pregnancy, as speculated by Guardino et al. (2014). Establishing whether different mindfulness measures generate consistent or different outcomes regarding relationships with health behaviours, mental health and motivation in community and pregnant samples could be a useful addition to this emergent field.

Establishing the extent to which actualised behaviours reflect initial intentions would help researchers to better understand if/how motivations alter to fit changes in capability during pregnancy. The study highlighted inadequate evidence about adherence to Vitamin D guidance, and future research could investigate whether this is a knowledge gap or deliberate non-adherence.

3.4.2 Limitations

This study has several limitations.

Recruitment

Opportunistic recruitment depended on community midwives distributing recruitment packs. We expected 20% return from 1,500 questionnaires over four months, but data collection took a year. This

suggests that not all eligible women were given packs, which may reflect Webster, Teschke and Janssen's (2012) finding that health care professionals can be too busy to hand out research study materials during routine medical appointments.

The women who took part in this survey were older, more educated, more likely to be employed, and more affluent than UK norms. It is not unusual to have problems recruiting young women in public health research studies (Bonevski et al., 2014; Galea & Tracy, 2007), and the socio-demographic profile may represent women who are willing to take part in university and/or antenatal mindfulness research.

Failure to attain the planned sample size and under-recruitment of women who did not adhere to guidance means that the study was underpowered to detect medium differences. The original target sample was too small to detect small differences between smokers and non-smokers.

Health behaviours

The low incidence of inactivity, high body mass index, and smoking, and the higher incidence of drinking reflected the sample's bias towards higher socio-economic status. Although the survey was anonymous, the subject may have deterred women who did not feel confident about disclosing information about their lifestyles and/or mental health.

Overcoming these problems would require purposeful, stratified sampling from medical records, and allowing time for women who consented to take part to complete the survey before handing it back to the researcher or community midwives. This was not feasible in the current study, and it would have obviated the benefits of anonymity. Direct, public recruitment into an online question may have increased the speed of data collection, and removed the burden on community midwives. However, neither option would assure a larger or more representative sample.

Family wise errors

The alpha value for significance was set at 5% and was not adjusted for the number of tests, which means that some significant outcomes may be false positives (Type I errors). Conducting multiple tests on the same population compounds the chance of detecting a false positive in a single test. It may therefore have been useful to reduce the 5% alpha value to reflect the family-wise error rate (FWER) (A. P. Field, 2013) by at least a factor of: the number of health behaviour risks (four, alpha .0125), the number of tests (17 in all: nine t-tests, three correlations, five binary logistic regressions, alpha .003),

or the number of factors (six aspects of mindfulness, four mental health, 12 motivation, etc., alpha .001).

The effect of this would have been to broaden the confidence intervals from 95% to close to 100%, reducing the chance of false positives. Smaller alphas would have rendered a number of significant tests non-significant. The tests which were significant at $<.001$ and/or indicated medium to large sized effects would have remained significant. These values indicate the apparent magnitude of the relationships, as significance alone is not highly meaningful.

However, this was an exploratory study with multiple variables, and cautious interpretation of findings took into account the likelihood of false positives. Effects sizes were reported on tests which were significant at alpha of .05.

Measures

Another limitation is that efforts to limit participant burden led to the selection of the brief versions of measures. Whilst the mindfulness, psychological health, pregnancy exercise, and alcohol measures were reliable and valid, the idiosyncratic supplement, smoking, and motivation measures may not have been appropriate.

Exercise

Whilst the PPAQ is a reliable and valid pregnancy-specific activity measure (Chasan-Taber et al., 2004), it is not designed to assess adherence to hours-based UK guidance, and the self-reported data may have been subject to recall or social desirability bias. However, the measure is pregnancy-specific, and was therefore a suitable choice for the survey.

Diet

It appears that Vitamin D was not an adequate proxy for adherence to dietary guidance, and it would have been more useful to measure whether women adhered to guidance to eat five portions of fruit and vegetables per day.

Alcohol

The alcohol measure was suitable to detect drinking, but not to identify units of alcohol; the score was converted to approximate units. It might have been more useful to provide open text boxes to collect data on low level, occasional drinking, and reasons for it.

Smoking

The smoking measure was idiosyncratic, and may have been subject to under-report, but objective measures were not available or appropriate to a cross-sectional survey.

Mindfulness

The 24 item short form of the five facet mindfulness questionnaire may have been less sensitive than the 39 item version. Trait mindfulness measured by the full FFMQ (Baer et al., 2006; Baer et al., 2008) or the MAAS (Brown & Ryan, 2003) might produce similar or different outcomes.

Mental health

Given that psychological ill-being is more likely to be associated with adverse health behaviours than is subjective wellbeing, including pregnancy-specific distress and depression scales might have gleaned more useful outcomes. However, ethical considerations constrained the choice of mental health measures.

Motivation

Particularly, the simplistic *every day* to *no days* scale on the intention, temptation, and confidence motivation items may have been inadequate. It may have been more useful to use a recognised Likert agreement scale on items about intention to be regularly active, regularly eat a five a day, not drink alcohol, and not smoke. Including options to record not drinking or smoking prior to pregnancy, and open text responses for barriers to exercise, healthy eating, etc. would have helped to obtain a more nuanced understanding of capability, opportunity, and motivation factors.

Dichotomisation of data

The dichotomisation of risk (risk v no risk determined by adherence v non-adherence), socio-demographic (age group, affluence, employment, and education), and motivation (high v low) data may have reduced the sensitivity of analyses.

The validity of testing for relationships between conception body mass index and mid to late pregnancy mental health and motivation is dubious.

Biases

Design bias due to efforts to reduce participant burden was acknowledged. Experimenter bias was addressed by cautious reporting of the results. Sampling bias was addressed by recruiting via antenatal clinics, which increased the opportunity to recruit a diverse socio-demographic population. Social desirability bias was addressed by anonymity. Measurement bias was addressed by checking a sample of the manual data entry against the paper questionnaires.

3.4.3 Implication for the intervention

This study provided no support to the proposal that mindfulness is related to beneficial maternal health behaviours or to lower levels of adverse antenatal health behaviours. There were inconsistent effects of mindfulness on inactivity and high BMI. The study indicated that trait mindfulness might be indirectly associated with health behaviours via antenatal mental health and behavioural motivation, and that improving antenatal mental health might improve health behaviours. It appeared that improving intention and confidence and developing practical skills to resist temptation might alleviate health behaviour risks. Associations between trait mindfulness and socio-demographic factors might indicate that a mindfulness-based intervention would have more appeal to older, well-educated and more affluent women. These women might not normally be offered any practical intervention during pregnancy due to the lower incidence of obesity and smoking in women with higher socio-economic status.

3.5 Conclusion

This study addressed the question *“To what extent is trait mindfulness related to women’s health behaviours during pregnancy?”* The findings indicated that there may be some benefits and disadvantages of being more mindful, but the effects were small. The study is the first to report that positive associations between general population trait mindfulness and mental health also appear to exist during pregnancy. It is the first to report apparent relationships between trait mindfulness and motivation to be active, to eat well, and to abstain from drinking and smoking during pregnancy.

This chapter addressed each health behaviour separately. The tendency of risks to cluster together is addressed in the next chapter, which reports risk co-occurrence and its relationships with trait mindfulness, antenatal mental health, and socio-demographic and pregnancy factors.

4

Chapter Four: Relationships between trait mindfulness and the co-occurrence of adverse maternal health behaviours.

4.1 Introduction

Interventions for maternal health behaviours tends to focus on single risks, such as gestational weight gain in women with high body mass index, drinking alcohol, or smoking. However, there is evidence that antenatal drinking and smoking co-occur (O'Keeffe et al., 2015), and interventions for gestational weight gain focus on diet and/or exercise, implying that these risks also co-occur (Soltani, Arden, Duxbury, & Fair, 2016) The King's Fund (2012) and NICE (2014b) recommend that researchers and intervention developers investigate and intervene in clustered health risk behaviours, but there is lack of evidence about the extent to which adverse maternal health behaviours co-occur. This study investigated the prevalence of co-occurrence, and whether there were relationships between co-occurrence, trait mindfulness and mental health.

4.1.1 Aim and objectives

The aim was to assess the co-occurrence of adverse antenatal health behaviour risks, and whether this was related to mindfulness. The specific objectives were to evaluate:

- 1) The co-occurrence of maternal health behaviour risks.
- 2) The extent of relationships between and differences in trait mindfulness and mental health for the number of risks.
- 3) The extent of associations between trait mindfulness, mental health and socio-demographic and pregnancy characteristics and the likelihood of co-occurring health behaviour risks.

4.2 Methods

The analyses were conducted on the data gathered in the cross-sectional survey. The methods were described in chapter three.

4.2.1 Defining co-occurrence

Co-occurrence was identified by two, three, four or five concurrent risks, as defined in chapter three (Table 3.1).

4.2.2 Data analysis

Spearman’s correlations were used to test for relationships between the number of risks and continuous variables. The strength of correlation coefficients was defined as 0.00 to 0.20 very weak, 0.20 to 0.39 weak, 0.40 to 0.59 moderate, 0.60 to 0.79 strong, and 0.80 to 1.00 very strong (A. P. Field, 2013). Independent t-tests were used to compare differences between groups. Parametric tests were conducted on the basis that the Central Limit Theorem asserts that samples of 30 or more tend towards normal distribution (Lumley et al., 2002). The effects of mindfulness, mental health, and socio-demographic and pregnancy characteristics on the likelihood of co-occurrence were analysed using binary logistic regression using the “Enter” approach. Significance was set at $p < .05$. Effect sizes were calculated using the formula $r = \sqrt{t^2 / (t^2 + df)}$, and categorised as $< 0.1 =$ trivial; 0.1 to $0.3 =$ small; 0.4 to $0.5 =$ moderate; $> 0.5 =$ large (J. Cohen, 1988).

4.3 Results

4.3.1 (Objective 1) The co-occurrence of adverse maternal health behaviours.

The prevalence of single and co-occurring risks is illustrated in Figure 4.1. Co-occurrence was most common for two risks (27%). Prevalence reduced as the number of risks increased, and no women had five concurrent risks (three: 11%; four: 2%, five: 0%).

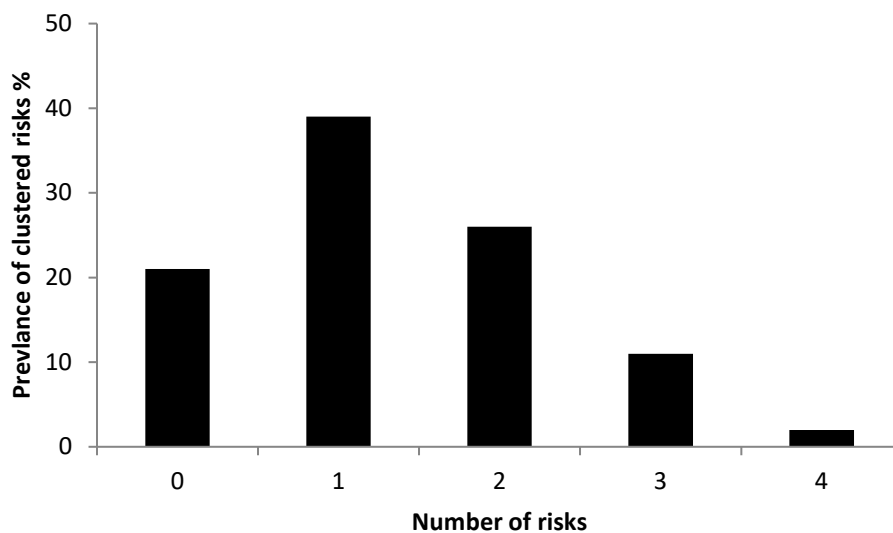


Figure 4.1 Reported prevalence of nil, single, and co-occurring risks, N = 318

Table 4.1 illustrates that 21% of the women had no risks, 40% had a single risk, and 39% had co-occurring risks. This equated to half of the women who had one or more risks. Exercise risk appeared in 74% of clusters, Vitamin D risk in 57%, BMI risk in 53%, alcohol risk in 43%, and smoking in 11% of clusters. The most common cluster was inactivity plus high body mass index, which was apparent in 29% of paired risks, 47% of triple risks, and 62% of quadruple risks. Alcohol and smoking risks rarely co-occurred, although the majority (86%) of the small number of smokers had other risks.

Table 4.1 Prevalence of individual and co-occurring adverse maternal health risks, N = 318

Co-occurring	Number of risks	Exercise	Vit D	BMI	Alcohol	Smoke	n	Total		Cumulative		
								n	%	n	%	
No	0						66	66	21	192	61	
	1	51	25	20	28	2	51	126	40			
Yes	2	✓	✓				18	84	26	126	39	
		✓		✓			24					
		✓			✓			14				
		✓				✓		3				
			✓	✓	✓			8				
			✓	✓		✓		7				
			✓	✓			✓	2				
				✓	✓	✓		7				
					✓	✓	✓	1				
	3	✓	✓	✓	✓			11	34	11		
			✓	✓		✓		9				
		✓	✓				✓		2			
		✓			✓	✓			5			
			✓	✓	✓	✓			5			
			✓	✓	✓		✓	✓	1			
	4	✓	✓	✓	✓	✓		4	8	2		
			✓	✓	✓		✓				3	
✓			✓		✓	✓		1				
		145	97	88	82	16	318					

4.3.2 (Objective 2) To investigate whether co-occurrence of maternal risk behaviours was related to or differed by trait mindfulness or mental health.

Table 4.2 illustrates the rank order correlations between the number of risks (0 to 4) and trait mindfulness and mental health scores. Mindfulness was not significantly correlated with the number of health behaviour risks. Positive affect and wellbeing were significantly negatively correlated with the number of risks, and negative affect was significantly positively correlated with the number of risks. The correlations were weak. This means that trait mindfulness was not related to the number of health behaviour risks, but mental health scores deteriorated as the number of risks increased.

Table 4.2 Spearman’s rank order correlations between the number of risks and trait mindfulness and mental health, *N* = 318

Psychological factor	<i>r_s</i>	<i>p</i>
Total mindfulness	-.077	.171
Non-reactive	-.058	.301
Observing	-.065	.248
Awareness	.006	.909
Describing	-.034	.546
Non-judging	-.049	.383
Positive affect	-.128	.023
Negative affect	.119	.034
Wellbeing	-.175	.002
Perceived Stress	.023	.686

Significant *p* values in bold

Table 4.3 illustrates the differences in trait mindfulness and mental health between the co-occurrence and no co-occurrence groups. Women with concurrent risks did not have significantly different levels of trait mindfulness to women with no or single risks, and the differences were trivial.

Wellbeing was significantly lower and negative affect was significant higher in the women with co-occurring risks. Effect sizes were negligible for positive affect and small for wellbeing. The findings indicate that co-occurrence was more common in women with poorer antenatal mental health, but the effects were small.

Table 4.3 Mean differences in trait mindfulness and mental health for co-occurrence and no co-occurrence groups, *N* = 318

Psychological factor	Group						Mean difference	95% CI		<i>t</i>	df	<i>p</i>	<i>r</i>
	Co-occurrence			No co-occurrence				Lower	Upper				
	M	SD	n	M	SD	n							
Total mindfulness	81.54	10.92	126	82.43	10.81	192	-0.89	-3.34	1.56	-0.71	316	.476	
Non-reactive	15.63	3.67		15.71	3.39		-0.07	-0.86	0.72	-0.18		.855	
Observing	13.42	3.75		13.55	2.77		-0.13	-0.75	0.50	-0.40		.690	
Awareness	17.10	3.02		17.41	3.67		-0.10	-0.87	0.68	-0.25		.806	
Describing	18.51	3.51		18.70	3.37		-0.19	-0.96	0.58	-0.48		.629	
Non-judging	16.67	3.53		17.07	3.38		-0.40	-1.18	0.38	-1.02		.310	
Positive affect	31.14	8.05		32.35	7.14		-1.21	-2.90	0.49	-1.40		.163	
Negative affect	21.17	7.46		19.44	6.48		1.74	0.18	3.29	2.20		.028	.13
Wellbeing	47.07	9.43		49.53	7.83		-2.46	-4.43	-0.49	-2.46		.014	.23
Perceived Stress	20.62	3.37		20.34	3.58		0.28	-0.51	1.07	0.70		.488	

Higher scores indicate higher levels of mindfulness and positive mental health, and higher levels of negative affect and stress. Significant *p* values in bold.

4.3.4 (Objective 3) To what extent were trait mindfulness, mental health, socio-demographic and pregnancy characteristics associated with the likelihood of co-occurring health behaviour risks?

Associations between psychological, socio-demographic and pregnancy factors and the likelihood of risk co-occurrence are illustrated in Table 4.3. Mindfulness and mental health were not significantly associated with changes in the likelihood of co-occurring risks. First time motherhood was associated by 46% lower likelihood of co-occurring risks, which was significant. Socio-demographics factors were not significantly associated with changes in the likelihood. This means that there was an association between multiparity and the likelihood of concurrent health behaviour risks.

Table 4.4 Binary logistic regression: associations between mindfulness, mental health, and socio-demographic and pregnancy factors and the likelihood of co-occurrence, N = 318

Factor	Odds ratio	p	95% CI	
			Lower	Upper
Total mindfulness	1.02	.145	0.99	1.06
Non-reactive	1.05	.246	0.97	1.14
Observing	0.99	.919	0.90	1.10
Awareness	1.03	.481	0.95	1.12
Describing	1.04	.417	0.95	1.14
Non-judging	0.99	.814	0.91	1.08
Positive affect	0.98	.437	0.94	1.03
Negative affect	1.04	.125	0.99	1.10
Wellbeing	1.00	.932	0.95	1.05
Perceived stress	1.04	.359	0.96	1.13
Nulliparous	0.54	.021	0.32	0.91
Unplanned pregnancy	1.78	.393	0.66	2.87
White ethnicity	1.91	.052	0.99	3.68
Aged under 30	0.84	.523	0.48	1.45
Not working	1.55	.175	0.82	2.90
Lower income	0.99	.985	0.55	1.80
Not university	1.64	.094	0.92	2.93

Significant p values in bold

4.4 Discussion

Objective one

The first objective of this study was to establish the prevalence of co-occurring risks. 39% of the women had co-occurring maternal health risks, which was half of women who had any risks. The most commonly co-occurring risks were high BMI plus insufficient exercise. This supports previous evidence that co-occurring pre-pregnancy exercise and diet habits continue into pregnancy (HSCIC, 2014e), and the associations between higher BMI and inactivity (Atkinson et al., 2015). That antenatal drinking did not tend to co-occur with higher BMI supports O’Keeffe et al’s (2015) finding that this risk is more likely in women with normal range BMI.

Notably, this study did not support O’Keeffe et al’s (2015) finding that smoking and drinking co-occur during pregnancy. This outcome is more likely the result of low numbers of smokers in this study than an actual lack of relationship. It may reflect the higher socio-economic status of the women who took part (HSCIC, 2014b), and/or be due to under-report of smoking and/or drinking, which is a known limitation of pregnancy health research (Lange et al., 2014; Shipton et al., 2009).

Objective two

The second objective was to investigate the extent to which the number of health behaviour risks was related to trait mindfulness and mental health. Trait mindfulness was not correlated with the number of risks, and nor did trait mindfulness differ between the co-occurrence and no co-occurrence groups. This reflects the absence of differences between trait mindfulness levels for the absence and presence of single risks, discussed in the previous chapter.

Although trait mindfulness was associated with lower likelihood of co-occurring diet and exercise health behaviour risks in university students (Gilbert & Waltz, 2010) and a wide range of co-occurring health behaviours in middle-aged Americans (sufficiently active, not smoking, and/or normal range body mass index) (Loucks et al., 2014), the current study did not provide any evidence that higher trait mindfulness influenced the number of maternal health behaviour risks. It may be either that these relationships are overwhelmed by other factors during pregnancy, that they did not exist prior to pregnancy, or that lack of consistency between measures of mindfulness led to inconsistent outcomes.

Mental health was correlated with the number of risks; both positive affect and wellbeing reduced as the number of risks increased, and negative affect increased. There were also small differences in the wellbeing and negative affect scores between co-occurrence and no co-occurrence groups. This reflects the established relationships between mental health and single health behaviours during pregnancy found in chapter three and in other studies (Lobel et al., 2008; Smedberg et al., 2014; Strandberg-Larsen et al., 2008). However, the apparent link between poorer subjective wellbeing and health behaviour risk does not determine cause and effect, and it is likely that they are a “toxic triangle” (Nolen-Hoeksema, 2006) of reciprocal capability, opportunity, and motivation factors (Michie et al., 2011).

Objective three

The third objective was to investigate the extent of associations between potentially modifiable mindfulness and mental health, fixed socio-demographic and pregnancy characteristics, and the likelihood of concurrent risks. Mindfulness did not affect the likelihood of co-occurring risk, which is unsurprising given that no facet of mindfulness significantly affected the likelihood of more than one health risk. Although mental health was correlated with the number of risks and was slightly worse between groups, it did not affect the likelihood of co-occurrence once sociodemographic and pregnancy factors were included. This indicates that fixed factors were more salient.

That multiparity was significant associated with increased likelihood of co-occurrence might suggest that having children inhibits pregnant women’s capability and/or opportunity to adhere to guidance for maternal health behaviours. Possible explanations might include childcare responsibilities impinging on opportunity to exercise, and/or not losing weight gained during or subsequent to a previous pregnancy (DoH, 2015; NICE, 2010c). There may also be differences in the surge of motivation recognised by as a pivotal driver of behaviour change at key life stages (NICE, 2007; Olander, Darwin, et al., 2015; Phelan, 2010) between first and subsequent pregnancies. This finding has some implications, as research and interventions tend to focus on nulliparous women, whereas this study might suggest that multiparous women are more likely to have co-occurring risks.

The study indicated that socio-demographic factors of education, employment and ethnicity were not significantly associated with the likelihood of co-occurring maternal health behaviour risks. This means that the current study does not reflect evidence that education is positively associated with sufficient activity, with good diet, and with not drinking or smoking during pregnancy (Chamberlain et al., 2013;

Chappell et al., 2013; Darmon & Drewnowski, 2008; HSCIC, 2014b, 2014c; Smedberg et al., 2014). Nor do the findings reflect the associations between White British or Irish ethnicity and higher likelihood of Vitamin D risk (chapter three) and of drinking alcohol during pregnancy (HSCIC, 2012b). This may be due to the measures and analysis used, and/or to the non-representative nature of the sample, as discussed in limitations below and in the previous chapter.

4.4.1 Limitations

The limitations were described in chapter three (3.4.2). The pregnant women who took part in this survey were not representative of socio-demographic or maternal health behaviours norms, and risks were likely to be under-reported, as discussed in the preceding chapter. The known associations between alcohol and smoking during pregnancy mean that their lack of co-occurrence herein is further cause to believe that either one or both of these risks were under-reported. As such, concurrence across all maternal health behaviours was likely to be under-reported. Although there were reasons for choosing reasonably benign measures of antenatal mental health, clinical measures might have added value and allowed us to evaluate whether depression, distress, and anxiety were related to co-occurrence.

Dichotomising the number of risks into non-co-occurrence and co-occurrence may have led to loss of sensitivity in the regression, but incremental reduction in prevalence constrained the choice of analysis.

It was not possible to derive overall maternal health behaviour motivation (intentions, confidence, and temptation) from the data, meaning that this potentially important factor was not included in the analysis. In all, the results herein should be interpreted with caution, and any implications are very much constrained.

4.4.2 Implications for the intervention

The high prevalence of co-occurring adverse antenatal health behaviours warranted the development of intervention with potential to alleviate clustered risks, rather than focusing on one single risk. The results suggested that it might be appropriate to focus on improving exercise levels and managing diet, as co-occurring BMI and inactivity risks were the most common cluster in this group. Mental health appeared to be associated with higher prevalence and likelihood of co-occurring risks.

Whilst the effects were small and the findings did not imply cause and effect, it may be that an intervention which improved mental health might impact on health behaviours, and/or that an intervention which reduced co-occurrence of risks might impact on mental health. Activity levels might be a target, as exercise during pregnancy is associated with reduced physical discomfort (T. Field, 2012) and improved mood (Daley et al., 2015; Gaston & Prapavessis, 2013; Lewis & Kennedy, 2011).

However, antenatal smoking was under-represented in this study, and alcohol may have been under-reported. This means that wider lifestyle interventions may be appropriate, even for pregnant women who are at lower risk of inactivity and/or high gestational weight gain. Publicly-funded interventions and research understandably focus on at-risk women, but there may be wider potential to optimise lower-risk women's lifestyle and mental health during pregnancy.

4.5 Conclusion

The chapter was the second of two to address the question "*To what extent is trait mindfulness related to women's health behaviours during pregnancy?*" The previous chapter focused on individual risks; this chapter focused on co-occurring risks. There was no evidence of relationships between trait mindfulness and co-occurring risks. Nonetheless, the study provides new evidence about the prevalence of co-occurring adverse antenatal health behaviours, and that prevalence reduces as the number of clustering risks increases. There was an apparent relationship between poorer mental health and co-occurrence, and between parity and co-occurrence. The outcomes were limited by methodological weaknesses, and they should be interpreted with caution.

Whilst no intervention can change parity, multiparous women may have potential to benefit from an intervention which targets co-occurring health risk behaviours, and improving mental health may have potential to alleviate co-occurring risks. The following chapter describes the mechanisms by which mindfulness training might impact maternal health behaviours.

5

Chapter Five: Mechanisms of change; a logic model for a mindfulness-based maternal behaviour change intervention.

5.1 Introduction

The review in chapter one identified capability, opportunity, and motivation factors which might impact on health behaviours in pregnancy. It proposed that mindfulness might be a further factor in manifest health behaviours, and that mindfulness training might be a basis for a maternal behaviour change intervention. Chapters three and four reported the outcomes of a cross-sectional survey to test the first proposal. Trait mindfulness did not appear to be a factor in maternal health behaviours, although it was related to subjective wellbeing and stress, and to motivation for health behaviours, albeit assessed using simplistic, idiosyncratic intention, confidence, and temptation measures.

Mental health and motivation are established factors in health behaviours, although the relationships are likely to be reciprocal rather than mono-directional. These relationships were confirmed in the cross-sectional study. Given the apparent lack of direct associations between trait mindfulness and maternal health behaviours, the question arises as to how a mindfulness-based intervention might logically impact them.

Black (2010) called for the mechanisms by which mindfulness based interventions may impact on health behaviours to be hypothesised and tested. However, this appears to be a nascent field, as the mechanisms and theoretical frameworks by which mindfulness might influence health behaviours have been minimally explored within established models of health behaviour change. Given this project's focus on mindfulness training as a potential health behaviour change intervention, it is timely to consider how it may logically impact on health behaviours using the Behaviour Change Wheel's (BCW) capability, opportunity and motivation model of behaviour (COM-B) (Michie et al., 2011), the Theoretical Domains Framework (TDF) (Cane et al., 2012), and the BCW's intervention functions and APEASE criteria (affordability, practicability, effectiveness/cost-effectiveness, acceptability, side effects/safety, and equity) (Michie et al., 2014). This is a novel approach to conceptualising mindfulness-based interventions.

This chapter forms step three of the current project. It considers the current theorising and evidence for mechanisms of change of mindfulness in clinical and behaviour change contexts. It reviews the integration of mindfulness with theories of behaviour change. It illustrates how generic and behaviour change mindfulness based interventions may map to the COM-B and TDF criteria, and how this might apply to a maternal intervention. It proposes a logic model. Lastly, it identifies mindfulness programmes' intervention functions and potential fit with the APEASE criteria. The BCW mapping

stages are guided by the Behaviour Change Wheel: A Guide to Designing Interventions (Michie et al., 2014).

5.2 Mechanisms of mindfulness for clinical mental health: proposals and evidence

The majority of mindfulness intervention research focuses on effects on psychological symptoms. The current theoretical and evidence-based mechanisms of change in remedial mental health mindfulness interventions might provide a basis for identifying how mindfulness training might improve health behaviours. Various theoretical mechanisms of change have arisen from philosophical perspectives, extensions of existing cognitive-behavioural and physiological models, and practitioners' and participants' phenomenological accounts of their experiences. Empirical studies are beginning to evaluate these theoretical proposals. Approaches described below include pre-post quantitative self-report; qualitative investigation, experimental studies, and neuro-physiological studies of micro-level neural structure and activity and telomere function to more macro-level sympathetic and parasympathetic system response and recovery.

Increases in self-reported mindfulness have been shown to precede improvements in self-reported psychological symptoms throughout a mindfulness-based intervention (Carmody, Baer, L B Lykins, & Olendzki, 2009), so there is an indication that increasing mindfulness is a cause of improved mental health. A recent systematic review by van der Velden et al. (2015) integrated hypothesised mechanisms of change in Mindfulness-based Cognitive Therapy (MBCT) for recurrent clinical depression with empirical investigations of these mechanisms. This review provides a useful basis for identifying logically theorised and empirically evaluated mechanisms.

Van der Velden et al. (2015) identified eight general hypothesised mechanisms of change. Table 5.1 illustrates the hypothesised mechanism of change and impact, and whether there was evidence for this.

Table 5.1 *Hypothesised mechanisms of change in mindfulness-based cognitive therapy for recurrent clinical depression*

Hypothesised mechanism of change	Hypothesised impact on	Evidence of change from baseline to post-MBCT
Modification of dysfunctional cognitive biases	Memory, attention, perception	Increased awareness. Improved attention control; changes in neural structures and functions in areas associated with memory and attention control.
Modification of dysfunctional beliefs	Beliefs about self, others, the world	Increases in self-compassion correlated with reductions in cognitive reactivity.
Improved bottom-up and top-down ability to moderate inner states	Emotional regulation, acceptance of uncomfortable psychological and physical sensations and states	Reduced emotional reactivity; improved specificity of life goals; changes in neural structures and functions in areas associated with emotional regulation.
Increased interoceptive awareness	Bodily awareness, sensitivity to physical correlates of emotional states	Increased self-awareness; ability to tolerate painful stimuli.

Hypothesised mechanism of change	Hypothesised impact on	Evidence of change from baseline to post-MBCT
Decreased habitual reactivity	Emotional stability, rumination, maladaptive coping behaviours	Reductions in rumination and worry associated with reductions in depressive symptoms.
Improved self-regulation	Reactive emotions, thought patterns, behaviours	Increased self-regulation of internal and external behaviours.
Increased awareness of positive experiences	Valence of positive emotions, events	Affective change, increased propensity to notice and appreciate positive experiences
Increased awareness of behaviour patterns	Dysfunctional, functional patterns	Reduced habitual reactivity

Bold indicates stronger evidence; van der Velden et al. (2015)

Van der Velden et al. (2015) concluded that there was evidence to support the hypotheses that alterations in mindfulness, rumination, worry, self-compassion, and meta-awareness were associated with MMBCT's effects on depression relapse rates. They also identified early indications that changes in attention, memory-specificity, affect, and emotional regulation may be involved. However, they cautioned that findings were not consistent across studies, and that theorised mechanisms have not been rigorously evaluated.

Limitations include reliance on self-report, that mindfulness scales conceptualise mindfulness in various ways, and that the hypothesised mechanisms of change and empirical studies tend to draw from the same evidence base. This may have a tendency to reconfirm previous ideas (van der Velden et al., 2015), and reflects current concern about reporting bias in mindfulness studies (Coronado-Montoya et al., 2016).

A further, biological hypothesis is that mindfulness provides a "buffering effect" on stress by alleviating psychological, neurological, and physiological responses to stressors (Creswell & Lindsay, 2014). This is supported by the brain scan evidence that mindfulness training leads to functional and neuroplastic change and lower neural reactivity to stress (Farb et al., 2010; Farb et al., 2007; Hölzel et al., 2010; Tang, Hölzel, & Posner, 2015; Vago & Silbersweig, 2012). There appear to be signs of beneficial effects on DNA replication in cancer patients, which might suggest reduced phenotype vulnerability to morbidity and mortality (Carlson et al., 2015).

However, a systematic review did not provide evidence that mindfulness training was associated with reduced cortisol response to stress (O'Leary, O'Neill, & Dockray, 2015). Moreover, functional and structural neurological differences in monastics in the Nyingma and Kagyu traditions of Tibetan Buddhism with at least 10,000 hours of practice (Lutz, McFarlin, Perlman, Salomons, & Davidson, 2013) do not provide a basis from which to predict the biological mechanisms of eight week secular mindfulness courses. Although the stress buffering model is clearly conceptualised, the nascent empirical field does not currently provide a robust evaluation of proposed physical mechanisms of change.

There is some evidence to support the various hypothesised mechanisms of mindfulness, but it is not conclusive. Given the complexity of mental health and of mindfulness-based interventions, this is not entirely surprising, although it does present a problem when attempting to identify anticipated mechanisms of change in adaptations of mindfulness-based interventions.

5.3 Mechanisms of mindfulness for health behaviour change: proposals and evidence

There is a limited amount of experimental evidence for mechanisms of change in mindfulness-based behaviour change interventions. Levin, Luoma, and Haeger (2015) reviewed the evidence that “decoupling” of internal experiences and consequent internalised or externalised behaviours might be the mechanism by which mindfulness-based interventions impact on the behavioural activation of triggers including: environmental cues, urges, cravings, dysphoria, and unwanted or unpleasant experiences.

They concluded that the strongest empirical health behaviour evidence related to preventing relapse into substance abuse, where “surfing the urge” (Bowen & Marlatt, 2009) is an established element of relapse prevention interventions. The evidence for decoupling between cues and smoking and overeating was more preliminary (Levin et al., 2015). Mindfulness programmes for smoking and eating behaviours tend to include cue exposure and developing an ability to explore and allow urges, rather than suppressing the thoughts and feelings.

Whilst maintaining abstinence from alcohol after rehabilitation is perhaps more about behaviour maintenance than behaviour change, an experimental study demonstrated reduced physiological attention to, and improved recovery from, alcohol cues appeared to be mechanisms of change in 37 abstinent alcohol-dependent adults who took part in the Mindfulness-Orientated Recovery Enhancement programme (Garland, 2011; Garland, Gaylord, Boettiger, & Howard, 2010).

The same group also self-reported reductions in stress and thought suppression (avoidance, distraction, denial of unwanted thoughts) (Garland et al., 2010). This suggests decoupling, and overlap with mechanisms of change in resilience to depression relapse. Qualitative feedback from a similar rehabilitation group indicated that change was supported by greater ability to cope with emotional distress and with addictive impulses, and greater self-awareness (Garland, Schwarz, Kelly, Whitt, & Howard, 2012).

Attenuation of goal frustration, greater ability to disengage from obsessive thinking, and weakening the link between cravings and reaction, were proposed mechanisms in reducing food cravings for adults taking part in a mindfulness-based weight management programme (Alberts et al., 2010). This reflects Loucks et al’s (2015) suggestion that mindfulness training might decouple the links between

overeating and being sedentary from evolutionary cravings for palatable foods and for energy-conserving sedentary behaviours.

Loucks et al.'s (2015) conceptualisation of how mindfulness training might have some potential as an intervention to protect and/or intervene in cardiovascular health via lifestyle is framed within a theoretical model of how attention control, emotional regulation, and self-awareness might impact on behavioural self-regulation to affect: smoking, physical activity, and diet; with effects on obesity and physiological markers. It was derived from evidence of associations between self-reported mindfulness (using the MAAS measure (Brown & Ryan, 2003)) and self-reported and objective cardio-vascular health indicators including BMI, fruit and vegetable intake, and smoking (Loucks et al., 2014). However, it is not specified within a model or theory of behaviour change.

These studies and reviews contribute to formulating a model of how mindfulness training might logically impact on health behaviours. There are limited number of papers which consider mindfulness within established theories of behaviour change.

5.4 Mindfulness and behaviour change theories

Self-determination theory proposes that autonomy, competency and connection to others are key factors in authentic, internally motivated decision making and behaviour (Ryan & Deci, 2000). Brown and Ryan (2003) and Brown, Ryan and Creswell (2007) argued that being more mindful, as characterised by greater awareness of thoughts and of counter-intentional habits, would be associated with tolerating impulses, self-regulating behaviours, and fulfilling short and long term intentions and goals. Levesque and Brown's (2007) evaluation of relationships between trait mindfulness and behavioural regulation offered some support, as it illustrated a positive relationship between mindfulness and autonomously motivated behaviour.

The transtheoretical stages of change model proposes six non-linear and iterative stages of behaviour change: pre-contemplation, contemplation, preparation, action, maintenance, and termination (Prochaska & Velicer, 1997). Wallace and Shapiro (2006) suggested that the philosophical Buddhist concept of "right motivation", including cultivating the absence of greed, cravings, and desire, had "implicitly found its way into Western psychology" (2006, p. 695) in this model. However, this philosophical-meets-behaviour change model of mindfulness interventions does not appear to have been empirically evaluated.

The Theory of Planned Behaviour (TPB) (Ajzen, 1991) proposes that action is determined by intentions which are related to attitudes, subjective norms, and perceived behavioural control. Chatzisarantis and Hagger's (2007) TPB-framed study empirically identified trait mindfulness as a moderating factor in the translation of vigorous leisure time exercise intentions into action in 226 American college students. Their finding that more mindful individuals' exercise behaviours were less likely to be affected by incidents of binge drinking led them to propose that trait mindfulness may protect intentions from counter-intentional habits and thoughts (Chatzisarantis & Hagger, 2007).

What is not obvious from the literature on proposed mechanisms and theories of change in mindfulness programmes is that they include a considerable amount of information in order to educate participants about their condition. The content depends on the target problem. Mindfulness-based Cognitive Therapy includes education on: the mechanisms of depression; the co-determinant relationships between thoughts, emotions, body states, and behaviours; the valence of pleasant, unpleasant, and neutral experiences; and tasks to self-record the thoughts, feelings, behaviours, and the contexts of day-to-day pleasant and unpleasant experiences (Z.V. Segal et al., 2013). Programmes for smoking and weight management can include cue-exposure, planning, and self-monitoring (de Souza et al., 2015; Timmerman & Brown, 2012). Community antenatal mindfulness programmes often include pregnancy, childbirth, and parenting education (Byrne et al., 2014; Duncan & Bardacke, 2010). This aspect of mindfulness-based interventions has potential to increase participants' evidence-based knowledge, create opportunities for insight, and dispel myths and heuristics.

A further unacknowledged potential mechanism of change is that mindfulness programmes are group-based. The opportunity to share experiences and challenges, to observe change in others, and mutual support for common problems and transitions may contribute to an increased sense of "common humanity" and compassion for self and others (Neff & Germer, 2013). It may also provide an opportunity for peer support and friendship beyond the group contact period.

Whilst this group-based proposal has not been investigated, van der Velden et al. (2015) reported that compassion is an evidence-based mechanism of mindfulness. According to Self-Determination Theory, a sense of connectedness is an essential aspect of psychological growth (Ryan & Deci, 2000). The value of group-based pregnancy mindfulness programmes with "people like us" was evident in the quantitative themes (Fisher et al., 2012; Woolhouse et al., 2014). A further group factor is that the trainer's competence, personal practice, and lived experience of the participants' challenges in

establishing a practice and remedying the target problem is fundamental to building trust and credibility (R. S. Crane, Kuyken, Hastings, Rothwell, & Williams, 2010).

5.5 The Behaviour Change Wheel approach

Recent attempts to cohere the diverse behaviour change field have resulted in the contemporary Behaviour Change Wheel (BCW) handbook for developing and specifying behaviour change interventions (Michie et al., 2014). The BCW includes the capability, opportunity and motivation model of behaviour (COM-B) (Michie et al., 2011), Theoretical Domains Framework (TDF) (Cane et al., 2012), and behaviour change technique taxonomies, including the BCTT v.1 (Michie et al., 2013).

The COM-B model proposes that behaviour in any given moment is the result of a dynamic combination of capability, opportunity, and motivation (Michie et al., 2011). The three factors act together to determine behaviour and adherence to behaviour goals, so are crucial mechanisms for behaviour change. Over time, the primacy of each component can change as new health behaviour habits are established (Michie et al., 2014), such that deliberate, conscious strategies to change behaviours are no longer required (“termination” in the transtheoretical model (Prochaska & Velicer, 1997)).

The TDF is an integrative framework which encapsulates common themes of 33 behaviour change theories, classifying 14 domains across 84 theoretical constructs (Cane et al., 2012). Whilst the authors acknowledge that it is not all-encompassing, it attempts to unify the diverse field, and helps to overcome the problem faced by intervention developers in selecting the appropriate theory(ies) from a broad field of overlapping theories.

The BCW (Michie et al., 2014) recognises that interventions occur in various contexts, from top-down policy making to one-to-one interventions. They can seek to change behaviour through different functions: education and training; creating internalised cognitive prompts to change behaviour, such as: modelling, persuasion, incentivisation, and coercion; and external changes in the environment to facilitate or prompt action. Interventions should also meet affordability, practicability, effectiveness, acceptability, safety, and equity (APEASE) criteria (Michie et al., 2014).

Potential factors in maternal health behaviours were identified against the COM-B model in chapter one (Table 1.2). The implementation of gestational health care has been considered within the TDF (Beenstock et al., 2012; Heslehurst et al., 2014) (chapter one, section 1.2.4). Recent interest in using

the BCW to identify the components of effective behaviour change interventions resulted in gestational weight gain (GWG) and exercise interventions being retrospectively mapped to the BCTT v.1 (Currie et al., 2013; Soltani et al., 2016).

Soltani et al. (2016) categorised 44 exercise only, diet only and mixed GWG intervention studies included in Thangaratnam et al.'s (2012) systematic review. The most frequent techniques were feedback and monitoring, shaping knowledge, goals and planning, repetition and substitution, antecedents, and comparison of behaviours. Although it was not possible to identify which individual or combined techniques impacted GWG, the effective interventions consistently included goals and planning and/or monitoring and feedback (Soltani et al., 2016).

This reflected Currie et al.'s (2013) findings that goals and planning, shaping knowledge, and comparison of outcomes (such as contemplating the possible outcomes of being active and being sedentary) were elements of successful interventions to increase physical activity during pregnancy. A limitation is that both these studies retrospectively identified behaviour change techniques in published papers. The authors emphasised the value of specifying techniques within the development process (Currie et al., 2013; Soltani et al., 2016).

A further factor in successful maternal behaviour change interventions may be their group-based nature and potential for peer support. Whilst social opportunity is an element in the COM-B model (Michie et al., 2011), this was not identified in the Currie et al. (2013) and Soltani et al. (2016) reviews of effective GWG and exercise interventions, as it is not a technique in the BCTT v.1 (Michie et al., 2013).

5.5.1 Mapping mindfulness based interventions to the Behaviour Change Wheel

The following considers how mindfulness training might impact on maternal health behaviours using the COM-B model, TDF, intervention functions, and APEASE criteria. It begins by identifying the proposed mechanisms of mindfulness above against the COM-B and TDF, and suggest how this might impact on maternal health behaviours. A logic model is then proposed. Generic and behaviour-change specific mindfulness-based interventions are then identified against functions and the APEASE criteria, allowing consideration of how this might apply to maternal health behaviours.

Step one and two of the BCW are to identify the target population and behaviours. This occurred in chapter one. The potential target behaviours are exercise, diet, alcohol, and smoking; the target

population is pregnant women. Step three is to identify what needs to change. In order to improve these maternal health behaviours in women who do not meet the UK guidance, women would need to either increase: weekly moderate activity exercise to 30 minutes per day five days per week; improve diet so that it regularly adheres to the Eatwell Plate recommendations, whilst avoiding overeating and foods that are contraindicated in pregnancy; supplement diet with Vitamin D and Folic Acid; and avoid drinking alcohol and smoking.

Step four is to use the COM-B model to identify what might need to change in order for the target behaviour to change. This occurred in chapter one. Potential factors in antenatal exercise, diet, alcohol, and smoking were mapped against the COM-B model in Table 1.2. Psychological capability, social opportunity, and motivation factors appeared to be consistent across exercise, diet, alcohol, and smoking, whereas different aspects of physical capability and opportunity were salient to different behaviours. Some factors appeared to be potentially amenable to change; socio-economic and demographic factors and pregnancy characteristics were fixed; and pregnancy symptoms and effects might vary over time and have various effects on health behaviours. An intervention might impact health behaviours by altering modifiable factors.

The following section suggests how the proposed mechanisms of mindfulness might match to the COM-B (BCW handbook Step 4) and TDF (BCW handbook Step 4a), and might impact on maternal health behaviour factors identified in Table 1.2. The BCW worksheets provided a guide as to how to match the TDF domains to the COM-B.

Table 5.2 draws on the theory-based hypotheses and evidence for mechanisms of change described above. It proposes how a group-based antenatal mindfulness based programme might have potential to affect behaviour change against the COM-B and TDF models. Factors which not be impacted are included in Table 5.2 but are struck through.

Table 5.2 *Potential mechanisms by which mindfulness might impact maternal health behaviours, identified against the COM-B model of behaviour and the TDF of behaviour change.*

COM-B factors	TDF domains	Proposed mechanism of mindfulness	Potential to impact on factor in maternal health behaviours
Physical capability	Physical Skills	None	Physical fitness Body mass index Pregnancy symptoms High risk pregnancy Physical addiction
Psychological capability	Knowledge	Education Modification of dysfunctional cognitive biases Modification of dysfunctional beliefs	Knowledge Mental Health and wellbeing
	Cognitive & Interpersonal skills	Improved bottom-up and top-down ability to moderate inner states Increased interoceptive awareness Decreased habitual reactivity Improved self-regulation Increased awareness of behaviour patterns	Mental health and wellbeing Emotional and behavioural regulation

COM-B factors	TDF domains	Proposed mechanism of mindfulness	Potential to impact on factor in maternal health behaviours
Psychological capability	Memory, attention and decision processes	Modification of dysfunctional cognitive biases Increased interoceptive awareness Increased awareness of behaviour patterns	Mental health and wellbeing Emotional and behavioural regulation Established coping strategies
Physical opportunity	Environmental contexts and resources	Opportunity to learn to practice mindfulness	Time and work commitments Proximity Financial resources
Social opportunity	Social influences	Group effects	Peer support Social and demographic factors
Reflective motivation	Professional/social role & identity		
	Beliefs about capabilities	Improved bottom-up and top-down ability to moderate inner states Improved self-regulation	Perceived behavioural control Self-efficacy Self-care
	Optimism	Increased awareness of positive experiences	Intentions Goals
	Beliefs about consequences	Modification of dysfunctional beliefs	Lay epistemology

COM-B factors	TDF domains	Proposed mechanism of mindfulness	Potential to impact on factor in maternal health behaviours
Reflective motivation	Intentions	Education	Intentions
		Modification of dysfunctional beliefs	Self-care
Automatic motivation	Goals	Psychoeducation	Goals
		Modification of dysfunctional beliefs	
Automatic motivation	Reinforcement	Decreased habitual reactivity	
		Improved self-regulation	Health habits
		Increased awareness of behaviour patterns	Emotional and behavioural regulation
	Emotions	Improved bottom-up and top-down ability to moderate inner states	Emotional valence of health behaviours
		Increased interoceptive awareness	Feelings about pregnancy
		Increased awareness of positive experiences	

COM-B (Michie et al., 2011), TDF (Cane et al., 2012); mechanisms of mindfulness (van der Velden et al., 2015), factors in maternal health behaviours from Table 1.2

The COM-B factors of psychological capability, social opportunity, and reflective and automatic motivation appears to include factors which might be amenable to change from a mindfulness-based intervention, which might impact on health behaviours. The TDF domains where change might occur as result of a mindfulness-based intervention and impact on health behaviours appear to be: knowledge; cognitive and interpersonal skills; memory, attention, and decision processes; behavioural regulation; social influences; beliefs about capabilities; optimism; beliefs about consequences; intentions; goals; reinforcement; and emotions.

The potential to impact psychological capability might include knowledge, and incremental improvements in: mental health and wellbeing, emotional and behavioural regulation, and coping strategies. A group-based intervention might create social opportunities for peer support, and observing change in others.

Reflective motivation might be affected by knowledge-based alterations in previously lay epistemologically-derived risk appraisal, with subsequent effects on goals and on intentions for self-care and for caring for the baby. Engaging in the challenge of mindfulness practice might incrementally affect self-efficacy and perceived behavioural control; this might extend into generalised sense of motivation, competency and capacity for self-care, and impact on health behaviours.

The inclusion of health-behaviour-specific knowledge and behaviour change techniques that support successful pregnancy weight gain and exercise interventions and mindfulness-based behaviour change interventions: goals and planning, monitoring and feedback (Currie et al., 2013; Soltani et al., 2016; Timmerman & Brown, 2012), in the intervention might logically increase its potential to impact on reflective motivation for health behaviour change.

Over time, actualisation of intentions to change health behaviours might impact on automatic motivations as new habits are formed and the behaviours are maintained without the same degree of conscious self-regulation required to begin the process. The emotional valence of health behaviours may improve as behaviours improve.

Whilst models of health behaviour change acknowledge the challenge of lapse and relapse, a more self-compassionate response (psychological capability) to lapses might protect against a negative shift in perceived control and self-efficacy and resulting relapse. The self-caring act of committing to take part in a mindfulness intervention might impact on feelings about the pregnancy and the self.

A mindfulness based intervention would not be likely to impact on physical capabilities, although increases in activity might impact physical fitness over time. An intervention would not alleviate mobility-hindering back or pelvic pain, or fatigue or nausea. It would not impact on physical constraints on access to goods and services. Although a mindfulness training course would provide a physical opportunity to learn to practice mindfulness, it might negatively impact on time to engage in exercise and diet due to the time commitment to attending a course and to home practice. It would not have potential to impact on socio-demographic factors or partner, family, or current peer group support for health behaviours. A caveat is that there is limited evidence for some proposed mechanisms (van der Velden et al., 2015).

5.6 A logic model

Assimilating the proposed mechanisms into a logic model, in Figure 5.1, indicates how the inputs of mindfulness training and behaviour change techniques might produce capability, opportunity, and motivation outcomes, which might have short-term impact on factors associated with health behaviour change, and then impact on maternal health behaviours.

Inputs	Outputs	Outcomes	Short term impact	Longer term impact
Mindfulness training	<p>Attention, awareness, attitude. (C), (M)</p> <p>Learning new practical skills (C)</p>	<p>Self-care (M)</p> <p>Acting with awareness, flexibly, autonomously (C)</p> <p>Mental health and wellbeing (C)</p> <p>Emotional and behavioural self-regulation (C)</p> <p>Adapting coping strategies and habits (C)</p>	<p>Motivation to optimise health behaviours and general wellbeing.</p> <p>Purposeful, self-regulated changes in health behaviours</p> <p>Self-efficacy. Perceived behavioural control.</p> <p>Reduced reactive health behaviours</p>	Improved health behaviours
Behaviour change techniques	<p>Knowledge (M)</p> <p>Goals and planning (M)</p> <p>Monitoring and feedback (M & C)</p> <p>Peer support (O)</p>	<p>Risk appraisal (M)</p> <p>Motivation. Self-care. (M)</p> <p>Awareness of gains. (M)</p> <p>Adjusted social norm (M), modelling (O) (M), connectedness (O) (M).</p>	<p>Initiation of behaviour change</p> <p>Motivation and opportunity to optimise health behaviours and general wellbeing</p> <p>Self-efficacy. Perceived behavioural control.</p>	

C, O, M indicate capability, opportunity, and motivation.

Figure 5.1 Logic model of how mindfulness training might impact maternal health behaviours.

5.7 Considering mindfulness-based interventions' functions, and fit to APEASE criteria

Step five of the BCW is to identify the intervention's functions, and potential fit with the APEASE criteria: affordable, practicable, effective, acceptable, safe, and equitable (Michie et al., 2014).

Table 5.3 identifies generic and behaviour change mindfulness-based interventions' potential functions, and suggests how this might apply to a maternal behaviour change intervention. Some functions are likely to be consistent across all types of mindfulness-based programmes, and some functions that are bespoke to the targeted problem. The maternal health behaviour column identifies functions which might impact on health behaviours. Explicit functions include education, training, modelling, and enablement. Persuasion, incentivisation, coercion, and restriction are not explicit functions of mindfulness-based interventions, although information about maternal health behaviours might persuade, incentivise, or coerce behaviour change.

Table 5.3 *Intervention functions of mindfulness based programmes: generic, problem-specific, and maternal health behaviours.*

Intervention function	Definition	Generic mindfulness based interventions	Problem-specific	Maternal health behaviours
Education	Increase knowledge or understanding	Relationships between thoughts, emotions, physical states, and behaviour. The unreliable nature of mind, function of emotions. Human-being and human-doing modes. Weekly reading.	Context-specific information, such as: pregnancy and childbirth information.	Context-specific information: potential consequences of health behaviours; to promote exercise, healthy eating, avoiding alcohol and smoking
Persuasion	Use communication to induce positive or negative feelings or stimulate action			Information may persuade behaviour change
Incentivisation	Creating an expectation of a reward			Information may incentivise behaviour change
Coercion	Creating an expectation of punishment or cost			Information may coerce behaviour change

Intervention function	Definition	Generic mindfulness based interventions	Problem-specific	Maternal health behaviours
Training	Imparting skills	Mindfulness practices	Substance misuse: urge surfing practices. Pregnancy: ice practices. Compassion practices.	Strategies for behaviour change: goals, intention, planning
Restriction	Using rules to reduce opportunity to engage in the target behaviours			
Environmental restructuring	Changing physical or social context			
Modelling	Providing an example for people to aspire to or imitate	Teacher has an established mindfulness practice, teaches from own experiences. Participants may observe changes in their peers.	Teachers follow the programme alongside the participants.	Teachers follow the programme alongside the participants.

Intervention function	Definition	Generic mindfulness based interventions	Problem-specific	Maternal health behaviours
Enablement	Increasing means/reducing barriers to increase capability or opportunity	Planning time to do home practice	Weight management: planning menu choices. Medication for clinical health conditions.	Supporting behaviour change by planning time to do practice and exercise

Intervention functions (Michie et al., 2014)

Table 5.4 identifies how generic and behaviour change mindfulness-based interventions appear to fit to APEASE criteria, and suggests how this might apply to a maternal behaviour change intervention. Mindfulness-based interventions' per capita affordability will depend on pro-rata development and training costs, and any fees paid to take part. Courses are deliverable, as teachers will have taken part in intervention-specific training pathways, and UK teachers should adhere to good practice guidance (UKNMBT, 2011).

Systematic reviews indicate that mindfulness training appears to have potential to effectively reduce clinical and sub-clinical mental health symptoms, and reduce relapse into recurrent depression and addictive behaviours (Chiesa & Serretti, 2014; Godfrey, Gallo, & Afari, 2015; van der Velden et al., 2015). Its cost-effectiveness depends on the impact on immediate and sustained health care costs, and delivery costs in comparison to other treatments (Kuyken et al., 2015). Its value on "quality of life" is not financially quantifiable.

Acceptability appears to be high, as attrition rates are low (C. Crane & Williams, 2010). However, adherence to home practice recommendations may be associated with gains, and adherence might be low even when the intervention is acceptable (C. Crane et al., 2014). Potential reasons for variation in adherence were discussed in chapter one.

Mindfulness-based interventions appear to be low risk, and teachers should be competent (UKNMBT, 2011). Some conditions contra-indicate mindfulness, and practice might have potential to trigger psychological vulnerabilities (Farias & Wikholm, 2015). Intensive, sustained meditation practice during weeks or months of silent retreat might have higher risk of this, but clinical and community mindfulness based interventions do not include immersive meditation practice, and trainers should work within their professional competency (UKNMBT, 2011).

The equity of mindfulness based interventions may be low. They appear to be a better fit and more effective for some groups than for others. Baseline mental health, personality characteristics, and life history appear to be factors (Hall et al., 2015; Lyssenko et al., 2015; D. H. Shapiro, 1992; J. M. G. Williams et al., 2014). Public courses cost around £350, which is likely to exclude less affluent groups. The teacher training process is lengthy and expensive, which may inhibit supply. Mindfulness training may however provide a viable alternative to pharmaceutical treatments for people for who prefer to avoid them (Kuyken et al., 2015).

The affordability of a mindfulness based antenatal behaviour change intervention will depend on whether development and training costs are considered. Material costs for books, handouts, and home practice materials are likely to be low.

The practicability, effectiveness, and acceptability are unknown, but problem-specific mindfulness-based interventions appear to meet these criteria (although this may be subject to reporting bias (Coronado-Montoya et al., 2016)). It can be expected to be low risk, although the ethics of recruiting people into mindfulness programmes without fully explaining the content and nature of the course were discussed in chapter two.

Equity may be constrained if it appeals only to a similar subgroup of affluent, educated women who took part in other antenatal mindfulness research studies (Hall et al., 2015) rather than “hard to reach” groups, and exclude women who are too busy or remote to attend. A community sample intervention may exclude pregnant women who feel marginalised due to high body mass index, or drinking, or smoking during pregnancy (Arden et al., 2014; DeJoy & Bittner, 2015; Furber & McGowan, 2011). Health-behaviour specific interventions may overcome this problem, but recruitment of eligible women into current gestational weight gain, exercise and smoking intervention studies encounters similar problems (Bauld et al., 2010; Currie et al., 2015).

It appears likely that a maternal mindfulness-based behaviour change intervention might meet some if not all of the APEASE criteria; this requires evaluation.

Table 5.4 *The fit of mindfulness based interventions to the APEASE criteria*

APEASE criterion	Generic mindfulness based interventions	Problem-specific	Maternal health behaviours
Affordable	Development and teacher training costs may be high. Group-based delivery costs are low. Materials costs (handouts, record sheets) are low.	Cost of participation in Oxford Mindfulness Centre MBCT: £350 for an 8-week course.	PhD study, no charge to participants. Cost of development and training largely met by PhD funding.
Practicable	Manualised courses delivered by trained teachers. Teaching competency assessments and good practice guidance in place.	Courses delivered by people with problem-specific knowledge.	The researcher is competent to deliver the intervention
Effective and cost-effective	Some gains, mixed evidence	MBCT is as cost-effective as medication, and reduces health care costs in high users.	To be evaluated in the feasibility study
Acceptable	Dropout rates are low.	Antenatal mindfulness courses are generally acceptable	To be evaluated in the feasibility study
Safe	Low risk		
Equitable	May have more potential to engage and to benefit subgroups.	Antenatal research studies tend to recruit educated, affluent, professional women in stable relationships.	May exclude women who are: not aware of mindfulness training, marginalised, have practical time and commitment barriers to participation. To be evaluated in the feasibility study

APEASE criteria (Michie et al., 2014)

5.8 Conclusion

This chapter proposed a theoretical basis and a logic model for the intervention study in the following chapters. It has articulated the theorising about the ways in which a mindfulness-based intervention might impact on health behaviours. It has identified the mechanisms of change that are proposed to occur in mindfulness interventions, and mapped them against the: capability, opportunity, and motivation model of behaviour (Michie et al., 2011); Theoretical Domains Framework (Cane et al., 2012); and factors which appear to be associated with maternal health behaviours. It has considered the apparent functions (Michie et al., 2014) of mindfulness-based interventions, and those which appear to be specific to behaviour change interventions. It has considered how well a maternal mindfulness based behaviour change intervention might fit with the APEASE criteria (Michie et al., 2014), per the Behaviour Change Wheel guide (Michie et al., 2014).

It proposes a logic model which suggests that a maternal mindfulness based behaviour change intervention might have some potential to improve health behaviours via factors including motivation and opportunity, mental health, self-regulation, risk appraisal, self-care, self-efficacy and perceived control, peer support, and/or reduced emotional and behavioural reactivity.

Although this might offer multiple mechanisms of impacting on health behaviours, a caveat is that a mindfulness programme is not a panacea. Any impact would be subject to individual differences at baseline, readiness to change, willingness to engage in the intervention, and adherence to the recommendations. Moreover, altering factors which appear to be associated with maternal health behaviours might not impact health behaviours, as associations do not imply cause and effect. Although there are indications that stress-focused mindfulness programmes have beneficial “side-effect” impacts on health behaviours (Salmoirago-Blotcher et al., 2013), following precedent to include specific behaviour change techniques, including goals and planning and/or monitoring and feedback (Soltani et al., 2016; Timmerman & Brown, 2012), in a targeted mindfulness-based intervention might increase the likelihood of impact.

The chapter indicated that there are theory and evidence-based reasons to develop and evaluate the feasibility of a mindfulness-based maternal behaviour change intervention. The following chapter describes the development of the intervention, and its specification according to policy categories, the BCTT v.1 behaviour change technique taxonomy and mode of delivery (steps six to eight of the handbook).

6

Chapter Six: Developing the “Mind the Bump” intervention.

6.1 Introduction

Step one of this project described the evidence base for factors associated with maternal health behaviours, and for mindfulness in the context of health behaviours and clinical, non-clinical, and antenatal mental health. The Mindfulness-based Stress Reduction (MBSR) programme has been adapted to many different problems by integrating the core mindfulness practices and psycho-education with techniques that are known to be effective in resolving the target problem.

Emergent evidence indicates that mindfulness based interventions have some effects on health behaviours, although community sample evidence is constrained to smoking cessation in people who are motivated to quit, and to weight management in adults (primarily women) who are motivated to control their weight. The evidence for MBIs in mental health contexts is stronger for clinical depression and anxiety than other psychopathologies.

There is a growing recognition of its potential to improve mental and physical wellbeing in non-clinical contexts, and there are indications from pilot studies that MBIs may have some potential to improve maternal mental health and wellbeing. The review indicated that mindfulness training might have some potential to alleviate adverse maternal health behaviours, perhaps via antenatal mental health.

Step two of this project tested the proposal that trait mindfulness might be related to maternal health behaviours. There was no convincing evidence that trait mindfulness was beneficially related to maternal health behaviours. In fact, it appeared that higher trait mindfulness may have been weakly positively related to risks. There were small to moderate associations between higher trait mindfulness and better antenatal mental health, and higher behaviour-related motivation. Subjective wellbeing was related to lower incidence of co-occurring maternal health behaviour risks. The most common cluster of risks was low activity plus high BMI, but diet, alcohol, and smoking risks also co-occurred with others. Poorer mental health was related to exercise, BMI, alcohol, and smoking risks. Although this study was limited in many ways, it provided grounds for an exploratory study to address the second primary research question:

Is mindfulness training a feasible behaviour change intervention for pregnant women?

The previous chapter described the theoretical basis and proposed logic model for the intervention.

This chapter forms step four of this project. It describes the development of the 'Mind the Bump' intervention. It details the selection of the most appropriate mindfulness course, and how it was adapted to fit the context. This step was informed by the MRC (2000, 2008), NICE (2007, 2014b), and the Behaviour Change Wheel guide (BCW) (Michie et al., 2014) recommendations for developing behaviour change interventions.

Developers should specify their intervention by its functional actions and components (Michie et al., 2014; NICE, 2007). Functions can include education, persuasion, Incentivisation, coercion, training, enablement, modelling, environmental restructuring, and restrictions (Michie et al., 2014). Chapter five identified the intervention functions of mindfulness programmes, in accordance with step five of the BCW. The next step of the BCW is to identify pertinent policy categories: guidelines, fiscal measures, regulation, legislation, and service provision (Michie et al., 2014). The next step is to identify the intervention's "ingredients". Michie et al.(2013) provide a taxonomy of 93 recognised behaviour change techniques (BCTT v.1) against which to identify the intervention's BCTs. The MRC recommend that developers anticipate the mechanisms by which their intervention will engender change (MRC, 2008). Identifying the functions, categories, and techniques of the intervention helps the developer to ensure that they are clear about the ways in which they are trying to change behaviours, and illustrates whether the intervention is appropriate to the context (targeted health behaviour(s), intended recipients). The eight and last BCW step is to identify the mode of delivery to individuals or groups, and face-to-face or from a distance via various media.

Goal setting is a consistently effective technique in GWG interventions (Soltani et al., 2016). Goals encourage reflective motivation, planning, and action (Michie et al., 2013). It is important to set goals that are specific, measurable, achievable, realistic and time-framed (SMART) (Meyer, 2003) as failure to achieve vague or unrealistic goals can undermine motivation and behavioural self-efficacy (Meyer, 2003; Ryan & Deci, 2000).

Self-monitoring can help to support self-regulation, perceived behavioural control, and self-efficacy in weight management interventions (Burke, Wang, & Sevick, 2011; Carter, Burley, Nykjaer, & Cade, 2013). It can also help individuals to recognise their capability, opportunity and motivation barriers to achieving their goals, and to facilitate planning of how to overcome anticipated and unexpected barriers (Michie et al., 2011). Goal setting and self-monitoring are recommended in the NICE (2007)

guidance for developing behaviour change interventions, and were included in Timmerman and Brown's (2012) mindfulness-based weight management intervention.

The aim when developing the current intervention was to integrate findings about factors which appear to be associated with adverse maternal health behaviours from the literature review (chapter one) and the cross-sectional survey (chapters three and four) with evidence-based behaviour change techniques within the context of a mindfulness-based intervention. The potentially modifiable factors were outlined in the logic model (motivation and opportunity, mental health, self-regulation, risk appraisal, self-care and compassion, self-efficacy and perceived control, social support, and/or reduced emotional and behavioural reactivity).

The research objectives of the intervention study were to: establish whether it was possible to develop an intervention, and to assess its feasibility. This chapter details the intervention development. The feasibility assessment is described in the subsequent chapters.

6.2 Developing Mind the Bump

The objective was to develop a deliverable intervention with potential for low-cost implementation. It was essential that the foundational MBI was adaptable to fit the problem and the participants.

Considerations in the deliverability included my professional competence to teach mindfulness training. Whilst mindfulness teaching is not regulated, good practice guidelines recommend that trainers: have an established mindfulness practice, take part in professional training pathways to learn to deliver mindfulness courses, and teach within their professional competency (UKNMBT, 2011). This means that patients with clinical mental health conditions should be taught mindfulness by clinically trained psychologists who have taken part in at least a year-long training to teach remedial MBIs, and that women with higher risk pregnancies should be taught mindfulness by appropriately trained health-care professionals. I am neither a clinician nor medically trained. I had taken part in training to teach MBCT (Z.V. Segal et al., 2013), Mindfulness, a Practical Path to Finding Peace in a Frantic World (MaPP) (Williams et al., 2013), and the .b and .b Foundations schools-based mindfulness curricula for staff and pupils (Burnett, Cullen, & O'Neill, 2011; Burnett, Cullen, Silverton, & Morris, 2014) and had experience of delivering mindfulness courses to non-clinical groups. My competency was constrained to non-clinical contexts.

There were a number of a priori considerations when developing the intervention: preferred mode of delivery, costs, time commitments, and ethics. Face-to-face delivery was preferred to book-led, remote, or online delivery. This mode of delivery was more likely to allow me to identify the aspects that worked well and those that did not, to monitor attendance and adherence to the intervention, to create social opportunities for the women to learn to practice mindfulness and to support each other's motivation, and for me to respond to the women's individual and potentially diverse capabilities to engage in mindfulness practice and health-promoting behaviours. The anticipated disadvantage was that there would be variations in the delivery of each session. However, this is typical in mindfulness courses, as trainers respond to participants' accounts of their various experiences within each session, and in feasibility testing as trainers become more experienced (MRC, 2008).

Materials costs were considered. The cost of training to teach MBCT was met by my PhD studentship; further training would have been self-funded. Time considerations included the development period, time required for pregnant women to attend the intervention, and time to complete regular mindfulness practice between face-to-face sessions. The ethical considerations of recruiting pregnant women into a mindfulness-based behaviour change intervention were outlined in chapter two.

6.2.1 Selection of the mindfulness based intervention

A number of standard mindfulness courses were considered as the foundation for the intervention. The considerations focused on the adaptability of the course to pregnancy and to the inclusion of recognised behaviour change techniques, my professional competency, the preference for face-to-face delivery, the cost of materials, and the demands it would place on pregnant women's time.

The courses considered were:

1. Mindfulness-based Cognitive Therapy (MBCT) which is appropriate for adults with clinical and non-clinical mental health conditions.
2. Mindfulness-based Relapse Prevention (MBRP) which has been adapted for smoking cessation.
3. Mindfulness-based Childbirth and Parenting (MBCP) which was designed to reduce parental anxiety about birth and parenting.
4. Be Mindful Online (BMO), the Mental Health Foundation's online course for the general public.
5. Mindfulness: A Practical Path to Finding Peace in a Frantic World (MaPP) which is a non-clinical adaptation of MBCT for the general public.

Table 6.1 illustrates the extent to which they fitted the criteria for Mind the Bump.

Table 6.1 Mindfulness-based interventions reviewed for best fit to Mind the Bump

Mindfulness based intervention		Context		Competency				Delivery	Time	Per person cost of materials
Name	Problem focus	Mental health	Behaviour change	Antenatal mental health	Teach	Training costs	Adaptable			
MBCT	To reduce relapse into clinical depression, & general population mental health	X			Yes	Nil	Yes	Face-to-face	8 x 2.5 hour sessions, 45-60 minutes of practice per day; total 70 hours	£23
MBRP	To reduce relapse into drug and alcohol use after rehabilitation		X		No	£1000	Yes	Face-to-face		
MBCP	Parents' anxieties & concerns about childbirth and parenting.			X	No	£3000	No	Face-to-face		N/F

Mindfulness based intervention		Context			Competency					
Name	Problem focus	Mental health	Behaviour change	Antenatal mental health	Teach	Training costs	Adaptable	Delivery	Time	Per person cost of materials
BMO	To improve mental health. Combines elements of MBSR & MBCT	X			N/A	N/A	No	Online	10 x 30 minute sessions. Daily practice 10-30 minutes; total approx. 10 hours	£60
MaPP	To improve non-clinical mental health and wellbeing. Derived from MBCT	X			Yes	Nil	Yes	Face-to-face	8 x 1.5 hour sessions, 10-30 minutes daily practice, approx. 35 hours	£8

MBI: Mindfulness-based intervention. MH = mental health, BC = behaviour change. X = good fit to Mind the Bump. Estimated costs per person included materials such as books and CD's for home mindfulness practice. N/F not feasible due to training costs. N/A not applicable to online mindfulness course.

The MaPP course was selected as the most appropriate foundation for the intervention because it met the requirements for my competency to teach the course, adaptability to the context, face to face delivery, lower time demands, and lower costs per person.

There was a precedent for adapting the MaPP course to specific populations, including the Mindfulness in Schools Project's ".b Foundations" course for school teachers (Beshai et al., 2015), and The Mindfulness Exchange's course for the workplace (Grazier, in preparation). Permission was sought from the MaPP authors, and Dr Danny Penman gave written permission for the course to be adapted and used in the study.

The portfolio of MaPP mindfulness exercises included formal practices, compassion practice, a brief three-stage "breathing space" practice, and informal practices. Table 6.2 outlines the standard MaPP course structure.

Table 6.2 *Standard MaPP course framework*

Week	Theme	Mindfulness practice	Home practice (minutes per day) five times per week, plus reading
1	“Waking up to the autopilot”: Introduction to theory and practice of mindfulness. Noticing autopilot thoughts and behaviours, reactivity.	Mindfulness of Breath & Body, Mindful eating.	Track 1 (10) Paying attention to a daily activity. Read chapter 5.
2	“Keeping the body in mind”: Noticing and appreciating the here & now. Unhooking from the narrative, developing greater embodied awareness.	Body Scan.	Track 2 (16) Paying attention to a daily activity. Read chapter 6.
3	“Weaving Mindfulness into daily life”: Noticing our attitude to our experiences. Developing embodied awareness and more frequent mindfulness.	Mindful Movement, Breath & Body, Three stage Breathing Space.	Track 3, 4 and 8 (23) Read chapter 7.
4	“Relating differently to thoughts”: Discerning between real and imagined problems. Recognising that thoughts can be exaggerated or incorrect. Noticing how thoughts and emotions are felt in the body.	Sounds & Thoughts.	Track 4, 5 and 8 (20) Read chapter 8.

Week	Theme	Mindfulness practice	Home practice (minutes per day) five times per week, plus reading
5	“Turning towards difficulties”: Accepting & allowing genuine difficulties to be present, exploring associated physical sensations with curiosity and compassion. Cultivating acceptance, discernment and responsiveness instead of ignoring, bracing and reactivity.	Exploring Difficulty, Breathing Space including difficulties.	Track 4, 5, 6 and 8 (33) Read chapter 9.
6	“Practicing kindness”: Recognising the Inner Critic – scenarios and automatic thoughts. Noticing self-criticism and harshness, moving towards kindness and compassion.	Befriending (self-compassion).	Track 4 and 7 (25) Read chapter 10.
7	“How can I best take care of myself”: Balance between nourishing and depleting activities. Optimising enjoyment and sense of achievement maximise yield from pleasurable activities and reduce depletion by necessary tasks.	Breath, Body, Exploring Difficulty.	Track 8 plus own choice (14 to 30) Read chapter 11.
8	“Review & looking ahead”: What have I learnt? What will I continue to practise?	Setting intentions. Mindfulness of Breath & Body including intentions.	Own choice of tracks (10 to 30) Read chapter 12.

Several adaptations were made to address the maternal behaviour change focus of the intervention and to make it suitable for pregnant women. Some changes were consistent with adaptations made to standard mindfulness practices in antenatal mental health MBIs. Other additions (knowledge about maternal health behaviour risks, information about exercise classes) were novel.

The intervention began with an introductory session at week 0. The course was delivered face-to-face over the standard eight weeks. There was an eight-week self-led period, during which the women were recommended to maintain a regular mindfulness practice and to self-monitor their goal achievement. This was consistent with mindfulness courses as the intention is for participants to maintain on-going mindfulness practice, and with behaviour change interventions as the intention is create sustained behaviour change.

The intervention was 17 weeks long, including the introductory session (week 0), the MBI (weeks 1 to 8), and the self-led period (weeks 9 to 16). Each taught session lasted 90 minutes, which was 13.5 hours in total. Recommended home practice during the taught course was from 20 to 23 hours, and during the self-led period was from seven to 21 hours, which totalled 27 to 44 hours plus the session time, totalling 40.5 to 57.5 hours overall.

6.2.2 Adaptations to the standard MaPP course to develop Mind the Bump

Adaptations to the standard MaPP course:

1. Focusing on the sensations of the baby during the Body and Breath, Body Scan, and Breath and Body practices.
2. Breath and Body acceptance practices included invitations to explore and accept neutral, pleasant and unpleasant sensations of being pregnant.
3. Substituting the Mindful Movement practice with Mindful Walking.
4. Focusing on the baby during the compassion practice.
5. Advising women to sit or to lie on their side to do the formal Body Scan rather than their back, which is not recommended after 16 weeks gestation (NHS, 2015a).

6.2.3 Additions to the standard MaPP course to develop Mind the Bump

Additions to the standard MaPP course included a *Week 0 Introductory session*, delivered as a PowerPoint presentation (included in Appendix C):

1. The effects of lifestyle during pregnancy: alcohol, smoking, weight management, nutrition, supplements, exercise on women and their babies.
2. Predictors of health-risk behaviours during pregnancy: low mood and established habits.
3. Defining mindfulness.
4. Information about UK guidance for health behaviours.
5. The potential of mindfulness in overcoming habits.
6. Introducing the Mind the Bump intervention

Week 0 Goal setting

A goal setting exercise occurred after the introductory presentation. Each woman decided on her own goals for diet, exercise, alcohol consumption, smoking, and mindfulness practice, and recorded them in the diary.

Week 1 to 8 additions to standard MaPP:

1. Extending the normal discussion of the preceding week's home mindfulness practice to include health behaviour goal attainment.
2. Formulating strategies to overcome barriers to lifestyle goals.
3. A weekly handout, summarising the session and detailing the home practice.
4. Intentions for mindful parenting in the week eight reflective task.

Week 9 to 16 Self-led period

An eight-week self-led period, maintaining mindfulness practice of 10 to 30 minutes of practice per day.

Week 1 to 16 Self-monitoring

The intervention included two forms of self-monitoring:

1. Weight gain: Women weighed themselves each time they attended a session, and recorded their weight on a group record sheet. This allowed them to monitor their weight change over time.
2. Goal achievement: Women were asked to monitor the extent to which they achieved their own goals in the Mind the Bump diary. There were two pages for each week; the first was blank for notes, and the second page was a record of goal achievement for alcohol, smoking, diet, exercise, and mindfulness practice, and a guide to the week's home practice. Women could indicate

whether they *achieved, almost achieved, or missed* their goals, and make a note of any factors that supported or hindered their goal achievement.

6.2.4 Materials in the Mind the Bump intervention

The materials included handouts and the diary (Appendix C), a book and CD for home reading and mindfulness practice, and a weighing scale.

1. Handout for each session.
2. “Do’s and Don’ts, Guidelines for Healthy Pregnancy”. A summary of UK guidance for supplements, diet, exercise alcohol and smoking during pregnancy.
3. “Weight gain”. UK guidance about calorie intake during pregnancy, and information about American weight gain guidance.
4. “Pregnancy exercise classes around Oxford”. A list of local pregnancy-specific exercise and yoga classes.
5. Diary.
6. “Mindfulness: A Practical Guide to Finding Peace in a Frantic World” book (Williams & Penman, 2011), including a CD of mindfulness practices.
7. Weighing scale.

6.2.5 Timetable

The intervention timetable is shown in Table 6.3.

Table 6.3 *Mind the Bump* timetable

Week	Element	Self-monitoring
0	Introduction and Goal Setting	Weight
1 to 8	Taught mindfulness course	Weight & Goal achievement
9 to 16	Self-led period	Goal achievement

Pregnant women’s views of the structure and format were obtained from a discussion with a group of pregnant women attending Oxford Brookes University’s “Zumba for Bump” exercise group. They did not suggest changes, and said that Mind the Bump appeared to be acceptable.

6.3 Specifying the intervention

6.3.1 Intervention functions

The first stage (step five of the BCW (Michie et al., 2014)) was to identify the intervention functions of Mind the Bump, illustrated in Table 6.4. The education and self-monitoring aspects of the intervention may have had persuasive, incentive, and coercive effects on motivation, but this was expected to be subject to individual differences, and the intervention did not involve overt persuasion, Incentivisation or coercion.

Table 6.4 *Mind the Bump's Intervention Functions*

Function	Definition	Mind the Bump's anticipated intervention functions
Education	Increasing knowledge or understanding	Context-specific information: potential consequences of health behaviours; ways to promote exercise, healthy eating, avoiding alcohol and smoking.
Persuasion*	Using communication to induce positive or negative emotions to stimulate behaviour	Information about risks. Self-monitoring.
Incentivisation*	Creating an expectation of reward	Information about risks. Self-monitoring.
Coercion*	Creating an expectation of cost	Information about risks. Self-monitoring.
Training	Imparting skills	Mindfulness training; strategies for behaviour change: goals, intention, planning. Self-monitoring,
Restriction	Using rules to curtail opportunity to engage in target behaviour	N/A

Function	Definition	Mind the Bump's anticipated intervention functions
Environmental restructuring	Changing physical or social contexts	Social opportunity to learn mindfulness
Modelling	Providing an example for people to aspire to or to imitate	Trainer has an established mindfulness practice and follows the programme alongside the participants (apart from pregnancy)
Enablement	Increasing means/reducing barriers to action, beyond education and restructuring e.g. pharmacology, surgery, problem solving	Supporting behaviour change by planning time to do: practice, exercise, healthy eating.

Functions per Michie, Atkins, et al. (2014). * not overt content, N/A not included in the intervention.

6.3.2 Behaviour change policy categories and techniques

Policy categories

The next stage (BCW step six) was to identify the intervention's policy category(ies) proposed by Michie, Atkins, et al. (2014). This was confined to service provision. The remaining categories: guidelines, fiscal measures, regulation, and legislation, were not included in its scope.

Behaviour change techniques

Step seven was to specify the intervention against the behaviour change technique taxonomy BCTT v.1 (Michie et al., 2013) in order to clearly define its ingredients. The mapping is illustrated in Table 6.5. It illustrates that the intervention included many behaviour change techniques, including aspects of goals and planning, feedback and monitoring, social support, shaping knowledge, natural consequences, comparison of behaviour, associations, repetition and substitution, comparison of outcomes, antecedents, identity, and self-belief. It did not include rewards and threat, scheduled consequences, or covert learning. The table identifies each of the behaviour change technique's (BCT) primary target of health behaviour change, and/or establishing a mindfulness practice.

This does not imply that the BCTs that target mindfulness practice had no potential to impact on health behaviours. For example, habit formation (BCT 8.3) might impact on psychological and health behaviour-related self-care; reduce negative emotions (BCT 11.2) and conserving mental resources (BCT 11.3) might impact on reactive health behaviours.

Table 6.5 *Mind the Bump's behaviour change techniques mapped to the Behaviour Change Technique Taxonomy BCTT v.1, primary targets: health behaviour change and establishing a mindfulness practice*

No.	BCT Label	Primary target: health behaviour change	Primary target: mindfulness practice
1	Goals and planning		
1.1	Goal setting (behaviour)	Health behaviour goal setting.	Mindfulness practice goal setting.
1.2	Problem solving	Recognising barriers to achieving lifestyle goals, solving the problem.	Recognising barriers to achieving mindfulness practice goals, solving the problem.
1.3	Goal setting (outcome)	Aspiration to a healthy pregnancy.	Establishing a mindfulness practice.
1.4	Action planning	Planning how to overcome barriers to health behaviour change.	Planning how to overcome barriers to mindfulness practice.
1.5	Review behaviour goals	Not present	
1.6	Discrepancy between behaviour and goals	Not present	

No.	BCT Label	Primary target: health behaviour change	Primary target: mindfulness practice
2	Feedback and monitoring		
2.1	Monitoring of behaviour of others without feedback	Not present	
2.2	Feedback on behaviour		Feedback on mindfulness practice.
2.3	Self-monitoring of behaviour	Daily record of lifestyle and mindfulness practice goal achievement. Weekly self-weighing.	
2.4	Self-monitoring outcomes of behaviour	Self-weighing	Recognising effects of mindfulness practice.
2.5	Monitoring of outcomes of behaviour without feedback	Not present	
2.6	Biofeedback	Not present	
2.7	Feedback on outcomes of behaviour	Not present	

No.	BCT Label	Primary target: health behaviour change	Primary target: mindfulness practice
3	Social support		
3.1	Social support (unspecified)		Group effect: peer support.
3.2	Social support (practical)	Not present	
3.2	Social support (social)	Not present	
4	Shaping knowledge		
4.1	Instruction on how to perform the behaviour		Guidance of formal mindfulness practice, teaching informal practices, response to feedback on problems and experiences.
4.2	Information about antecedents	Explaining mind/body/behaviour environmental/social relationships, noticing factors associated with positive and negative experiences.	Explaining mind/body/behaviour environmental/social relationships, noticing factors associated with positive and negative experiences.
4.3	Re-attribution	Identifying perceived causes of behaviour, adjusting perceptions.	Identifying perceived causes of behaviour, adjusting perceptions.
4.4	Behavioural experiments	Not present	

No.	BCT Label	Primary target: health behaviour change	Primary target: mindfulness practice
5	Natural consequences		
5.1	Information about health consequences	Provide information about potential consequences of: inactivity, poor diet, alcohol and smoking during pregnancy, potential benefits of adhering to guidance.	
5.2	Salience of consequences	Images of babies in the health presentation, emphasising the potential benefits of health behaviour change for maternal and infant outcomes.	
5.3	Information about social and environmental consequences	Not present.	
5.4	Monitoring of emotional consequences		Prompting assessment of emotions after attempts to practice mindfulness meditations, typical emotional states during normal daily life, and any changes in emotional reactivity to normal or unusual challenges.
5.5	Anticipated regret	Information about possible effects of unhealthy lifestyles during pregnancy.	
5.6	Information about emotional consequences	Not present	

No.	BCT Label	Primary target: health behaviour change	Primary target: mindfulness practice
6	Comparison of behaviour		
6.1	Demonstration of behaviour		Mindful meditation, movement, mindful walking, posture.
6.2	Social comparison	Not present	
6.3	Information about others' approval	Not present	
7	Associations		
7.1	Prompts/cues		Suggest environmental cues for 3 stage breathing spaces, such as queues, traffic lights, waiting for kettle to boil. Sticky notes to remind mindfulness of daily activities, such as cleaning teeth, eating mindfully.
7.2	Cue signalling reward	Not present	
7.3	Reduce prompts/cues		Week 7 onwards, participants chose own home practice.
7.4	Remove access to reward	Not present	
7.5	Remove aversive stimulus	Not present	
7.6	Satiation	Not present	

No.	BCT Label	Primary target: health behaviour change	Primary target: mindfulness practice
8	Repetition and substitution		
8.1	Behavioural practice/rehearsal		Taught mindfulness practices in each session, CD for home practice.
8.2	Behaviour substitution	Not present	
8.3	Habit formation	Encourage health behaviour change and formation of new habits over time.	Prompted rehearsal and repetition of mindfulness practice in sessions and at home, so that context cued behaviour. Reduce habitual reactivity and maladaptive coping habits.
8.4	Habit reversal	Not present	
8.5	Overcorrection	Not present	
8.6	Generalisation of target behaviour		Practicing mindfulness whenever the situation cues it, especially three stage breathing space.
8.7	Graded tasks		Increase amount of practice each week

No.	BCT Label	Primary target: health behaviour change	Primary target: mindfulness practice
9	Comparison of outcomes		
9.1	Credible source	Information about potential consequences of health lifestyle from NICE, RCOG, NHS.	MaPP book by Professor Mark Williams. Teacher models mindfulness and adheres to the course.
9.2	Pros and cons	Not present	
9.3	Comparative imagining of future outcomes	Possible, due to information about maternal and infant health behaviour risks.	
10	Reward and threat	Not present	
11	Regulation		
11.1	Pharmacological support	Not present	
11.2	Reduce negative emotions	Not present	Mindfulness practice associated with reduced negative biases and mood, increased awareness of positives.
11.3	Conserving mental resources		Rebalancing depleting and nurturing activities.
11.4	Paradoxical instructions	Not present	

No.	BCT Label	Primary target: health behaviour change	Primary target: mindfulness practice
12	Antecedents		
12.1	Restructuring physical environment	Not present	
12.2	Restructuring the social environment	Possible, group effects, peer support. From other people who are working towards: not drinking, smoking, being active, and/or eating well.	
12.3	Avoidance/reducing cue for the behaviour	Not present	
12.4	Distraction	Not present	
12.5	Adding objects to the environment	Not present	
12.6	Body changes	Effects of pregnancy, but not an intervention technique.	

No.	BCT Label	Primary target: health behaviour change	Primary target: mindfulness practice
13	Identity		
13.1	Identification of self as role model	Teacher models mindfulness and adheres to own health behaviour goals.	Teacher models mindfulness and adheres to the course.
13.2	Framing/reframing		Emphasising mindfulness practices as a way to gain a new perspective and to change cognitions and emotions, with effects on health behaviours.
13.3	Incompatible beliefs	Not present	
13.4	Valued identity	Possibly: self-care focused letter to self and to baby at the end of the 8-week course.	Self-care focused letter to self and to baby at the end of the 8-week course.
13.5	Identity associated with changed behaviour	Not present	
14	Scheduled consequences	Not present	

No.	BCT Label	Primary target: health behaviour change	Primary target: mindfulness practice
15	Self-belief		
15.1	Verbal persuasion about capability		Acknowledging the normal challenges of developing a mindfulness practice, that there is no wrong way of doing practice, that it takes time to train the mind. Share own experience as an example.
15.2	Mental rehearsal of successful performance	Not present	
15.3	Focus on past success	Not present	
15.4	Self-talk	Not present	
16	Covert learning	Not present	

BCTT v1 (Michie et al., 2013). COM-B = capability, opportunity, motivation aspects of behaviour

6.3.3 Mode of delivery

The final step of the BCW is to specify mode of delivery. The course was designed to be delivered face-to-face to groups of pregnant women. The venue would be suitable rooms at Oxford Brookes University. Each session would be taught twice per week (one weekday evening and Saturday morning), and the women could attend either session.

6.3.4 Anticipated impacts of Mind the Bump

The anticipated mechanisms of change for a mindfulness-based maternal health behaviour intervention were proposed in Table 5.2 and 5.3. Table 6.6 illustrates how the various components of Mind the Bump might impact on capability, opportunity, and motivation to change health behaviours and develop a mindfulness practice. There appeared to be potential to increase capability, opportunity, and motivation for maternal health behaviours via health behaviour-focused and mindfulness practice techniques.

Table 6.6 *Anticipated impacts of Mind the Bump on capability, opportunity, and motivation factors in maternal health behaviours (HB) and mindfulness practice (MFN).*

Week	Component	Intervention Function	Impact on		
			Capability	Opportunity	Motivation
0	Knowledge	Education	HB: Understanding the reasons for health behaviour change: knowing about UK maternal health behaviour guidance, and possible consequences of non-adherence. MFN: Understanding the potential benefits of establishing a mindfulness practice.	HB: Knowing about local antenatal exercise classes.	HB: Accurate health behaviour risk appraisal. To engage in self-care by choosing health behaviour change. MFN: To engage in self-care by choosing mindfulness practice.
0	Goal setting	Enablement			HB: Reflective motivation about the potential benefits of health behaviour change. Autonomous SMART goals for health behaviours. MFN: Reflective motivation about the potential benefits of establishing a mindfulness practice. Autonomous SMART goals for mindfulness practice.

Week	Component	Intervention Function	Impact on		
			Capability	Opportunity	Motivation
1 to 8	Mindfulness training	Training	<p>HB: Greater awareness of health behaviours and emotional reactivity.</p> <p>Greater mental ability to notice and tolerate urges to be sedentary, eat unhealthily, to drink alcohol, to smoke.</p> <p>(Potential issue: impact of pregnancy on physical capabilities might have negative effect.)</p>	<p>HB: Making time for self-care: to engage in health-promoting behaviours.</p> <p>Peer support.</p> <p>(Potential issue: tension between making time for one self-care activity and not having time for another.)</p>	<p>HB: Reminders and reflections on reasons for health behaviour goals. Increasingly automatic motivations for positive health behaviours. Awareness of peers' health behaviours.</p> <p>(Potential issue: tension between making time for one self-care activity and not having time for another.)</p>
1 to 8	Mindfulness training	Training	<p>MFN: Developing practical skills to cope with emotional and physical difficulties; potential impact on mental health and wellbeing, and on behaviour-related self-efficacy. Improved mental health, reduced health behaviour and emotional reactivity.</p> <p>Greater mental ability to notice and tolerate urges to avoid mindfulness practice.</p>	<p>MFN: Opportunity to attend the weekly mindfulness sessions, and to access mindfulness practice resources. Peer support. Making time for self-care: to do mindfulness practice.</p> <p>(Potential issue: tension between making time for one self-care activity and not having time for another.)</p>	<p>MFN: Reminders and reflections on reasons for mindfulness practice goals. Increasingly automatic motivations for mindfulness practice. Awareness of peers' mindfulness practice.</p> <p>(Potential issue: tension between making time for one self-care activity and not having time for another.)</p>

Week	Component	Intervention Function	Impact on		
			Capability	Opportunity	Motivation
1 to 8	Mindfulness training	Enablement	<p>HB: Improved physical capability to exercise in sedentary women.</p> <p>(Potential issue: impact of pregnancy on physical capabilities might have negative effect.)</p> <p>MFN: Improved capability to engage in mindfulness practice, with potential to increase trait mindfulness and propensity/skills for state mindfulness.</p>	<p>HB: Planning how to overcome barriers to health behaviour goals.</p> <p>MFN: Planning how to overcome barriers to mindfulness practice goals.</p>	<p>HB: Increased capability and opportunity might impact on reflective and automatic motivations for health behaviours.</p> <p>MFN: Increased capability and opportunity might impact on reflective and automatic motivations for mindfulness practice.</p>
1 to 8	Mindfulness training	Modelling	<p>HB: “Walking the talk” – trainer embodied mindfulness adhered to her own health behaviour goals.</p> <p>MFN: “Walking the talk” – trainer embodied mindfulness, followed the recommendations for home practice.</p>	<p>HB: To discuss barriers and enablers for health behaviours, to share experiences of health behaviours, and pregnancy with other pregnant women.</p> <p>MFN: To discuss barriers and enablers for mindfulness practice, to share experiences of mindfulness with other pregnant women.</p>	<p>HB: Belief in ability to achieve health behaviour goals.</p> <p>MFN: Belief in ability to become more mindful.</p>

Week	Component	Intervention Function	Impact on		
			Capability	Opportunity	Motivation
1 to 16	Self- monitoring	Enablement	<p>HB: Improved health behaviour self-efficacy and self-regulation.</p> <p>Transformation of conscious health behaviour change into healthier automatic habits.</p> <p>MFN: Improved mindfulness and emotional self-efficacy and self-regulation.</p> <p>Establishment of an independent, sustainable mindfulness practice.</p>	<p>HB: Observing and reflecting on self-care through health behaviour goal achievements, and barriers and enablers to this.</p> <p>MFN: Observing and reflecting on self-care through mindfulness practice and emotional self-regulation.</p>	<p>HB: Greater self-determination, self-efficacy, and perceived control of health behaviours.</p> <p>MFN: Greater self-determination, self-efficacy, and perceived control of mindfulness practice and psychological wellbeing.</p>

Functions per Michie, Atkins, et al. (2014).

6.4 Summary

The intervention was developed by integrating appropriate behaviour change techniques with a suitable mindfulness based intervention adapted to the context of pregnant women. This chapter specified the intervention, and identified its functions, behaviour change techniques, and mode of delivery. This was the first step in addressing the question *“Is mindfulness training a feasible behaviour change intervention for pregnant women?”*

A limitation of the development is that neither the choice of mindfulness programme, the intervention content and format, nor the mapping to the BCW were reviewed by an expert. The following chapters describe the feasibility testing stage.

7

Chapter Seven: Feasibility: recruitment, adherence, costs, and safety.

7.1 Introduction

Recent studies indicate that tailored mindfulness-based interventions appear to have some potential to support smoking cessation and weight management, although they are unlikely to have any effect for people who are not motivated to change their lifestyles. Early indications are that problem-focused mindfulness programmes may have some potential to improve antenatal psychological health, particularly in women who at risk of, or are diagnosed with, clinical mental health conditions. The pregnancy evidence base is currently constrained to feasibility studies but, in conjunction with early evidence for the effects of mindfulness training in behaviour change contexts, it led to the proposal that mindfulness training might have some potential to improve maternal health behaviours, perhaps by improving mental health.

This project firstly investigated the extent to which trait mindfulness was related to maternal health behaviours. It also investigated whether trait mindfulness was related to antenatal mental health and motivation, which may be potentially modifiable factors in maternal health behaviours. It found no beneficial relationships between mindfulness and adherence to UK guidance for maternal health behaviours. In fact, it appeared that higher trait mindfulness was slightly associated with increased likelihood of non-adherence. However, there were apparent beneficial relationships between mindfulness, mental wellbeing, and health behaviour motivation.

The previous chapter described the development and structure of the “Mind the Bump”, intervention, which was step four of this project. The following two chapters form step five, which addressed the second primary research question “*Is mindfulness training a feasible behaviour change intervention for pregnant women?*”

NICE (2007) recommend that the evaluation of new behaviour change interventions includes measures of feasibility, acceptability, equity, safety, and effectiveness and, where appropriate, taking a qualitative approach to investigate the experience, meaning, and value of changes. The cohort should be described by socio-economic and cultural variables, including education, income and ethnicity. Indicative outcomes should include standard deviation of the outcome measures in order to inform sample sizes for powered studies. The NIHR (2015) advise that feasibility studies of health interventions report: the success of recruitment, including different recruitment approaches and translation of interest into participation; the response rate to questionnaires used to measure the

feasibility of the intervention at baseline, after the intervention, and at follow-up; and the participants' adherence to the intervention, including attendance and compliance with any recommendations.

These elements are important because they are indicators of whether it is practical to recruit people to take part in a novel behaviour change intervention, and whether or not they can follow its recommendations, as there is no value in an intervention that does not have at least some potential to attract participants and/or for them to comply with the programme. The indicative effects and acceptability illustrate whether the intervention has any potential to be effective, and whether it is a good fit to the population and the problem. The outcomes can highlight problems with the design, implementation and effectiveness of the intervention, and indicate accessibility and acceptability for the target population. This chapter reports the recruitment and adherence aspects of Mind the Bump's feasibility. The indicative effects and acceptability are reported in the subsequent chapter.

7.1.1 Aims and objectives

The aim was to evaluate the feasibility of delivering Mind the Bump, a mindfulness-based behaviour change intervention for pregnant women. The objectives were to report the following feasibility criteria:

1. The effectiveness of different recruitment strategies, according to interest attracted and translation into recruitment.
2. Participants' socio-demographic and pregnancy characteristics and their baseline psychological and health behaviour characteristics.
3. Response and retention at weeks 8 and 16.
4. Adherence to the intervention.
5. Per capita cost of the intervention.
6. Indicative safety of the intervention.

7.2 Methods

This was a single-arm exploratory study conducted with a convenience sample of pregnant women.

7.2.1 Recruitment

The participants were self-selecting volunteers who met the inclusion criteria and did not meet the exclusion criteria in Table 7.1.

Table 7.1 *Inclusion and exclusion criteria*

Category	Criterion	Reason for the criterion
Inclusion	Up to 26 weeks gestation	To evaluate intervention within pregnancy timeframe.
Inclusion	Age 16 years and over	Women could provide their own informed consent.
Inclusion	Not adhering to at least one UK recommendation for maternal lifestyle behaviours	To measure the indicative effects on health behaviours.
Inclusion	Available to attend nine concurrent weekly sessions at Oxford Brookes University (the introduction session plus the eight-week mindfulness course)	To evaluate attendance and attrition.
Exclusion	Current mindfulness practice	To evaluate the feasibility of developing a mindfulness practice.
Exclusion	Diagnosis of current mental illness	The researcher was not clinically trained and the intervention was not designed for a clinical population.
Exclusion	Required significant specialist obstetric care	The intervention was not designed for women with high risk pregnancies.
Exclusion	Taking part in another health behaviour intervention	To avoid confounding effects.
Exclusion	Unable to speak or read English	The course and materials were in English. I had no capacity to provide multi-lingual materials.

7.2.1.1 Sample size

The target sample was 30 pregnant women. This was sufficient to evaluate the feasibility of the intervention, and was consistent with other feasibility studies of mindfulness-based interventions for antenatal mental health (Hall et al., 2015), smoking cessation (de Souza et al., 2015), and weight management (Katterman, Kleinman, Hood, Nackers, & Corsica, 2014).

7.2.1.2 Setting

Anticipated time and expense barriers to pregnant women attending nine weekly sessions at Oxford Brookes University resulted in focusing recruitment approaches on the Oxford region.

7.2.1.3 Recruitment Methods

Recruitment approaches included posters, online, email, and face-to-face, as illustrated in Table 7.2. Recruitment materials are included in Appendix D. Posters were placed on notice boards where pregnant women might see them, including community centres, churches, children's centres, sports centres, shops, Oxford Brookes University and the University of Oxford. An online advertisement was placed on a website commonly used to advertise university research projects in Oxford. It provided a link to the participant information sheet on the Oxford Brookes University maternity projects website, www.oxbump.org. Dedicated Facebook and Twitter accounts were set up for Mind the Bump. Information about the study was placed on the Facebook pages of local pregnancy exercise and interest groups after obtaining permission from their administrators. Email and Facebook generated contact with local antenatal exercise teachers, some of whom then expressed an interest in the study, and offered to disseminate email and paper-based information about it to the women who attended their classes. Two yoga teachers invited me to make a brief presentation to their antenatal groups, and a local sports centre invited me to give information directly to women attending their aqua-natal classes.

Table 7.2 Recruitment methods

Recruitment Method	Forum	Distribution
Poster	Notice boards	100 posters
Online	www.oxbump.org	The site displayed brief details about the study, and the Information Sheet.
	www.dailyinfo.co.uk	A free Oxford-based community news forum
Social Media	Facebook	Mind the Bump page, posts on Mumsnet Oxfordshire, the National Childbirth Trust, Children’s Centres, and pregnancy health and exercise groups.
	Twitter	Mind the Bump account. Tweets sent local news media, “Baby Labs” at Oxford Brookes University and University of Oxford, local pregnancy groups, with requests for retweets.
Email	Oxford Brookes University Research Alert	In-house research project alerts to subscribed staff and students.
	Local pregnancy exercise teachers	Email briefly describing the study, and asking whether teachers would share information with the pregnant women who attended their classes and subscribed to their email news.
Face to face	Pregnancy yoga and aquanatal classes	Brief presentations at pregnancy yoga groups. Flyers to women on their way to aquanatal class.

7.2.1.4 Response to expressions of interest

Pregnant women who contacted me by phone or by email were sent the Participant Information Sheet (PIS) by post or email, according to their preference. Women who expressed an interest in participating after reading the PIS were screened by telephone to assess whether they were eligible in accordance with the criteria in Table 7.1. If the women were not eligible, they were thanked for their interest and sent a thank you letter by post or email. Eligible women were verbally invited to take part in the study and sent a formal invitation letter by post or email. The invited women were asked to provide information about the mornings, afternoons, and evenings on which they could attend a nine week, 1.5 hours per week course at the university. Written consent was attained at week 0. The materials are included in Appendix D.

7.2.3 Data collection

Baseline data were collected at the pre-course introductory session in week 0. Week 8 questionnaires and prepaid envelopes were given or posted to women in week 7, for return at week 8. Week 16 questionnaires and prepaid envelopes were posted to the women in week 16, accompanied by a letter asking for the questionnaire to be returned within two weeks, followed by an email reminder two weeks later. The study process is illustrated in Table 7.3.

Table 7.3 *Mind the Bump processes from recruitment to completion*

Week	Participant activity
< 0	Potential participants contacted researcher. Researcher responded. Information Sheet sent. Interested women made second contact with researcher. Telephone screening identified eligible participants. Eligible women invited to participate.
0	Consent. Emergency contact details. Self-completed questionnaires.
8	Self-completed questionnaires.
16	Self-completed questionnaires.

Data was collected from the first group on 15th October 2013, 15th December 2013, and 3rd February 2014. Data was collected from the second group on 25th January 2014, 29th March 2014, and 19th May 2014.

Feasibility data included objective recruitment, attrition, attendance and responses to questionnaires, and the cost of materials. Self-reported data included socio-demographic and pregnancy characteristics, baseline health behaviour and psychological characteristics, and self-reported adherence to health behaviour goals. The questionnaires are included in Appendix D. The selection of measures was discussed in chapter two (2.1.5).

7.2.4 Participant characteristics

At baseline, women provided information about their parity, gestation, pregnancy recognition, whether pregnancy was planned or assisted with IVF, their age group, employment, family income, education, and ethnicity.

7.2.5 Health behaviours during pregnancy

Baseline health behaviours were measured using reliable and validated self-reported measures of exercise and alcohol that were either specific to pregnancy or had been used in other antenatal studies. Idiosyncratic measures were created for diet and smoking. Unless otherwise stated, these were five point Likert Scale questionnaires. The selection process was discussed in chapter two (2.1.5).

Activity levels

Activity levels were measured using the Pregnancy Physical Activity Questionnaire (PPAQ) (Chasan-Taber et al., 2004). This questionnaire is specific to pregnancy; it assessed the spectrum of daily and weekly activity, including household activities with children and the home, occupational activities, active and sedentary leisure, sports and exercise, walking, and travelling to work and other places. There are 32 questions scored on a six-point scale, from *nil* to *three hours or more* per day/week. It is a valid and reliable measure of sedentary, light, moderate and vigorous activity in pregnant women (Cronbach's alpha = 0.78). Higher scores indicate higher activity levels.

Diet

Women indicated whether they were taking pregnancy-specific multivitamins, Folic Acid, and Vitamin D supplements, the frequency with which they would describe their diet as "healthy and balanced", and the frequency with which their diet conformed to the Eatwell Plate (starchy carbohydrates, "five a day" portions of fruit and vegetables, protein-rich foods, dairy products, and high fat/sugar foods and drinks) on a scale of *every day* to *never*. This study did not have the scope to collect data about calorie intake or dietary composition, and these idiosyncratic questions were created in order to avoid the participant burden of a food frequency questionnaire. The questions were sufficient to identify whether the women were adhering to dietary guidance.

Alcohol consumption

Pre-pregnancy and current alcohol consumption was measured using the three item Alcohol Use Disorders Identification Test Consumption scale (AUDIT-C) (Bradley et al., 2007). This measure, which has been used in other antenatal studies, asks about the frequency and quantity of alcohol consumption.

Smoking

Smoking was measured by asking women to indicate how many cigarettes they smoked each day.

7.2.6 Psychological factors

The rationale for selecting the mindfulness and mental health measures was to evaluate baseline characteristics, and to measure the indicative effect of Mind the Bump on psychological factors that may be related to maternal health behaviours. For consistency, the measures from the cross-sectional survey (chapter three) were included. Four further measures of mental health were selected, three of which were specific to maternal mental health and had been used in other antenatal mindfulness evaluations. Compassion measures were included because compassion may be a mechanism of gains from mindfulness training (van der Velden et al., 2015). The measures were used to evaluate indicative effects of the intervention from baseline (week 0) to week 8 and week 16.

Mindfulness

The Five Facet Mindfulness Questionnaire (Short Form) FFMQ-SF (Bohlmeijer et al., 2011) is a short version of the Five Facet Mindfulness Questionnaire, the FFMQ. The FFMQ was developed from factor analysis of five independently validated mindfulness questionnaires (Baer et al., 2008) and has been used in other antenatal studies. The five domains are: describing, such as “I’m good at finding the word to describe my feelings”; non-reactivity to inner experience, for example “I watch my feelings without getting carried away by them”; non-judging of inner experience, for example “I think some of my emotions are bad or inappropriate and I shouldn’t feel them”; observing, such as “I notice visual elements in art or nature, such as colours, shapes, textures, or patterns of light and shadow”; and acting with awareness, for example “I find it difficult to stay focused on what’s happening in the

present moment”; Higher scores indicate greater levels of mindfulness. The short form was selected in order to reduce participant burden.

Affect

Affect was measured using the Positive and Negative Affect Schedule (PANAS) which evaluates tendency towards positive and negative frames of mind (Watson et al., 1988). It asks how frequently participants experience 10 positive and 10 negative mood states, such as “interested” and “scared”. PANAS has been shown to have moderately good validity, and good test-retest reliability. There are two total scores, one for positive affect and one for negative affect. Higher scores indicate better positive mood and worse negative mood.

Wellbeing

Wellbeing was measured using the Warwick-Edinburgh Mental Well-being Scale (WEMWBS) (Tennant et al., 2007). It asks about the frequency of experiencing 14 positive states, such as “I’ve been feeling optimistic about the future” on a scale from *none of the time* to *all of the time*. WEMWBS has been shown to have good validity, internal consistency, and test-retest reliability with a general population sample (N = 2075). Higher scores indicate better wellbeing and lower distress.

Perceived stress

Stress was measured using the Perceived Stress Scale (PSS) (S. Cohen et al., 1983). It evaluates tendency to view life events over the previous month as stressful and beyond ability to cope using a 10 question scale of items, such as “How often have you been upset because of something that happened unexpectedly?” on a scale from *never* to *very often*. This scale has demonstrated good reliability, validity and sensitivity to change (Hewitt, 1992). Higher scores indicate greater perceived stress. A score of 13 is average, 20 indicates high levels.

The measures additional to the cross-sectional survey were as follows:

General anxiety

The Generalised Anxiety Scale (GAD-7) (Spitzer et al., 2006) measured symptoms of anxiety over the week using seven questions on a four point scale from *not at all* to *nearly every day*. It includes items

such as “I have been anxious or worried for no good reason”, and also asks about thoughts about self-harm: “The thought of harming myself has occurred to me”. GAD-7 is a valid and reliable device for screening generalized anxiety disorder and for assessing its severity (Cronbach’s alpha = 0.89) (Löwe et al., 2008). Scores of 5, 10, and 15 respectively indicate mild, moderate, and severe anxiety.

Antenatal depression

The Edinburgh Postnatal Depression Scale, EPDS (Cox et al., 1987) measured symptoms of ante-natal depression, using 10 questions on a four item scale about how women have felt over the last two weeks. It includes questions about the frequency of feeling guilty, sleep disturbance, low energy, anhedonia, and suicidal ideation. The EPDS is a reliable instrument for screening depression in each of the three trimesters of pregnancy, and it has a high test-retest reliability and validity (Bergink et al., 2011) The reliability values of the EPDS indicated by Cronbach's alpha per trimester are respectively 0.82, 0.83, and 0.84 (Bergink et al., 2011). A score of 10 indicates possible ante-natal depression, 13 and above indicates higher severity (Cox et al., 1987).

Pregnancy-related distress

Tilburg Pregnancy-Related Distress Scale, TPRDS (Pop et al., 2011) evaluated the way women felt about their pregnancy during the last seven days. There are five positively worded and 11 negatively worded four item questions on items such as “The pregnancy has brought my partner and I closer together” and “The delivery is troubling me”. The TPDS has been validated among Dutch pregnant women, and demonstrated good internal consistency overall (Cronbach’s alpha = 0.78). Higher scores indicate higher levels of distress.

Compassion

The Self-Compassion Scale - Short form (SCS-SF) (Raes, Pommier, Neff, & Van Gucht, 2011) measured compassion towards the self with six positively worded questions including “I try to be loving towards myself when I’m feeling emotional pain”, and six negatively worded questions, such as “I’m intolerant and impatient towards those aspects of my personality I don't like”. Higher scores indicated higher self-compassion. The short form was selected in order to reduce participant burden. The Compassion Scale (Pommier, 2010) measured compassion for other people using 12 positively worded questions including “When others feel sadness, I try to comfort them”, and 12 negatively worded questions, such

as “I don’t think much about the concerns of others”. Higher scores indicate higher compassion towards other people.

General female population median scores are 31 for positive affect and 15 for negative affect (Crawford & Henry, 2004). General population median wellbeing score is 51 (Tennant et al., 2007). As above, a stress score of 13 is average and 20 indicates high stress levels (S. Cohen et al., 1983). Antenatal depression scores of 13 or more indicate the likelihood of depressive illness of some severity (Bergink et al., 2011). Anxiety scores of 5, 10, and 15 are the cut off points for mild, moderate, and severe anxiety (Spitzer et al., 2006). A distress score of 17 indicate high distress (Pop et al., 2011).

7.2.7 Adherence to the intervention

The self-reported health behaviour measured adherence to UK guidance for maternal health behaviours. Women self-reported their own adherence to the recommendations for mindfulness practice, the frequency with which they had achieved their lifestyle goals, and the frequency with which they had used the diary at weeks 8 and 16, on a scale of *no days* to *every day*. The feasibility and health questionnaires are included in Appendix D.

7.2.8 Addressing potential biases

In order to reduce the effect of social desirability bias on self-reported adherence, the questionnaires were anonymous. Each woman was given a sealed blank envelope containing an ID number in week 0, and subsequently wrote the number onto each of her questionnaires at week 0, week 8 and week 16. Completed questionnaires were returned in sealed blank envelopes into an unsorted pile at taught sessions, or by post in pre-paid printed envelopes. I reduced my experimenter bias by not reading the questionnaires until after the final questionnaires were received for each of the two groups. Quantitative feedback was gathered from written data rather than by focus group or interviews, which may have reduced response bias.

7.2.9 Analysis

Attendance and self-report adherence data were entered, checked, and analysed in Excel. Less than 50% attendance of the eight-week mindfulness course counted as non-completion; this is typical in antenatal mindfulness-based studies (Dimidjian et al., 2015; Guardino et al., 2014). BMI at conception

was calculated using height and weight data. Leisure time physical activities were classified as low, moderate, and vigorous intensity and time spent in each category were calculated in accordance with PPAQ instructions (Chasan-Taber et al., 2004). Low level exercise was disregarded, and weekly moderate and vigorous leisure time physical activity hours were totalled to give total weekly moderate exercise hours.

Some women who were drinking small amounts had written notes on the pregnancy alcohol scale as it did not allow them to accurately report amounts of less than one unit. Consequently, their pregnancy alcohol consumption was assessed in fractions of units.

Adherence to guidance for maternal leisure time physical activity, alcohol, and smoking was assessed using the recommendations in Table 1.1. Total weekly exercise of less than two hours per week was classified as low; two to less than 3.5 hours per week was classified as moderate, and 3.5 hours or more per week was classified as high. A score of three or more on the pre-pregnancy AUDIT-C identified higher risk (Bradley et al., 2007). Adherence to goals on *most days* or *all days* was classified as regular; lower frequency was classified as irregular. Descriptive summary data was reported.

7.2.10 Ethics and governance

Ethical permission to conduct the research was granted by Oxford Brookes University Ethics Committee (Appendix A). The ethical considerations for the intervention were discussed in chapter two.

7.3 Results

7.3.1 Recruitment

Table 7.4 illustrates the success of the recruitment approaches. Posters, Facebook, and pregnancy exercise classes were the most successful method of generating interest. No expressions of interest were generated by posters displayed in the less affluent areas of Oxford, whereas posters in more affluent and university areas led to expressions of interest. Online adverts and Twitter were the least successful methods. Translation of expressions of interest into recruitment was highest from women who were already engaged in antenatal exercise classes, or were signed up to Facebook pregnancy groups.

Fifty women expressed interest in participating in the study between September 2013 and January 2014. Nine women decided not to proceed after reading the Information Sheet; six were unable to commit the time, one woman miscarried, and two women did not respond to further email correspondence. Six women were not eligible after screening; five were high gestation, and one was under the care of specialist obstetric team due to higher risk pregnancy. Three eligible women withdrew prior to the introductory session; one decided on “hypnobirthing”, two women suffered bereavements. Thirty-two women participated.

Table 7.4 *The effectiveness of different recruitment methods*

Method	Forum	Interest	Translation into	Contribution to
		n (%)	recruitment	recruitment
			n (%)	%
Poster	Noticeboards	26 (52)	13 (50)	41
Online	OxBump	-	-	-
	Daily Info	-	-	-
Social Media	Facebook	9 (18)	7 (78)	22
	Twitter	-	-	-
Email	OBU research group	2 (4)	1 (50)	3
	Antenatal teachers	7 (14)	7 (100)	22
Face-to-face	Antenatal yoga	5 (10)	3 (60)	9
	Aquanatal class	1 (2)	1 (100)	3

7.3.2 Participant characteristics

This section describes the women’s socio-demographic, health behaviour and psychological characteristics at baseline (week 0), and compares them to national norms.

Socio-demographics

Socio-demographic characteristics are illustrated in Table 7.5. The majority of women were in their thirties. All spoke fluent English, and most were UK nationals. The majority were employed full or part-time. All but one of the women were graduates, and more than half had master’s or PhD degrees. The

majority had a family income of £40,000 or more per annum. All were either married to or cohabiting with the father of the baby. Most were in the second trimester, with singleton pregnancies. More than half the women were nulliparous, and most of the pregnancies were planned, naturally conceived and discovered early. Two women were expecting twins, and one of these pregnancies was assisted with IVF. In comparison to national norms, the women were more likely to be well educated, relatively affluent, older first-time mothers who had planned their pregnancies with their husbands or cohabiting partners.

Table 7.5 Participant socio-demographics, N = 32

Characteristic	Group	Baseline n (%)	National norms (%)
Age group	16-25	1 (3)	23
	26-30	7 (22)	28
	31-35	15 (47)	30
	36-40	8 (25)	15
	41 and over	1 (3)	4
Nationality	White British	22 (69)	74
	Asian British	1 (3)	
	White Irish	2 (6)	
	White European	4 (13)	26
	White American	1 (3)	
	White Canadian	1 (3)	
	Chinese	1 (3)	
Native English speaker		27 (84)	N/A
Employment	Full-time	20 (63)	} 66
	Part-time	8 (25)	
	PhD student	2 (6)	
	Full-time mother	2 (6)	
Highest level of education	GCSE's	1 (3)	15
	Bachelor's degree	14 (44)	
	Master's degree	9 (28)	} 37
	Doctorate	8 (25)	
Annual Family Income	£10,000 to <£40,000	13 (41)	60
	£40,000 to <£80,000	14 (43)	30
	£80,000 & over	5 (16)	10
Married to or cohabiting		32 (100)	53

Characteristic	Group	Baseline n (%)	National norms (%)
Trimester	First	2 (6)	}N/A
	Second	23 (72)	
	Third	7 (22)	
Expecting twins		2 (6)	2
Nulliparous		19 (59)	37
Planned pregnancy		28 (88)	83
Natural conception		31 (97)	84

Norms (NHS, 2014; ONS, 2014a, 2014b, 2014c, 2014d, 2015b; Wellings et al., 2013).

Baseline health behaviours

The women's health behaviours at baseline are illustrated in Table 7.6. The majority of women were sufficiently active, had a regularly healthy and balanced diet including five portions of fruit and/or vegetables, were in the normal BMI range at conception, and were not drinking alcohol; no-one was smoking. Adherence to UK guidance was higher than normal (HSCIC, 2012b, 2014c, 2014e; ONS, 2013, 2015a) and in the cross-sectional survey (chapter three) other than alcohol. Inactive, overweight and obese women were noticeably under-represented in comparison to expected numbers (Inactive: Mind the Bump, 16%; population, 50%; cross-sectional survey, 28%; BMI \geq 25: Mind the Bump, 6%; population, 50%; cross-sectional survey: 26%); more women were eating five a day than expected (population, 53%), and more were taking Vitamin D supplements (cross-sectional survey, 69%). Fewer women (37%) were drinking alcohol than is typical (population, 41%; but more than cross-sectional survey, 26%); they reported drinking within the NICE (2008a) recommended maximum of two units twice per week.

Eleven women (34%) were adhering to UK guidance for maternal health behaviours. Sixteen (50%) had one risk (1x exercise, 2x five a day, 1x Vitamin D, 3x BMI, 9x alcohol), three women (10%) had two risks (1x exercise and BMI, 1x BMI and alcohol, 1x exercise and alcohol), and two women (6%) had three risks (1x BMI, exercise, and five a day; 1x exercise, five a day, and alcohol). This means that the prevalence of co-occurring risks was below that found in the cross-sectional survey (chapter four).

Table 7.6 Health behaviours at baseline, N = 32

Behaviour	Guidance	Baseline		National
		n	%	norm %
Exercise	Less than 2 hours moderate intensity per week	5	16	50
	At least 2 hours per week	27	84	50
	Optimal 3.5 hours per week	21	66	19
Diet	Regular healthy, balanced	24	81	-
	Regular five a day	28	88	53
Folic Acid	First trimester	32	100	94
Vitamin D	Daily supplement	31	97	58
BMI	Underweight (<18.5)	2	6	50
	Normal range (18.5 to <25)	25	78	
	Overweight (25 to <30)	2	6	30
	Obese (≥ 30)	3	10	20
Alcohol	Not drinking	20	63	59
	Drinking some alcohol	12	37	41
Smoking	Not smoking	32	100	88

Healthy & balanced was self-defined. Regular = most or all days. Guidance (NHS, 2013a, 2015b, 2015f; NICE, 2008a, 2008b, 2010b, 2010c; RCOG, 2015).

Norms (HSCIC, 2012b, 2014c, 2014e; ONS, 2013, 2015a).

Baseline mental health

Table 7.7 illustrates average mindfulness, positive affect, negative affect, wellbeing, and perceived stress scores at baseline. On average, the women had worse antenatal mental health than those in the cross-sectional survey (chapter three), general population medians, and clinical scores for higher stress and distress. Low mood and perceived stress were highly prevalent, and a number of women scored above the clinical cut-off for antenatal depression, general anxiety, and pregnancy distress.

Table 7.7 Psychological scores at baseline, N = 32

Variable	Mean	Cross-sectional survey mean	Population median/ clinical level scores	Above median or clinical level	
				n	%
Total mindfulness	73.13	82.08			
Non-reactivity	13.69	15.68			
Observing	13.31	13.50			
Awareness	13.81	17.37			
Describing	16.66	18.62			
Non-judging	15.66	16.91			
Positive affect	29.63	31.87	31 *	19	59
Negative affect	21.13	20.13	15 *	24	75
Wellbeing	47.56	48.56	51 *	16	50
Perceived stress	22.06	20.45	20 **	23	72
Antenatal depression	7.84	-	13 **	4	13
General anxiety	5.75	-	10 **	3	9
Pregnancy distress	14.50	-	18 **	9	28
Self-compassion	14.75	-	-	-	-
Social compassion	26.16	-	-	-	-

*Population median. **Indicates clinical level. Cross-sectional survey means from chapter three.

7.3.3 Retention

Response rates

All the 32 women completed baseline measures; 26 (100% of remaining cohort) completed week 8 measures; 22 (85% of 26) completed week 16 measures, 10 of whom had given birth.

Withdrawal rates

Six women (19%) withdrew by week 1 to 3, having attended one or two mindfulness sessions; five withdrew due to lack of time, one withdrew due to family illness. Figure 7.1 summarises participant flow from expression of interest to week 16.

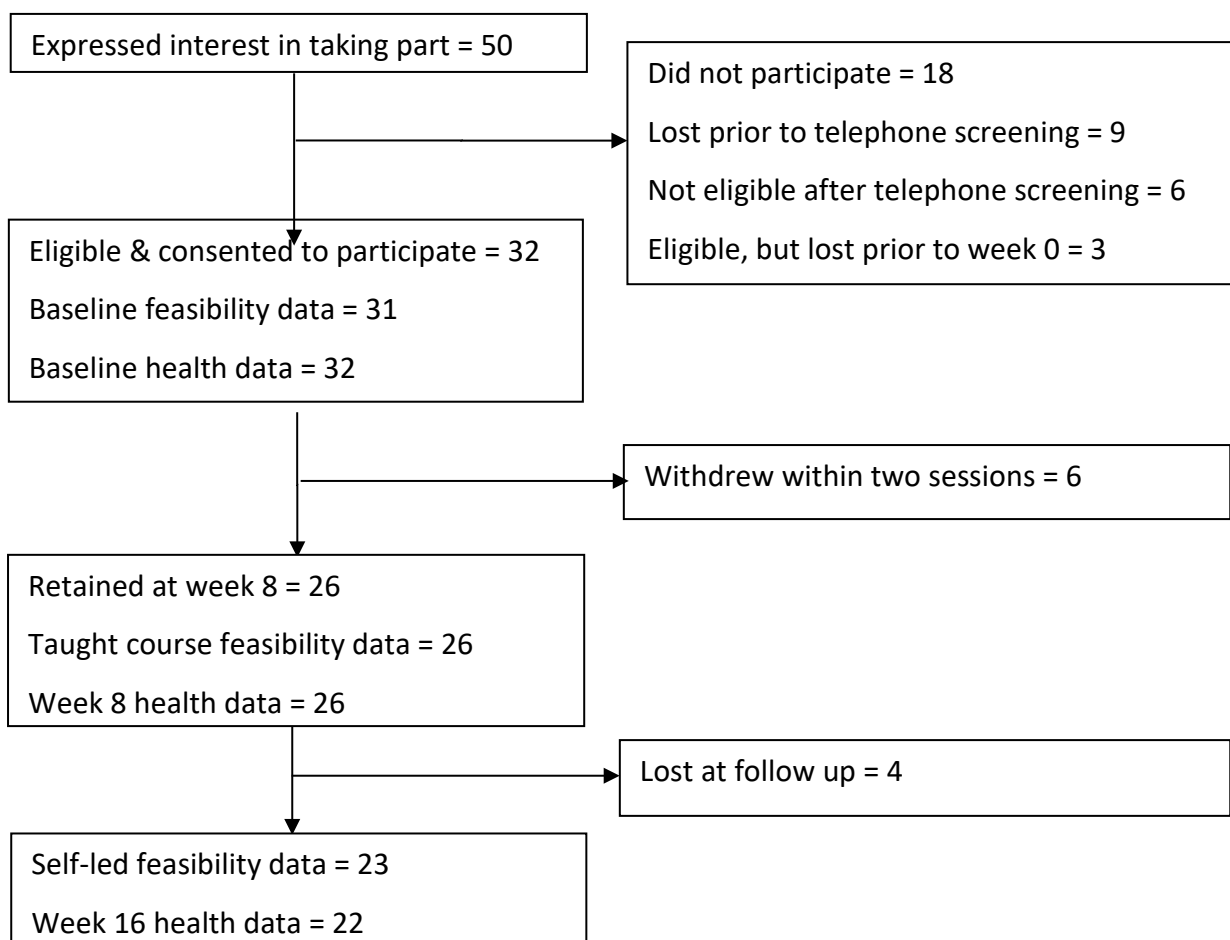


Figure 7.1 Participant flow

Attendance rates

Modal attendance was five sessions (28%). Twenty one women completed the course; five women attended too few sessions to complete. Reasons for non-attendance included attending academic conferences, illness, fatigue, lack of childcare, and social commitments.

The women who withdrew or did not complete did not have noticeably different demographic or baseline physical health characteristics to those who completed the mindfulness course, other than that the three women whose BMI was in the obese category either withdrew or did not complete. Table 7.8 summarises attendance, withdrawal, retention, and completion.

Table 7.8 *Mind the Bump attendance, withdrawal, and completion*

Number of sessions	1	2	3	4	5	6	7	8	Total n	%
Attendees, n	5	3	3	1	9	6	2	3	32	100
Withdrew, n	4	2							6	19
Retained, n	1	1	3	1	9	6	2	3	26	81
Completion, n				1	9	6	2	3	21	66

7.3.4 Adherence to the intervention

Four types of self-rated adherence are reported: adherence to the recommendation to do mindfulness practice on at least five days per week; adherence to UK guidance for health behaviours during pregnancy; the women’s adherence to their goals; adherence to using the diary to self-monitor their goal achievement.

Mindfulness practice recommendation was to 10 to 30 minutes of daily formal mindfulness practice using the CD, daily informal practices from week 1, and three or more daily breathing space practises from week 3. Recommendations for the self-led period were to: maintain 10 to 30 minutes of daily practice, and to use informal and breathing space practices as required, per Table 6.2.

Figure 7.2 illustrates adherence for the taught course period (weeks 1 to 8). Twelve percent of the women adhered to the recommendations for formal practice, 31% to recommendations for informal practice, and 9% to recommendations for breathing spaces during the weeks 1 to 8. The majority

practiced each type of mindfulness exercise at least three times per week (formal: 70%, informal: 69%, breathing spaces: 39%). One woman did no formal practice, and 30% did no breathing spaces.

Figure 7.3 illustrates adherence in the self-led period (weeks 9 to 16). Formal practice reduced considerably from the taught period (nil: 35% once or twice per week: 48%, three or four times per week: 17%). Informal practice reduced (nil: 14%, once or twice per week: 43%, three or more times per week: 43%). Breathing spaces were practiced more frequently: a third of the women practiced at least five times each week and a further half practiced at least once a week, although 19% did not engage in this practice. This means that adherence to the home mindfulness practice element of the intervention was low to moderate during the taught course, and reduced in the self-led period. Preference switched from formal practice in the taught period to the breathing space practice in the self-led period.

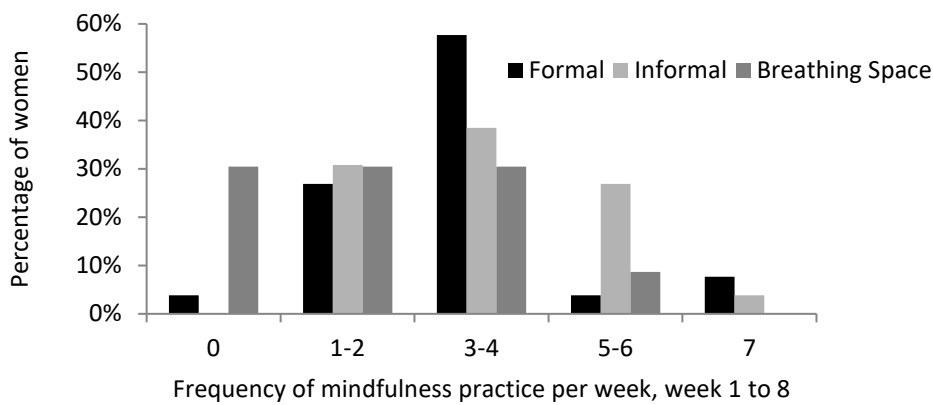


Figure 7.2 Practice frequencies during the taught course

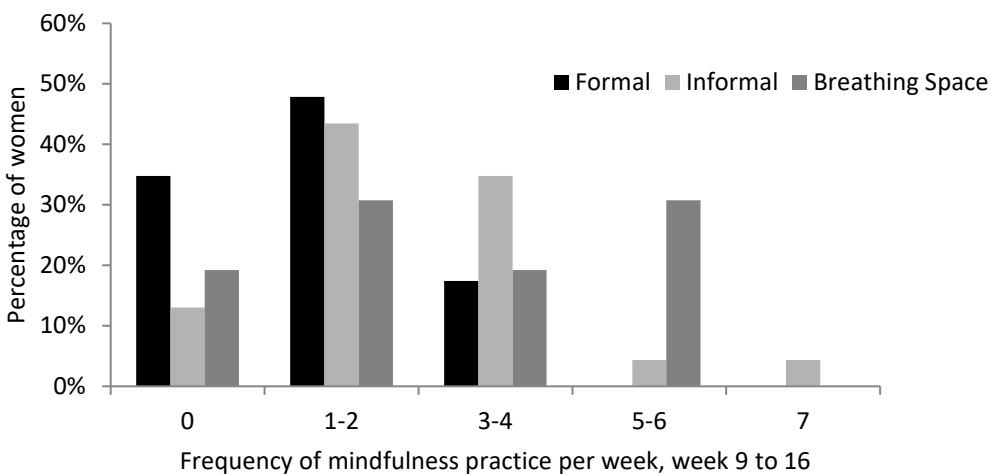


Figure 7.3 Practice frequencies during the self-led period

This section describes the prevalence of adherence to guidance for UK maternal health behaviour guidance. Table 7.9 illustrates adherence. The majority of women adhered to exercise guidance at baseline, but an increasing proportion became less active than recommended (week 0: 16%, week 8: 35%, week 16: 41%). A caveat is that nine women (28%) reported Pelvic Girdle Pain at baseline, and this condition can limit mobility and ability to exercise.

The majority adhered to guidance to take Folic Acid prior to pregnancy. All were taking it at baseline, and intake dropped a little at weeks 8 and 16. This is within guidance as Folic Acid is recommended pre-pregnancy and in the first trimester. One to two women were not taking Vitamin D at each time point. The majority of the women described their diet as regularly healthy and balanced at baseline and week 8, and this improved at week 16. The proportion regularly consuming five a day reduced from baseline to week 8 and to week 16. (Whilst conception BMI is not a pregnancy health behaviour, 84% of the women were within normal range BMI at conception.)

More than half the women adhered to guidance to not drink, but abstinence reduced slightly from baseline to week 8 and to week 16. All the women who drank at baseline and week 8 reported that they drank less than two units twice per week, and one woman exceeded two units twice a week at week 16. All the women complied with guidance to not smoke during pregnancy. One smoked prior to becoming pregnant, and reported abstinence throughout.

Other than for drinking, adherence to guidance was higher than UK norms throughout the intervention (HSCIC, 2012b, 2014c, 2014e; ONS, 2013, 2015a).

Table 7.9 Adherence to maternal health behaviour guidance at: baseline, N = 32; week 8, n = 26; week 16, n = 22

Behaviour	Guidance	Adherence			
		Baseline n (%)	Week 8 n (%)	Week 16 n (%)	National norm, %
Exercise	At least 2 hours of moderate intensity per week	27 (84)	17 (65)	13 (59)	50
	Optimal 3.5 hours per week	21 (66)	13 (50)	10 (45)	19
Diet	Regular healthy, balanced	24 (81)	21 (81)	19 (86)	-
	Regular five a day	28 (88)	21 (81)	17 (77)	53
Folic Acid	First trimester	32 (100)			94
Vitamin D	Daily supplement	31 (97)	23 (88)	18 (81)	42
BMI	Normal range at baseline	27 (84)			48
Alcohol	Abstain	20 (63)	20 (63)	11 (55)	72
If choose	No more than 1- 2 units once or twice a week	12 (37)	10 (39)	9 (45)	28
Smoking	Abstain	32 (100)	26 (100)	22 (100)	88

Healthy & balanced was self-defined. Regular = most or all days. Norms (HSCIC, 2012b, 2014c, 2014e; ONS, 2013, 2015a).

Table 7.10 illustrates women’s self-reported adherence to their own health behaviour goals. At least half the women adhered to their own goals during the taught course, but there was some change in achievability in the self-led period. There were distinct differences in the patterns of adherence to exercise goals in comparison to adherence to diet and alcohol goals. It appears that exercise goals became less achievable, that diet goals were consistently achievable, and that alcohol goals became more achievable. One woman smoked prior to pregnancy; she adhered to her goals to not smoke throughout.

Table 7.10 Adherence to goals at: week 8, n = 26; and week 16, n = 23

Goal achievement	Week 8			Week 16		
	Regular n (%)	Irregular n (%)	N/A n (%)	Regular n (%)	Irregular n (%)	N/A n (%)
Exercise	13 (50)	11 (42)	2 (8)	5 (23)	14 (64)	4 (18)
Diet	14 (54)	11 (42)	1 (4)	13 (59)	8 (36)	2 (9)
Alcohol	14 (54)	6 (23)	6 (23)	14 (64)	4 (18)	5 (23)

Regular: Exercise and diet = most or all days; alcohol: all days. N/A: some women could not exercise due to pain, some did not record diet goals, some were teetotal and did not record alcohol goals.

Women were recommended to use the diary to self-monitor their goal achievement. Eight percent (n = 2) used the diary on most days, 69% (n = 18) used it occasionally, and 19% (n = 5) did not use it all. This reduced during the self-led period to 39% (n = 9) who used it occasionally, and 61% (n = 13) who did not use it. This means that adherence to the self-monitoring recommendation was low.

7.3.5 Costs

Rooms were provided free of charge by Oxford Brookes University. There were no rewards for completion, or financial or other incentives for participation, and travel costs were not reimbursed. Each participant was provided with a copy of a book, “Mindfulness: A Practical Guide to Finding Peace in a Frantic World” by Mark Williams and Danny Penman at a cost of £8.11 per copy, totalling £259.52. The cost of food and drink was £100.

The cost of my training to teach mindfulness was approximately £4,000 over three years. The time taken to develop the intervention and to deliver it were funded by an Oxford Brookes University PhD

award. It occurred over approximate 12-month period, at an estimated cost of £7,000. On-going costs to maintain training competency would include time and financial implications of continuing to adhere to good practice guidance.

Including these expenses increased the cost considerably, illustrated in Table 6.11, which shows the per estimated per capita cost for the total cohort, for the retained women, and for the women who completed. The per capita cost of the various considerations ranged from £11 (all participants, material costs only) to £516 (completers, all costs considered).

Table 7.11 *Estimated per capita costs*

	Estimated cost	Group, N =32	Retained, n = 26	Completed, n = 22
Materials	£360	£11	£14	£16
Training	£4000	£125	£154	£182
Development	£7000	£219	£270	£318
Total	£11360	£355	£437	£516

7.3.6 Indicative safety of the intervention

No intervention-related incidents were reported during the mindfulness course or self-led period. Two women’s pregnancies became higher risk during the mindfulness course. This was reported to the research supervisor, and the women selected to continue their participation in the study.

7.4 Discussion

It was feasible to deliver the Mind the Bump intervention to pregnant women. Recruitment was feasible, although it attracted a non-representative sample of women who were older, more affluent, and more educated than norms. At baseline, the women were more adherent to maternal health behaviour guidance than is normal, other than self-report of alcohol during pregnancy, but they appeared to be more stressed than may be typical during pregnancy. Adherence to the intervention was generally low, which suggests design and/or implementation failures, and/or the need for adjustments to the intervention. It was low risk, but the costs per person were considerable when development costs were included. I will the address the objective and self-reported feasibility objectives and consider their implications, before drawing conclusions.

7.4.1 Recruitment

Recruitment occurred over six months into two sequential groups. Posters were the most effective way of generating interest, with the caveat that posters in less affluent parts of Oxford were unsuccessful whereas those in more affluent areas and university areas generated interest. Direct and indirect approaches to women already engaged in antenatal exercise or interest groups generated the best translation into recruitment. It may be that these women's interest arose because they had already actualised their intention to focus on their health and wellbeing during their pregnancy, and that the mindfulness aspect of the intervention was a good fit with the ethos of antenatal yoga and aquanatal classes. Face-to-face contact allowed women to ask questions about the study, and perhaps to judge the credibility of the researcher. Facebook reached women from further afield and who would not have seen posters, but Twitter was not effective, which suggests that this is not a media where women look for information about pregnancy research studies, and/or that the strategy was incorrect.

It was apparent that there were different ways to engage pregnant women's interest, but that personalised and targeted approaches were more successful than general advertising. The effectiveness of the various approaches was similar to those reported by Woolhouse et al. (2014) in their antenatal mindfulness study. They accrued very little recruitment from posting brochures about the study to the home addresses of eligible women, whereas face-to-face recruitment at antenatal clinics was highly successful. The current study did not have NHS ethical approval, and it was therefore not possible to recruit via midwives, or to approach women at antenatal clinics.

A number of women who expressed interest were put off by the time commitment described in the Participant Information Sheet. It is understandable that the time commitment was judged by some women to be too high, but mindfulness courses typically run over eight weeks, and it was appropriate to evaluate a standard length course in this study. Whether shorter interventions are easier to recruit into is not clear, as Woolhouse et al. (2014) also reported recruitment problems for their six-week antenatal mindfulness intervention.

A number of eligible women withdrew prior to week 0, either because they changed their mind in the time it took to recruit sufficient women for each cohort, or because of personal challenges. Delays between earliest recruitment and the introduction session were overcome by Guardino et al. (2014) by recruiting pregnant women into a rolling mindfulness programme which was also open to the general public, but this approach was not available in the current study.

7.4.2 Participants

The women who took part in the intervention were more likely to be first time mothers, in their thirties, and in employment than norms for pregnancy. Although I attempted to recruit women from diverse socio-economic backgrounds, most were relatively affluent and all but one were graduates. Seven women either had or were studying for a PhD, two were clinical psychologist, nine had a master's degree, and 14 had a bachelor's degree. They were perhaps more aware of the value of research and more willing to take part in it. All the women were in stable cohabiting relationships with the father of the baby. This means that the group was not representative of pregnant women. It suggests that the intervention appealed more to older, higher income, highly educated women in stable relationships who do not have childcare responsibilities. This might portray the profile of women who are willing to take part in university research and/or a mindfulness-based intervention which focuses on health behaviours during pregnancy.

Although Mind the Bump did not have the same antenatal stress/distress focus as other piloted mindfulness programmes, the literature confirms the impression that this type of intervention appeals to relatively affluent, married or cohabiting graduates (Byrne et al., 2014; Dimidjian et al., 2015; Vieten & Astin, 2008; Woolhouse et al., 2014). The exception was Zhang and Emory (2015) who purposefully recruited urban, low income, African-American women, of whom almost half were either single or not cohabiting, and 85% were unemployed. This sub-sample focus was not appropriate to the current feasibility study and, although initial poster-based recruitment focused on more deprived parts of Oxford, it was not possible to recruit women from these areas.

I was able to recruit women who were less active than advised, were overweight or obese at conception, did not adhere to five a day recommendations, and were drinking alcohol, but I was not able to recruit women who were drinking at high levels or smoking. Although the intention was to recruit women who were not adhering to maternal health behaviour guidance, 11 women were adhering to guidance for exercise, diet, alcohol and smoking at baseline, and there was low prevalence of co-occurring risks. The three obese participants either withdrew or did not complete the course, which means that the intervention had low acceptability for this higher risk group. This problem may be overcome by offering mindfulness groups for obese women, as scoped by Thomas et al.(2014), but Mind the Bump was designed as a universal intervention. The study attracted a relatively high number of women who were suffering from pelvic girdle pain, which can inhibit exercise and limiting any

potential of the intervention to improve activity levels. These women were perhaps interested in taking part because they were aware that mindfulness can alleviate pain-related stress (Grossman, Niemann, Schmidt, & Walach, 2004).

Despite efforts to screen out clinically-diagnosable women by telephone, a number of women self-reported high levels of stress, anxiety, pregnancy-specific distress, and depression. This suggests that women may have been interested in the study because they were aware of their low mood and had heard that mindfulness training can be helpful in this context. Woolhouse et al.'s (2014) open recruitment, universal antenatal mindfulness study also attracted a higher than typical proportion of pregnant women who scored above clinical cut-off for depression and anxiety.

Notwithstanding, that 13% of the women indicated for antenatal depression at baseline is cause for concern because they were neither diagnosed nor receiving medical support. As a non-clinician, I should not have been teaching mindfulness to women with antenatal depression. The problem could be overcome by women completing depression measures during the initial screening process, and/or by asking a member of a research team to check the questionnaires for clinical scores. However, Vieten and Astin (2008) commented that women in their Mindful Motherhood study were more likely to mention stress and mood issues than depression and anxiety, despite scoring above cut-off on anxiety and depression measures. They speculated that this may be due to perceived stigma, and advised researchers to use benign terms such as stress and mood in recruitment and screening.

Overall, the Mind the Bump group were not representative in terms of their health behaviours, socio-demographics, or mental health characteristics. Investigating the “goodness of fit” of antenatal mindfulness to socio-demographic, psychological and personality characteristics could support appropriate implementation.

7.4.3 Response and retention

The response rate was high: 100% at week 8 and 84% at week 16 was no worse than 72% in Woolhouse et al. (2014) and 84% in Guardino et al.'s (2014) antenatal mindfulness studies. The loss of data at week 16 was confined to four women who were still pregnant.

The 19% withdrawal rate was consistent with 12% to 23% withdrawal in non-clinical antenatal mindfulness studies (Duncan & Bardacke, 2010; Woolhouse et al., 2014), 18% withdrawal in a mindfulness for smoking cessation study (Brewer et al., 2011), and 16% average attrition in

randomised controlled clinical mindfulness (RCT) trials (Khoury et al., 2013). Dobkin, Irving and Amar (2012b) found that people who drop out of mindfulness courses tend to do so early, and that being unable to meet the time commitment is a common reason for withdrawal, meaning that this study's withdrawal pattern was consistent with other mindfulness studies.

Although only three women attended all eight classes, the completion rate of 85% was comparable to the 86% to 88% completion rate in the antenatal Mindful Awareness Practices, CALM Pregnancy, and MBCT-PD studies (Dimidjian et al., 2015; Goodman et al., 2014; Guardino et al., 2014). Running each session twice each week improved accessibility and attendance, but this is unlikely to be feasible in a larger evaluation or roll-out. Women who did not attend had the opportunity to keep up by reading the emailed weekly handout, which contained home practice recommendations, and the diary. However, the diary had only moderate initial credibility and was not much used, and it may be that I inadvertently negated its utility by providing weekly handouts.

7.4.4 Adherence

Four types of self-rated adherence were reported, beginning with adherence to the recommendation to do mindfulness practice on at least five days per week, followed by adherence to UK guidance for health behaviours during pregnancy, the women's adherence to their goals, and their adherence to using the diary to self-monitor their goal achievement.

Adherence to home practice recommendations is regarded as the elusive "Holy Grail" of mindfulness based interventions, but there is a lack of consensus on dose effects and adherence to recommendations (C. Crane et al., 2014; J. M. G. Williams et al., 2014), and data may be distorted by retrospective self-report. However, all the women did some practice during the mindfulness course, so this aspect was at least minimally adhered to. No women practiced mindfulness at recommended levels, suggesting that this was too onerous, but nearly all the women used all or some parts of the portfolio of formal, informal, and breathing space practices during the taught course. Most practiced on at least three to four days each week, which is comparable to the mean 3.75 days per week, 10 minutes per day in the antenatal Mindful Awareness Practices study (Guardino et al., 2014). Other studies with longer practices reported 4.16 days per week (Goodman et al., 2014), and 3.60 days per week (Byrne et al., 2014), so it appears that three to four days is the typical frequency, irrespective of practice length. The breathing space practice was used less frequently than Goodman et al.'s (2014)

average of 12 times per week, which suggests that I did not implement this element of the intervention well, and/or that the women did not find it useful.

Practice rates reduced during the self-led period. This suggests that contact with the teacher was important in maintaining motivation and opportunity, and that perhaps the course was too short. However, this pattern reflected the common tendency of practice to diminish after the course is complete, and it may be associated with whether or not participants believe that the practices are a plausible way of maintaining mental health (C. Crane et al., 2014).

There was a switch from longer to shorter practices during the self-led period. Longer-term evaluation did not occur in the current study, and this could be assessed in future studies. The women were provided with information about public mindfulness practice sessions at Oxford Mindfulness Centre, but this was not taken up. This is understandable, given that 10 women had given birth at week 16.

Adherence to guidance for maternal health behaviours was high throughout the intervention. This was not surprising as it was apparent that the women who volunteered to take part in this study had generally healthy lifestyles, and 11 women were adhering to recommendations at baseline, meaning that there was little potential to improve their adherence to maternal health behaviour guidance. Overall, the women were more active than pregnant population norms, and moderate activity levels remained fairly consistent throughout the intervention. This differs to the general trend for exercise levels to diminish during pregnancy (Gaston & Cramp, 2011), and might suggest that Mind the Bump had a protective effect.

The majority of women were adhering to guidance to take vitamin supplements, eat well, and consume sufficient fruit and vegetables when they started the mindfulness course. Diet quality deteriorated slightly during the intervention, and this differs from the tendency for dietary balance to be maintained during pregnancy (Abreu et al., 2014; Crozier et al., 2009), although the high levels of healthy diet and five a day at baseline and throughout the intervention reflected the typically healthy diets of higher socio-economic status women (Darmon & Drewnowski, 2008).

It was notable that most women who did not adhere to guidance to avoid alcohol at baseline continued to drink small amounts throughout. Although there was some fluctuation the amount each woman was drinking, this may have been due to variations in the accuracy of self-reporting, and we can expect under-report of drinking during pregnancy (Lange et al., 2014). It was notable that the 37%

baseline prevalence of drinking was closer to the retrospective HSCIC (2012b) 41% figure rather than the “during the last week” ONS (2015a) 28% figure. This reflected the goodness of fit of the participants to the affluent, educated, older professional socio-demographic characteristics of women who are more likely to drink at low levels during pregnancy (Chappell et al., 2013; HSCIC, 2012b; O’Keeffe et al., 2015). The single former smoker had adhered to guidance to quit, and did not report smoking during the intervention. The low prevalence of pre-pregnancy smoking reflected the affluent and educated status of this group (HSCIC, 2014b).

Whilst the majority of women adhered to their own exercise goals, this became less achievable as pregnancy progressed. Adherence to diet goals was more consistent across time, and it seems reasonable to suggest that diet is less subject to the effects of progressing pregnancy than exercise. Most women adhered to their alcohol goals, but some did not. This suggests that I did not make the alcohol information salient to the women, and/or that there were challenges in avoiding alcohol.

The literature on antenatal alcohol interventions draws contradictory conclusions. For example Crawford-Williams et al. (2014) found that educational antenatal alcohol interventions do not significantly reduce consumption even though they improve knowledge, whereas Nilsen (2009) reported that brief interventions can be effective. Mind the Bump was not a brief intervention, and its alcohol message was probably obscured by the focus on mindfulness.

Low adherence to the recommendation to use the diary for self-monitoring might suggest that I did not make this aspect of the intervention salient, that the diary was poorly designed, or that the weekly handouts negated the diary’s utility. It might have been that health behaviour change was not a priority for the participants, or that the impact of pregnancy and daily commitments on ability to fulfil intentions led to disengagement with self-monitoring.

7.4.4.1 Considering the suitability of a paper-based diary

The use of a paper diary was a pragmatic choice in the intervention as costs were confined to design time and printing costs. Alternatives might include a smartphone application, or asking participants to complete an online record. A systematic review of the self-monitoring in weight loss programmes literature from 1989 to 2009 indicated that adherence to and acceptability of personal digital assistants (PDAs) for recording diet and exercise appeared to be higher than for paper diaries (Burke et

al., 2011). PDAs have now been largely replaced by smartphone apps and activity monitors, but the review illustrates that self-monitoring using paper diaries may be increasingly redundant.

This suggestion was supported by Carter, Burley, Nykjaer, and Cade's (2013) pilot RCT with 128 overweight British adults which evaluated adherence to self-monitoring using: a novel smartphone app; an existing web-based weight loss website; and an existing paper food diary plus calorie-counting book. Adherence and retention at six months were highest in the app arm, and lowest in the diary arm. The app was more acceptable than the diary, although weight change over six months was not significantly different between the app and diary groups (Carter et al., 2013). App-based self-monitoring was not considered in the present study, but it indicated that lower adherence to paper diary-based methods in the general population might also be apparent in pregnant women.

The other self-monitoring aspect of the intervention (self-weighing at each taught mindfulness session (weeks 1 to 8) had moderate to high adherence. GWG and acceptability are reported in the following chapter. There were no written indications that this aspect was unacceptable, which reflects Zheng et al.'s (2015) systematic review finding that regular self-weighing is an acceptable and effective technique in weight management interventions.

A consideration is that the apparent acceptability of self-monitoring and self-weighing in the general population might not generalise to pregnancy. The inevitability of weight gain, and perhaps changes in physical capability to engage in "healthy" behaviours, might mean that self-monitoring the achievement of health behaviour goals is not particularly suitable for pregnant women.

7.4.5 Costs

The costs of delivering the intervention were low because there were no venue costs, the book and CD were inexpensive, and participants' travel costs were not reimbursed. The costs of development and training to deliver mindfulness-based interventions increased the per capita cost considerably. Other antenatal mindfulness studies have not reported costs, other than Woolhouse et al.(2014), who reported the costs of advertising. Per capita development and training costs would potentially reduce over time if the intervention was delivered to more women. However, there would be considerable costs to train health-care professionals to deliver the intervention if they were not already trained to teach MBIs.

7.4.6 Health and safety

No harms were reported, which indicated that the intervention appeared to be safe.

7.5 Conclusions

This chapter addressed the recruitment, adherence, costs and safety aspects of the question “*Is mindfulness training a feasible behaviour change intervention for pregnant women?*” Overall, the objective measures of recruitment, retention, attendance, and potentially reducing per capita costs indicate that this was a feasible intervention. Without a control group, it is not possible to say whether Mind the Bump supported the maintenance of higher than typical adherence to UK health behaviour guidance during pregnancy, but the indications are that it did no harm. The taught mindfulness course and goal setting elements of Mind the Bump were feasible, but self-monitoring was not well implemented, and mindfulness practice was not maintained in the self-led period.

It may have been that motivation to participate was more generated by the opportunity to learn mindfulness rather than by motivation to change health behaviours. Perhaps the burden of participating in the research was offset by the free mindfulness course, and it is not possible to make any assertion as to whether this intervention has potential to appeal to women who are not familiar with the concept of mindfulness. However, it may be possible to work with participant panels and user groups to optimise the intervention content and overcome these problems.

The participants’ socio-demographic characteristics and health lifestyles suggest that they were a distinct subsample of the typical UK pregnant population. No interest was generated from women who potentially had most to gain from reducing or quitting drinking or smoking, and/or considerably improving their exercise and diet patterns, and women in the obese BMI category withdrew or did not complete. This indicates that the intervention is may be feasible for women with the same characteristics as the women who completed the intervention, but no such assertion can be made for different groups.

There appear to be substantial barriers to recruiting and/or maintaining the engagement of women who are most at risk of the potential consequences of adverse antenatal health lifestyle. Whilst these women are perhaps seen by researchers as being the most in need of support to change their lifestyle, their own perceptions may be substantially different and, although it would be useful to investigate this further, it may be difficult to engage the target population. The following chapter concludes the

second study by describing the indicative effects of the intervention, and acceptability. It discusses the limitations of the study, before drawing conclusions about its feasibility.

8

Chapter Eight: Feasibility: indicative effects and acceptability.

8.1 Introduction

The aim of the second study in this PhD was to develop and evaluate the feasibility of a mindfulness-based maternal behaviour change intervention called Mind the Bump. The feasibility of the intervention is described within the frameworks recommended by the Medical Research Council (MRC), the National Institute for Health and Care Excellence (NICE), and the National Institute for Health Research (NIHR). Chapter seven reported the feasibility of recruitment, adherence, costs, and safety.

This chapter fulfils the NICE (2007) and NIHR (2015) recommendations to report the indicative effects of the intervention and its acceptability, including the women's feedback on their experiences. This aspect was important because it provided an indication of whether or not the intervention had any potential to fulfil its aim of improving women's health behaviours during pregnancy. It provided some insight into what the women thought of Mind the Bump and which, if any, factors helped and hindered them in achieving their health behaviour goals and the mindfulness practice recommendations. The results from chapters seven and eight are compared to the Behaviour Change Wheel's affordability, practicality, effectiveness, acceptability, safety, and equity (APEASE) criteria for implementation (Michie et al., 2014).

I discuss the acceptability and indicative effects findings, the extent to which they reflect existing research, and whether the anticipated mechanisms of behaviour change identified in the logic model were realised. I discuss the limitations of this study before drawing conclusions about the feasibility of the intervention.

8.1.1 Aims and objectives

The objectives were to report the:

1. The indicative effects of Mind the Bump: health behaviours, mindfulness, and mental health at week 8 and week 16, to identify the immediate effects of the intervention, and whether any gains were sustained or increased in the post-course self-led period.
2. The acceptability of Mind the Bump: its usefulness, interest, and enjoyment, and the women's experiences of taking part, including their suggestions for changes.

8.2 Methods

The methods and measures were described in chapter six. This chapter focuses on self-reported outcome measures, acceptability, and qualitative feedback.

8.2.1 Gestational weight gain

Weight was self-recorded at each session using the same weighing scale.

8.2.2 Acceptability

Women rated the intervention's usefulness, interest, and enjoyment of the intervention, and how specific, measurable, achievable, realistic, and time-framed (SMART) their goals were on scales from *not at all* to *very* at baseline, week 8 and at week 16. The questionnaires are included in Appendix D.

8.2.3 Qualitative feedback

Women had the opportunity to use text boxes to give written responses to open questions about their experience and opinion of the intervention, and to make suggestions for changes to it.

8.2.4 Addressing potential biases in data collection

Attempts to minimise respondent bias in the women's written feedback included using open questions asking about: negative and positive aspects of the intervention, what helped and hindered goal achievement and mindfulness practice, suggestions for changes. The data was anonymous in order to reduce social desirability bias. I reduced my experimenter bias by not reading each group's feedback until after their week 16 questionnaires were received. All data was collected using questionnaires in order to avoid the higher likelihood of respondent bias in interviews.

8.2.5 Analysis

Data were checked and cleaned in Excel. The data was analysed using a combination of descriptive and inferential statistics in SPSS 22. Chapter six describes how exercise time and alcohol units were calculated from the PPAQ (Chasan-Taber et al., 2004) and AUDIT-C (Bradley et al., 2007). The mean and standard deviation of exercise hours and units of alcohol per week were calculated at baseline, week 8, and week 16. (Neither diet nor smoking data could be described in this way.) Self-rated *mostly*

and *very* achievable goals were classified as higher achievability; *not at all*, *rarely*, and *sometimes* achievable goals were classified as lower achievability. Achieving goals *most of the time* and *all of time* was classified as regular; lower frequency (*none of the time*, *rarely*, and *sometimes*) was classified as irregular. Descriptive summary data was reported.

Minutes of exercise and units of alcohol were treated as ratio data. Mindfulness and mental health scores were treated as continuous. Wilcoxon signed rank analysis was conducted on baseline to week 8 data from the women who were retained at week 8 (n = 26). Friedman repeated measures one-way analysis was conducted on baseline to week 16 data for the women who were retained at week 16 (n = 22). Post-hoc Wilcoxon signed rank analysis was conducted on significant Friedman tests. The baseline to week 8 tests indicated immediate changes during the mindfulness course. The baseline to week 16 tests indicated cumulative changes from baseline, and the post-hoc tests showed whether these changes occurred during the mindfulness course and/or the self-led period.

Effect sizes were calculated using the formula $r = (Z)/\sqrt{N}$ and categorised as $<.1$ = trivial; $.1$ to $.3$ = small; $.4$ to $.5$ = moderate; $>.5$ = large (J. Cohen, 1988). Significance was set at $p < .05$. Although multiples tests were performed, it was decided not to divide the alpha value by the number of comparisons because this was an exploratory feasibility study.

The written feedback data was transcribed into Word. Common themes were identified using Braun and Clarke's (2006) Thematic Analysis framework. This method was appropriate because it can be used to identify themes from the data without any preconceived ideas about what they will be, and allows for the iterative derivation of initial codes, sub-themes and themes directly from the data. Following Braun and Clarke's (2006) instructions, initial ideas for codes were noted whilst reading through the data, after which systematic coding occurred across the whole data set.

Initial coding was conducted using pen and paper; it involved splitting each person's feedback into blocks of text that referred to a specific aspect of their experience, and giving each block a provisional code. The coding process was repeated several times until blocks which consistently referred to the same aspect of experience had the same code. The generated codes were grouped into potential sub-themes, and a map of the dataset was produced by recording each subtheme against each text block in an Excel spreadsheet. Each sub-theme and theme was iteratively refined, and clear names were created. The rootedness of the sub-themes and themes in the data was validated by checking the internal homogeneity of the blocks of text in each of the final 14 sub-themes. Two over-arching

themes were established. To ensure anonymity, participant id numbers were changed to letters of the alphabet. Text extracts that illustrated each theme were then selected. An example of coding is included in Appendix D.

8.3 Results

8.3.1 Health behaviours

At baseline, the women were engaging in an average of four hours 26 minutes per week (SD = 2.72) of moderate exercise. This increased by 29 minutes to an average of four hours 55 minutes (SD = 3.70) at week 8. At week 16, average moderate exercise reduced by 10 minutes to four hours 45 minutes (SD = 3.16), which was above baseline. The range of moderate exercise hours was between 0.5 and 10 hours per week at baseline, between nil and 13.5 hours at week 8, and between nil and 12 hours per week at week 16.

The average amount of weight gained each week was 0.55kg (SD 0.26) within a range of 0.05 kg loss to 1.05 kg gain. The average total amount of weight gain for the 21 women who provided baseline and week 7 or 8 weight data was 4.01 kg (SD 1.56) within a range of 1.60 kg to 6.80 kg. In the absence of UK guidance for weight gain during pregnancy, it is not possible to say whether average weight gain was outside normal range.

The average number of units of alcohol per week was 0.26 (SD = 0.50) at baseline, 0.28 (SD = 0.55) at week 8, and 0.57 (SD = 1.33) at week 16, within a range of 0 to 2 units per week at baseline and week 8, and 0 to 6 units at week 16.

8.3.2 Mindfulness and mental health

Table 8.1 illustrates the means, standard deviations, and ranges of mindfulness and mental health scores at baseline, week 8 and week 16. Mindfulness scores increased from baseline to week 8, and there were further small changes at week 16. Mental health scores improved from baseline to week 8, and there were further small gains at week 16. Mean perceived stress, antenatal depression, general anxiety, and pregnancy distress reduced from baseline to week 8, but gains were partially lost by week 16. Self-compassion increased from baseline to week 8, and week 16. Compassion for others was stable throughout.

This gives the impression that mindfulness and mental health improved during the taught course period, and that some gains were maintained and others were lost by during the self-led period. The standard deviations tended to reduce slightly at week 8, but reverted to being consistent with baseline variation at week 16. This means that the diversity of scores reduced during the mindfulness course, but this was not maintained in the self-led period.

In comparison to population medians (Table 7.7) average positive affect increased to above the median by week 8, but negative affect remained worse than median throughout the intervention. Mean wellbeing remained slightly below population median, and perceived stress remained above the cut-off for high. Although mean depression and general anxiety were well below the indicator score, the upper values were above the indicator scores at week 8, and considerably higher at week 16. Similarly, mean pregnancy distress was below the indicator score, but the upper values were higher. This means that some women reported higher levels of stress and distress at each time-point.

Table 8.1 *Mindfulness and mental health; baseline, N= 32; week 8, n = 26; week 16, n = 22*

Variable	Baseline			Week 8			Week 16		
	Mean	SD	Range	Mean	SD	Range	Mean	SD	Range
Total mindfulness	73.13	11.41	51 - 93	83.00	10.99	61 - 104	83.77	11.95	62 - 110
Non-reactivity	13.69	2.82	9 - 20	15.88	3.23	10 - 23	16.18	3.45	10 - 25
Observing	13.31	3.01	9 - 20	14.35	3.02	9 - 18	14.00	3.52	8 - 20
Awareness	13.81	3.30	7 - 20	16.00	3.20	7 - 20	17.00	3.09	10 - 21
Describing	16.66	3.40	10 - 24	19.27	2.79	14 - 24	18.95	3.00	12 - 25
Non-judging	15.66	4.14	9 - 25	17.50	2.66	13 - 22	17.64	4.05	11 - 25
Positive affect	29.63	6.48	19 - 45	33.38	6.01	20 - 43	34.27	7.79	18 - 46
Wellbeing	47.56	7.68	30 - 62	50.62	7.06	35 - 62	49.82	9.00	30 - 62
Negative affect	21.13	8.34	11 - 42	19.62	8.08	10 - 40	19.50	10.00	10 - 50
Perceived stress	22.06	2.93	17 - 29	20.88	2.14	18 - 26	21.68	3.64	17 - 33
Antenatal depression	7.63	4.62	1 - 21	6.12	3.71	1 - 14	7.09	5.32	0 - 20
General anxiety	5.59	4.36	0 - 15	3.65	2.93	0 - 10	3.77	4.62	0 - 17
Pregnancy distress	15.00	8.09	1 - 33	13.08	7.69	2 - 30	2.53	9.05	1 - 33
Self-compassion	14.75	4.17	8 - 22	16.62	4.11	9 - 25	18.36	4.59	7 - 25
Social compassion	26.16	2.34	20 - 30	26.65	2.48	20 - 30	26.32	2.64	21 - 30

8.3.3 Normality of the data

Inspection of histograms, stem and leaf diagrams, kurtosis, skew and Kolmogorov-Smirnov tests indicated that some scores were normally distributed, but others were not. Exercise hours not normally distributed at week 8 ($D(26) = .24, p < .001$). Total mindfulness not normally distributed at baseline ($D(32) = .17, p = .031$) or week 8 ($D(26) = .19, p = .024$); observing was not normally distributed at week 16 ($D(22) = .22, p = .013$); acting with awareness was not normally distributed at week 8 ($D(26) = .22, p = .002$); describing was non-parametric at week 16 ($D(22) = .19, p = .04$). Negative affect was not normally distributed at baseline ($D(32) = .17, p = .017$), week 8 ($D(26) = .30, p < .001$), or week 16 ($D(22) = .19, p = .043$). Perceived stress was non-parametric at week 8 ($D(26) = .20, p = .089$). Antenatal depression was non-parametric at week 8 ($D(26) = .23, p = .001$). General anxiety was non-parametric at week 8 ($D(26) = .20, p = .007$) and week 16 ($D(22) = .17, p = .034$).

Rather than conducting parametric tests on parametric data and non-parametric tests on non-parametric data, a consistent non-parametric approach was selected. Non-parametric testing produces conservative outcomes, which was a good fit with the cautious interpretation of the outcomes from this small sample.

8.3.4 (Objective 1.1) The indicative effects of Mind the Bump on the women’s health behaviours

Median moderate exercise hours at week 8 and at week 16 were not significantly different to baseline exercise hours, per Tables 8.2 and 8.3. This means that median exercise levels did not change significantly during the mindfulness course or the self-led period of the Mind the Bump intervention.

Table 8.2 *Wilcoxon signed rank: change in median moderate exercise hours from baseline to week 8, n = 26*

Health behaviour	Baseline	Week 8	Change	
	Median hours		Z	p
Moderate exercise	4.13	3.75	- 0.75	.453

Table 8.3 *Friedman repeated measures: change in median moderate exercise hours from baseline to week 16, n = 18*

Health behaviour	Week 0	Week 8	Week 16	Change	
	Median hours			$\chi^2 (2)$	p
Moderate exercise	4.25	3.75	4.00	0.95	.623

An impression of exercise tendencies was gathered from baseline to week 16 data from the 18 women who reported their activity at each time point. Figures 8.1, 8.2 and 8.3 illustrate the patterns over time of women who exercised for at least 3.5 hours at baseline, for two to 3.5 hours at baseline, and less than two hours at baseline. The red lines indicate mean exercise hours in each group at each time point. Low, moderate and higher activity levels at baseline tended to endure to week 16, which confirms the impression that activity did not improve or deteriorate during the study.

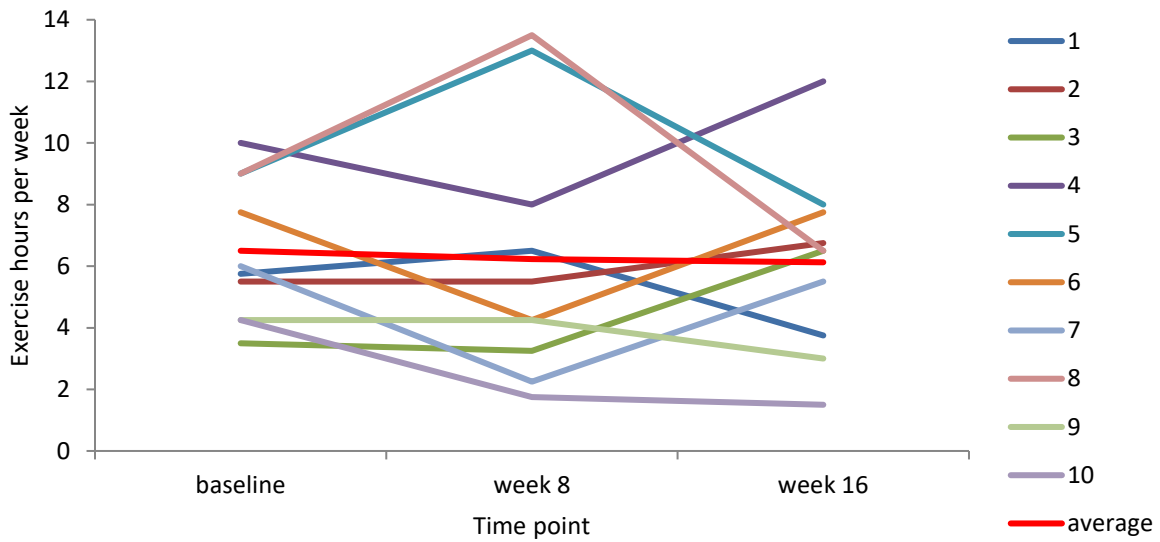


Figure 8.1 Weekly activity hours for highly active women, n = 10

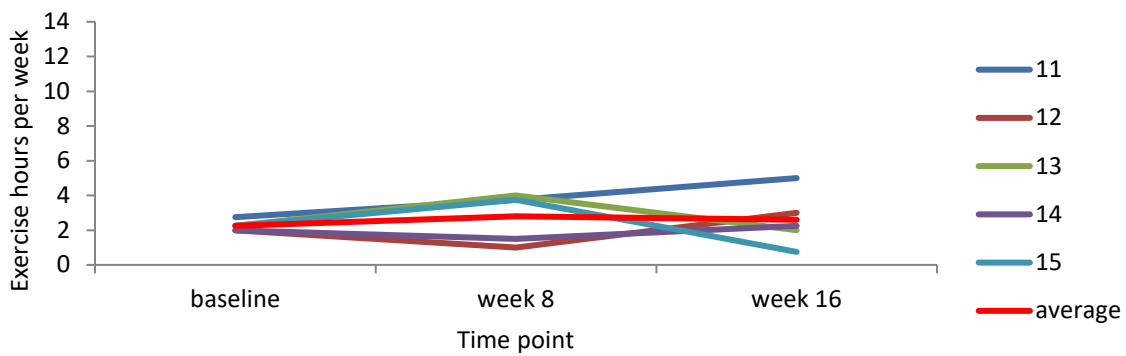


Figure 8.2

Weekly activity hours for moderately active women, n = 5

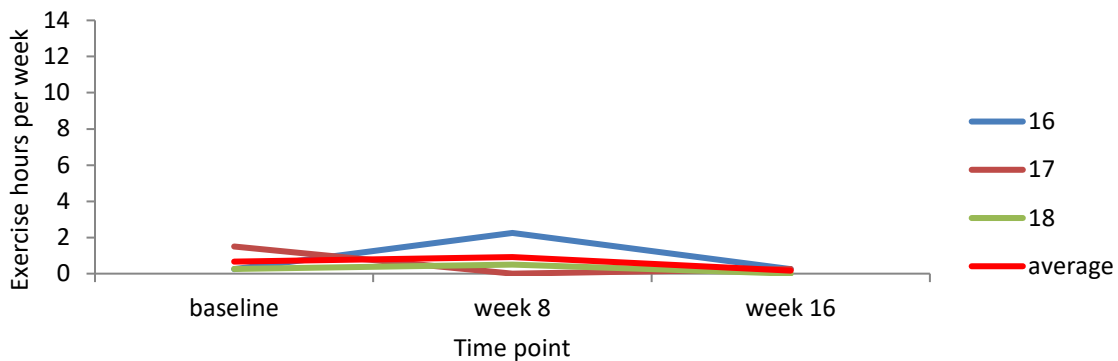


Figure 8.3 Weekly activity hours for less active women, n = 3

Median alcohol units at week 8 and at week 16 in the women who drank some alcohol at some time during the intervention were not significantly different to baseline median alcohol units, per Tables 8.4 and 8.5. This means that median alcohol consumption did not change significantly during the intervention.

Table 8.4 *Wilcoxon signed rank: change in median alcohol units in women who drank at baseline and at week 8, n = 10*

Alcohol Units	Week 0	Week 8	Change	
	Median		Z	p
	0.50	0.50	- 0.36	.719

Table 8.5 *Friedman repeated measures: change in median alcohol units in women who drank at baseline and at week 16, n = 9*

Alcohol Units	Week 0	Week 8	Week 16	Change	
	Median			χ^2 (2)	p
	0.50	0.50	0.25	0.30	.862

An impression of tendencies was gathered from the baseline to week 16 alcohol data from the 14 women who reported their consumption at each time point. Figure 8.4 illustrates alcohol consumption in units at baseline, week 8, and week 16 in the 14 women who drank at baseline and/or week 8 and/or week 16. The red line indicates average units per week. Three women who were not drinking at baseline drank some alcohol during the intervention. Five women who were drinking some alcohol at baseline drank at higher levels during the intervention, whereas five women drank less over time. Overall, the average line shows that self-reported alcohol consumption increased marginally during the intervention. This trend was affected by one woman’s drinking (case 14), which was two units twice per week at baseline and week 8, and six units per week at week 16.

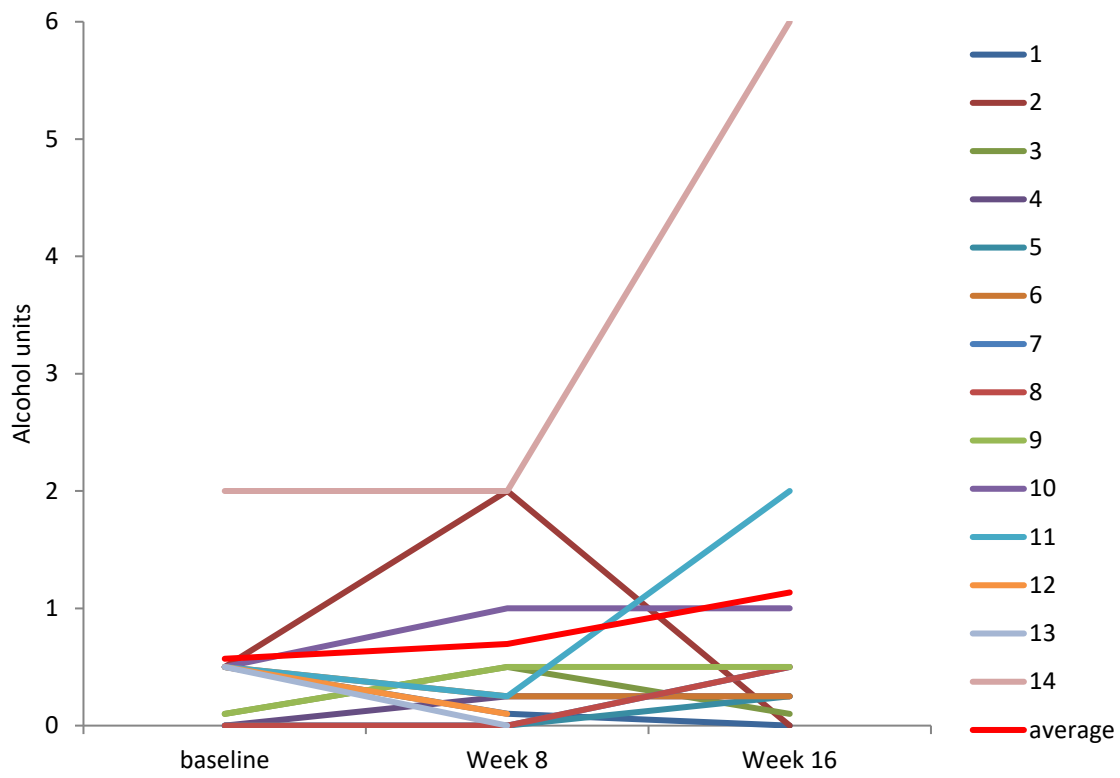


Figure 8.4 Weekly alcohol consumption, n = 14

8.3.5 (Objective 1.2) The indicative effects of Mind the Bump on the women’s mindfulness and mental health

Table 8.6 illustrates the magnitude and significance of changes in median mindfulness and mental health scores from baseline to week 8 (the mindfulness course). The increases in total mindfulness, and the non-reactivity, observing, acting with awareness, and describing subscales were highly significant, with large effect sizes. The change in non-judgment was not significant. This means that emotional reactivity tended to reduce, the women were more likely to be aware of and able to articulate present-moment physical sensations and environmental sights and sounds, they were more aware of their behaviours and less likely to be on “autopilot”.

The increase in positive affect was highly significant, with large effect size, and the improvement in wellbeing was significant, with moderate effect size. Negative affect, perceived stress, antenatal depression, general anxiety, pregnancy distress, and compassion did not change significantly.

This means that mindfulness and positive aspects of psychological health improved during the taught course, but negative and clinical aspects of antenatal mental health did not improve.

Table 8.6 Wilcoxon signed rank: change in median mindfulness and mental health; baseline to week 8,
n = 26

Mindfulness and mental health	Week 0	Week 8	Change		Effect size
	Median		Z	<i>p</i>	<i>r</i>
Total mindfulness	75.5	87.0	3.88	<.001	.77
Non-reactivity	14.0	16.0	3.33	.001	.65
Observing	12.0	14.0	2.83	.005	.55
Awareness	13.5	16.0	3.78	<.001	.74
Describing	17.0	20.0	3.48	.001	.68
Non-judging	16.5	18.0	1.68	.093	
Positive affect	27.0	34.0	2.94	.003	.58
Wellbeing	49.0	52.5	2.06	.039	.40
Negative affect	18.0	16.0	-0.70	.482	
Perceived stress	21.0	21.0	-1.58	.115	
Antenatal depression	6.0	5.0	-1.00	.316	
General anxiety	3.0	3.0	-1.59	.119	
Pregnancy distress	13.0	12.0	-1.41	.159	
Self-compassion	16.0	17.0	1.62	.105	
Social compassion	26.0	27.0	1.28	.199	

Significant probability scores are in bold.

Table 8.7 illustrates the magnitude and significance of median mindfulness and mental health score changes from baseline to week 16 (mindfulness course plus the self-led period). The increases in total mindfulness, and the non-reactivity, observing, acting with awareness, and describing subscales were highly significant. Post-hoc tests indicated that the significant increases occurred during the taught course period, not during the self-led period, other than for acting with awareness, which continued to increase in the latter period. Some taught course gains were lost in the self-led period, but final median mindfulness scores were equal to or higher than baseline scores.

The increase in positive affect was highly significant, and the post-hoc test indicated that the significant improvement occurred during the taught course period. Median values for negative affect, general anxiety, pregnancy distress, wellbeing, perceived stress, antenatal depression, and compassion did not change significantly.

This means that improvements in mindfulness and positive affect tended to occur in the taught course period, rather than the self-led period, that negative mental health improved slightly across the intervention period, and that self-compassion developed during the self-led period.

Table 8.7 Friedman repeated measures: change in median mindfulness and mental health; baseline to week 16, $n = 22$.

Variable	Week 0	Week 8	Week 16	Week 0 to 16		Week 0 to 8		Week 8 to 16	
	Median			$\chi^2(2)$	p	Z	p	Z	p
Total mindfulness	79.0	86.0	85.0	16.09	<.001	3.42	.001	0.73	.465
Non-reactivity	15.0	16.0	16.0	9.07	.011	2.69	.007	0.64	.522
Observing	12.5	14.0	12.5	9.38	.009	2.23	.026	0.49	.626
Awareness	15.0	16.5	18.0	20.66	<.001	3.31	.001	2.10	.036
Describing	17.0	19.5	19.0	12.49	.002	3.11	.002	0.36	.717
Non-judging	17.0	18.0	17.0	5.61	.060				
Positive affect	30.5	34.0	35.5	11.05	.004	2.58	.010	0.51	.614
Wellbeing	50.5	51.5	51.5	2.16	.339				
Negative affect	16.0	16.0	15.5	1.54	.463				
Perceived stress	21.0	21.5	21.5	3.98	.137				
Antenatal depression	6.0	5.0	6.5	0.29	.867				
General anxiety	3.0	3.0	2.0	0.70	.703				
Pregnancy distress	12.0	12.0	9.0	0.31	.859				
Self-compassion	16.0	16.0	19.0	5.57	.062				
Social compassion	26.0	27.0	26.5	1.62	.446				

Post-hoc Wilcoxon signed rank analysis. Significant probability scores are in bold.

8.3.6 (Objective 2.1) The acceptability of Mind the Bump

This section presents the information on how the women rated the intervention’s credibility at baseline, and how they rated its acceptability at week 8 (the mindfulness course) and week 16 (the self-led period). The three main elements of the intervention: mindfulness training, goal setting, and self-monitoring are reported separately.

Acceptability of the mindfulness course

Figure 8.5 illustrates that lower expectations about the usefulness, interest and enjoyment of the intervention tended to cluster together, whereas higher expectations tended to cluster together. Six women were at best unsure about at least one aspect of the intervention, whereas 10 women had consistently high expectations. Overall, the impression is that the intervention was reasonably credible.

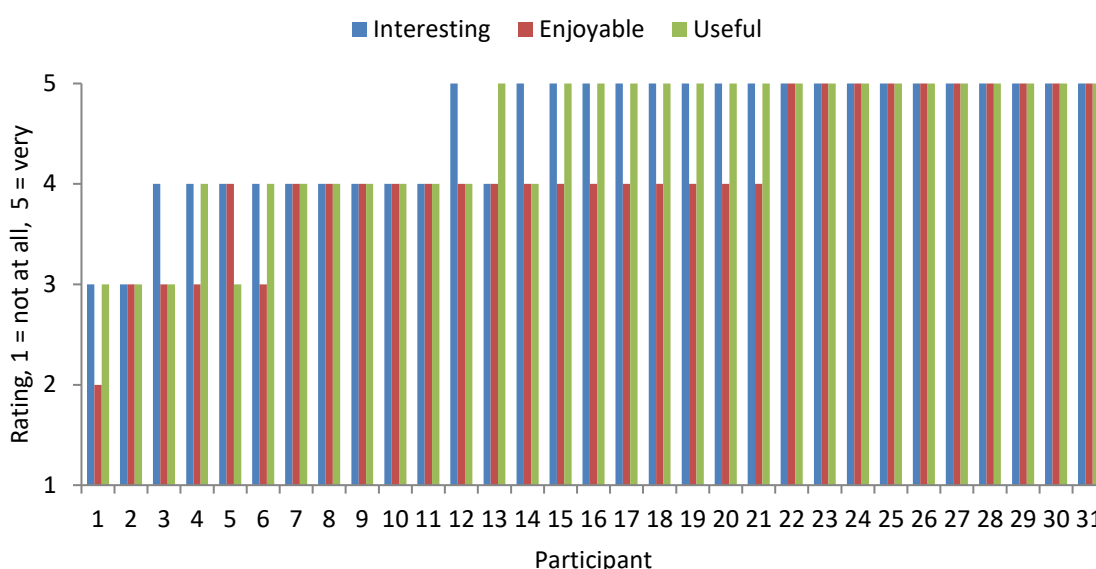


Figure 8.5 Credibility ratings

Women’s ratings of how useful, interesting and enjoyable the mindfulness course was at week 8 are illustrated in Figure 8.6. Lower scores for the course tended to cluster together. The majority of women (n = 19, 83%) rated it as at least mostly useful, interesting and enjoyable, and 8 women (34%) regarded it as very acceptable. Three women (13%) did not find it more than moderately useful or enjoyable, of whom one (4%) did not find it interesting. The women who initially gave lower credibility ratings tended to either withdraw or not complete, meaning that lower ratings were associated with

lower attendance, whereas higher ratings were associated with completion. Overall, the impression is that the mindfulness course was moderately acceptable.

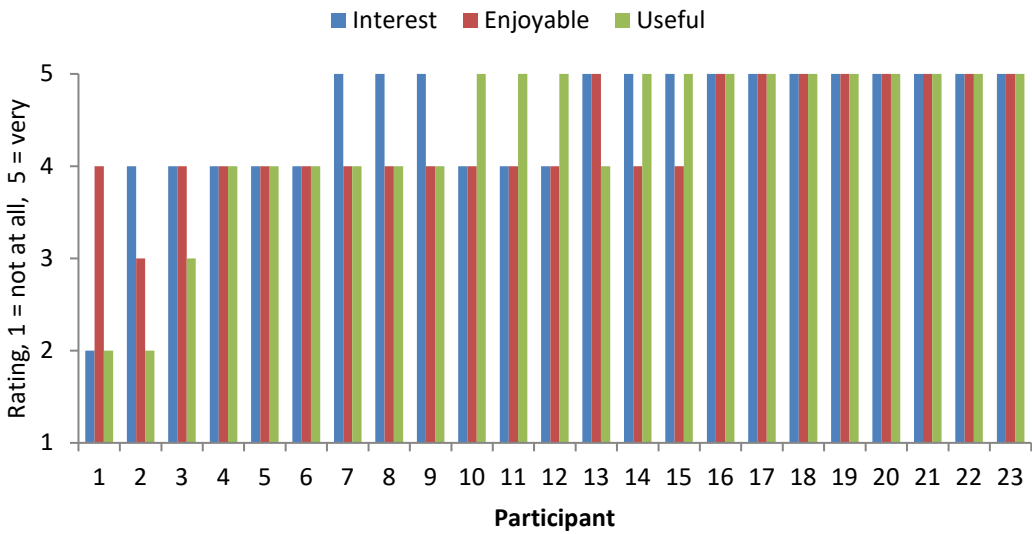


Figure 8.6 Experience of usefulness, interest, and enjoyment of the mindfulness course

The mindfulness course was slightly less useful and less interesting, and slightly more enjoyable, than expected, illustrated in Figures 8.7, 8.8, and 8.9. The majority of women rated this aspect of the intervention as mostly useful, interesting, and enjoyable.

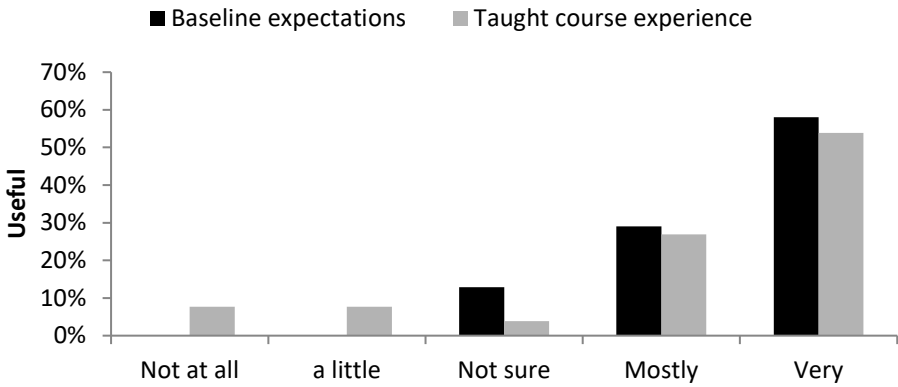


Figure 8.7 Usefulness ratings at week 8

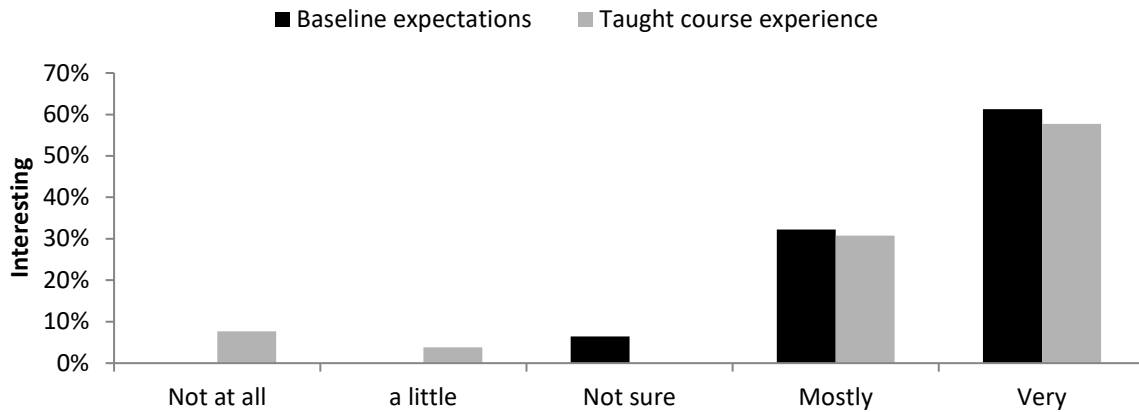


Figure 8.8 Interest ratings at week 8

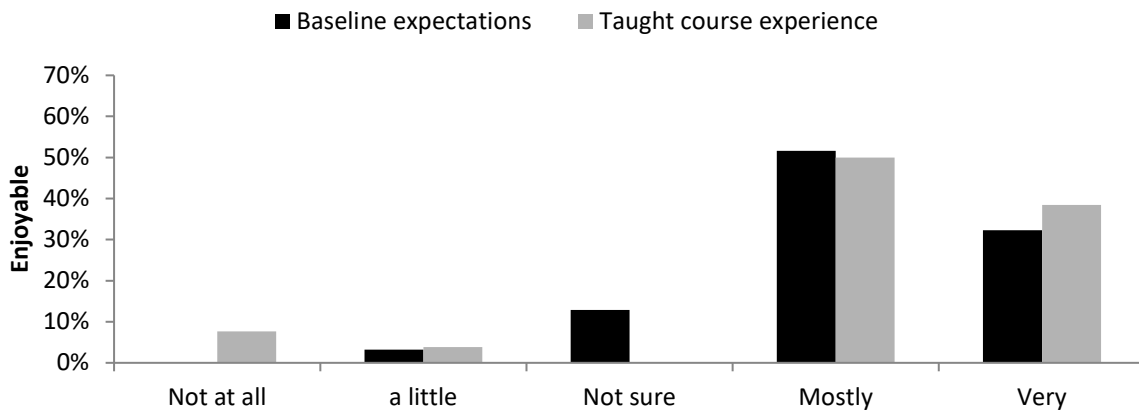


Figure 8.9 Enjoyment ratings at week 8

Ratings for the self-led period were lower than for the mindfulness course. Seventy percent of the women rated this period as mostly to very useful, 78% as mostly to very interesting, and 74% as mostly to very enjoyable. The women who rated this part of the intervention as not useful ($n = 5$), not interesting ($n = 4$), and not enjoyable ($n = 4$) had not completed the mindfulness course, which suggests that these women did not re-engage in the latter part of the intervention.

Overall, the mindfulness course and self-led period of the intervention were reasonably acceptable, but the self-led period was rated more poorly, and women who were unsure about the intervention at baseline tended to withdraw or not complete.

Acceptability of goal setting

At baseline, 75% (n=24) of the women expected their goals to be highly useful, and almost all rated them as highly achievable and realistic, per Table 8.8. Goals became progressively less achievable and realistic from baseline to week 8 and to week 16. This means that this part of the intervention was credible, but that goals became less attainable over time.

Table 8.8 *Self-rated achievability of health behaviour goals over time*

Factor	Baseline, N = 32		Week 8, n = 26		Week 16, n = 23	
	Higher, n (%)	Lower, n (%)	Higher, n (%)	Lower, n (%)	Higher, n (%)	Lower, n (%)
Achievable	30 (93)	2 (7)	22 (84)	10 (16)	12 (52)	11 (48)
Realistic	31 (97)	1 (3)	21 (80)	5 (20)	15 (65)	8 (35)

Table 8.9 illustrates that, amongst women who set goals, exercise goals were achieved at least most of the time by half the women during the baseline to week 8 period, but this diminished during the self-led period to week 16. Over half the women achieved their diet goal at least most of the time across the intervention period. The proportion of women who did not achieve their alcohol goal was lower at week 16 than week 8.

Smoking is not reported as only one woman smoked prior to pregnancy, and she adhered to her goals to not smoke throughout. Diminishing numbers at each time point limit any implications of the changes in goal achievement during the intervention, but exercise goals were evidently less achievable over time, whereas diet and alcohol goals were more consistently achievable across time.

Table 8.9 *Self-rated regularity of goal achievement over time*

Frequency	Week 8, n = 26			Week 16, n = 23		
	Regular, n (%)	Irregular, n (%)	N/A, n (%)	Regular, n (%)	Irregular, n (%)	N/A, n (%)
Exercise	13 (50)	11 (42)	2 (8)	5 (23)	14 (64)	4 (18)
Diet	14 (54)	11 (42)	1 (4)	13 (59)	8 (36)	2 (9)
Alcohol	14 (54)	6 (23)	6 (23)	14 (64)	4 (18)	5 (23)

The goal setting aspect of the intervention appeared to have had high credibility but, at best, moderate achievability. There were distinct differences between the effects of time on exercise goals in comparison to diet and alcohol goals. Exercise goals were not highly achievable, and became increasingly less so over time.

Acceptability of self-monitoring

The diary had moderate credibility at baseline, as 55% (n = 18) of women expecting to be at least mostly useful. Although 46% (n = 12) rated the diary as useful during the taught period, only 8% (n = 2) used it most days, 69% (n = 18) used it occasionally, and 19% (n = 5) did not use it at all. Use reduced further during the self-led period to 17% (n = 4) who rated it as useful, 39% (n = 9) using it occasionally, and 61% (n = 13) not using it at all. This means that this aspect of the intervention had low acceptability.

8.3.7 (Objective 2.2) The women's experience of Mind the Bump: benefits and barriers

The women's experience of the intervention was described by two over-arching themes: benefits and barriers. Subthemes for benefits were resource/skill, protective effect, beneficial effects, enjoyment, and the group. Subthemes for barriers to mindfulness practice were dislikes, practical barriers, and motivation; subthemes for barriers to achieving health goals were practical barriers, temptation, occasional drinking, and overcoming barriers. Although the protective effects and alcohol subthemes were not consistent across women, they are reported due to their pertinence to the indicative outcomes of the intervention. Table 8.10 indicates the frequency of the subthemes within each theme, which is followed by an illustration of each sub-theme. This section concludes with a summary of the women's suggestions about how to improve the intervention.

Benefits

Resource/skill

The utility of mindfulness practices as a “powerful tool” (j) to respond appropriately to circumstances (g) indicates that the women developed a new way of engaging with daily life. The adaptability of the practices to different situations was evident in one woman commenting that “I liked having practical tools and exercises to use, depending on my mood and needs” (g). Mindfulness could “become an integral part of life” (g), and a “go-to” resource to focus thoughts and attention, even at times when it might be easy to get caught up in busyness:

“I have been surprised how quickly I have turned to formal practice to help me centre during the day, often at very busy moments.” (b)

Some women expected that the mindfulness techniques would be a useful resource during childbirth, and this may have motivated them to practice:

“I'm convinced that the practice will be extremely helpful during childbirth, and have been focusing on developing practice with this in mind.” (d)

Protective effects

Mindfulness techniques were utilised to alleviate stress and distress, for example “to ground myself and stop spirals of feeling low or down or stressed” (j), to stop “spiralling anxiety before it gets unmanageable”(e), “to lift myself out of anxiety” (d), and “to deal with stressful situations at work, and with the insomnia that usually results from this” (s). This means that some of the women appeared to be using mindfulness practices to maintain their wellbeing. In addition to improving ability to relax, developing a more accepting attitude to the unwanted and uncomfortable physical experiences of pregnancy could ameliorate stress:

“I have learned relaxation skills which I have found very helpful during the past few weeks. I have learnt that everything is not perfect and to enjoy the now more. Not being upset or annoyed if I can't sleep, get comfortable, eat, which I struggled with before.” (r)

This means that some women might have been more able to avoid adding reactive emotional suffering to some of the challenging physical experiences of pregnancy, such as insomnia, pain, and digestion

problems. The compassion practice was welcomed as a tool for improving the ability to self-regulate emotional reactivity, and realising the ability to unhook from rumination and unwanted thought cycles could be revelation:

“The realisation that I could have this kind of control over my mental processes was quite enlightening.” (m)

In addition to psychological benefits, becoming more embodied could lead to becoming more aware of the physical correlates of stress:

“I am able to listen to my body and breathing, and begin to recognise how I physically react to anxiety and stress.” (w)

This greater awareness of the physiological response to psychological stress means that the women may have been more likely to respond to escalating stress and anxiety levels by taking steps to alleviate the cause and/or to employ mindfulness techniques to reduce the stress reaction. Experiencing the effects of mindfulness practice could generate recognition that maintaining practice had potential to provide longer term resilience:

“If I continue to develop my own mindfulness practice, I should be able to deal with most things that life throws at me!” (d)

It also appeared that mindfulness was perceived to offer protection against postnatal depression after giving birth:

“Feel this helps me to cope with the stress of being a new mum and avoid postnatal depression.” (u)

This means that the protective effects were felt to continue in the post-partum period.

Beneficial effects

In addition to protecting against stress and anxiety, mindfulness also appeared to improve the ability to be happy (j, q), be positive (p), to refocus (p), to relax (p, q, r, s), and to cultivate calm (k, q). Self-care benefits included “learn(ing) how helpful it is to pause and make that space for myself to reflect, pause, relax, etc.” (b). Benefits could accumulate over time (u), or appear “out of the blue” (g). Sometimes the benefits were unnoticed until practice lapsed:

“I have really noticed a big difference in my state of mind when I go a number of days without practising mindfulness.” (d)

Some women felt a stronger connection with their baby during mindfulness practices when they focused on physical sensations, especially those of being pregnant:

“Guided meditations have.... helped me to.... connect with my baby more closely by closely paying greater attention to my body and my breathing.” (b)

Postpartum, the benefits of accepting things as they are, rather than how they were wished to be, was felt to be helpful in the transition from pregnancy into parenthood, even when women were challenged by broken sleep:

“The transition has been smooth and easy because I have internalised the principles of being present and accepting of current sensations and circumstances, even if I haven't had time to do for formal practices. It was a wonderful course – I love it and think it help me so much to maintain calm and happy thoughts at the end of my pregnancy, labour and newborn period. The practices were so helpful and taught me a great deal. I really internalise the idea of accepting sensations and circumstances as they are, even if I don't like them – I don't have to like things like waking up every two hours with a demanding newborn I've managed to remain calm and happy, largely because of this input from the course.” (q)

Enjoyment

Many of the women said that they enjoyed the course and/or the practices. Even if the credibility of the intervention was not high at baseline, experience could exceed expectations if benefits accrued:

“I was sceptical to begin with, but I really enjoyed the practices and quickly noticed an effect on my mind and well-being, perception of life and pregnancy.” (w)

Group

Shared support and contact with the group was frequently reported as a valuable aspect of the intervention (q). Women appreciated sharing their thoughts and emotions about pregnancy (b) and their experiences of using mindfulness (c, k, u) with “similar minded people” (u) “who were also pregnant” (i, k). This was particularly valuable for one first time mother:

“Just to be with other pregnant people and understand what was common for normal feelings.”

(z)

Contact with the group was described as “enormously sustaining and nourishing” (j) which means that the social aspect of the intervention was important. Some of the women continued to meet after the mindfulness course, and this was helpful in maintaining motivation to practice mindfulness:

“I have learnt that the motivation and contact with the group helped me to remain more on track in achieving my mindfulness goal. I feel grateful to have the continuing support of the group.” (b)

Barriers

There were a number of barriers to mindfulness practice and to lifestyle goal achievement. This section begins with the barriers to mindfulness practice.

Barriers to mindfulness practice

Dislikes

Women disliked various aspects of the mindfulness practices. One woman found the formal practices “boring” (l) and another disliked the repetitive nature of the CD (g). The practices were generally acceptable, but the negative emotions practice (week five) did not feel appropriate for one woman as her motivation for taking part in the study was to increase her level of calm, rather than to face into difficulties:

“One of the things I am really mostly attracted to in mindfulness is finding a quieter mind - learning to appreciate the present and slow my thoughts. For this reason, I have found practices that encourage you to observe or introduce thoughts the most difficult and least productive for my mental well-being.” (b)

There appeared to a clash between the idea of adhering to lifestyle goals with the self-acceptance, non-striving ethos of mindfulness (b). Furthermore, not achieving goals could lead to self-criticism:

“I found the setting diet and exercise goals slightly clashed with the overall attitude that mindfulness practice promotes. Having the goals there makes it quite easy to be hard on yourself when you don't achieve them.” (d)

This means that the gap between intention and behaviour could add to the women's stress. This was evident for one woman who felt guilty when she received the handout about diet, body mass index, and gestational weight gain. This caused her to disengage from the intervention:

“I didn't think the prescriptiveness of some of the information around diets/BMI was appropriate, and it really put me off. The BMI info and how much weight we should gain was particularly problematic, and just make me feel guilty. I found it jarred with the principles of mindfulness and was unnecessary as I had already received this info from midwives.” (y)

Practical barriers

The most common barrier to mindfulness practice was busyness and lack of time due to family commitments (v), the demands of young children (n), and work (g). Inability to find time could also be counterproductive for wellbeing:

“It was difficult to find time to do all the exercises every day, and it was quite frustrating that I didn't manage to find enough time” (f).

The physical consequences of pregnancy could hinder mindfulness practice and lifestyle goal achievement:

“Fatigue, more sleep required, etc. made it challenging to fit in as much time in meditation and exercise (as per my goals) as I had hoped/wanted to” (g)

and fatigue could lead to falling asleep during practice (p).

Motivation

One woman noted that it was difficult to get out of the habit of carrying on with day to day tasks, despite awareness of the benefits of taking the time to do mindfulness practice:

“Very hard to learn not to give into “keeping going” and to stop and make the effort to practice, even though I know how beneficial it is.” (j)

Losing momentum and lapsing practice could reduce motivation to practice (γ), as could losing interest in the course (l, γ). Feeling calm could also reduce the perceived need to practice:

“Sometimes feeling like ‘I feel calm today, so I don’t need to practice’; had to remind myself to practice even when feeling good – ‘pro-active rather than reactive’.” (w)

This may mean that practice became less salient when women felt calm, but that they were aware that benefits could be lost if they lapsed.

Barriers to lifestyle goals

Practical barriers

Lack of time was an obstacle to exercise and to eating healthily:

“I wasn’t able to increase the amount of exercise, which was a bit disappointing. This was mainly due to lack of time.” (f)

and

“Food preparation was sometimes challenging due to fatigue or hectic schedule. Occasionally this meant more carbs and less vegetables, and eating more fruit because it was easier and more convenient.” (g)

Physical barriers to diet goals included tiredness (d, u, γ), hunger (k), and “bad heartburn and acid reflux” (q). Tiredness and pelvic girdle pain inhibited exercise (e). There was recognition that the physical demands of pregnancy could mean that initially realistic goals became unrealistic:

“Pregnancy is an unpredictable time, and even with best laid plans, fatigue and illness can prevent you from doing all that you hoped to achieve.” (b)

Temptation

Temptation to eat snacks, sugary, or high fat food could override dietary goals, and giving in to temptation could lead to self-recrimination:

“Temptation everywhere, mainly in the form of other people buying or bringing things along. It is difficult as I always feel bad when I did eat those things I knew I should keep away from.” (v)

This was particularly evident in one woman who said that she felt “very low and angry with myself, and hopeless” (m) when she did not meet her own expectations for diet and exercise.

Occasional alcohol

A number of women commented that they drank occasionally. Some did not intend to abstain (e.g. m, p), and did not feel guilty about drinking (n). Risk perception appeared to be low (b), and one woman cited research which reported no risk of drinking in late pregnancy:

“I discovered that the no study has proved that very small amounts of alcohol affect babies in late pregnancy, so I have allowed myself a few sips here and there.” (d)

Overcoming barriers

Some women adopted practical strategies suggested during the taught sessions to overcome barriers for mindfulness practice and lifestyle goals. Some developed a routine to practice mindfulness at the same time every day (f, p, s), or incorporated it into daily walking for exercise and/or with their dogs (b, p). Other women prompted themselves to practice using cues such as post-it notes, keeping the book in sight (a), and automatic phone reminders (b). Finding a quiet time and space could be difficult for women with children, and some resorted to practicing in the car (c) or the bath (g). Self-care focused strategies to improve lifestyle included

“deciding I deserved time to exercise and building it in with my son; for example, all of us going swimming, and having some time on my own to do laps.” (c)

and noticing the physical effect of “sweets food and junk food... in my body has helped me to avoid them” (p).

Practical strategies to support diet goals included “making meal plans and buying this in advance” (u). Practical strategies for exercise included “join(ing) a gym with someone else... having this encouragement helped me to attend more often” (u). Lastly, mindful awareness of the emotional triggers and after effects of snacking or “good” food (c, m, z), could help with tolerating food cravings.

Suggestions for improvements to the intervention

There were various suggestions for changes to the intervention. Some women suggested that the mindfulness course should be longer, or that it should be followed up with less frequent maintenance sessions after the initial eight-week course in order to maintain motivation to practice and build an established mindfulness practice:

“The course was incredibly helpful. It may be helpful to run the eight week course and then regular refreshers to help embed mindfulness in our lives. I accept that much of this down to self-discipline, but the encouragement would I'm sure be useful.” (o)

Other suggestions included a library of mindfulness practices (g), and a session to which partners were invited (x). One woman suggested having:

“A diary that focused only on mindfulness practice - it's quite a challenge to adapt and fit this into your life, and I did feel discouraged by setting certain other goals.” (b)

One women’s suggestion implied that it might have been useful to revisit exercise goals and that hers became increasingly unrealistic:

“As the first pregnancy, it was hard to know what exercise goals were going to be realistic for the whole of the nine months.” (d)

8.3.8 Implementability

This section integrates the findings from the two feasibility chapters and compares them Behaviour Change Wheel’s affordability, practicality, effectiveness, acceptability, safety, and equity (APEASE) criteria for considering whether an intervention is implementable in its current version (Michie et al., 2014). Table 8.11 indicates that the Mind the Bump intervention did not adequately fulfil these criteria.

Table 8.11 *Mind the Bump feasibility in accordance with the APEASE criteria for implementable interventions*

Criterion	Condition	Mind the Bump
Affordability	Reasonable costs.	Unclear.
Practicality	The intervention can be delivered as designed.	Yes.
Effectiveness	The indicative outcomes suggest that the intervention will change health behaviours and targeted factors.	Not for the primary target of antenatal health related behaviours. Some positive effects on mindfulness and positive aspects of antenatal mental health, but no effects on negative aspects of antenatal mental health.
Acceptability	To recipients, and in wider social and political contexts	Reasonably acceptable to recipients; not known in a wider context.
Side effects/safety	Assess potential harms.	No risks reported.
Equity	The intervention reaches its intended recipients. Does not disadvantage particular groups.	No. Not possible to recruit higher risk women. Appeal may be limited to women who are similar to this sample.

(Michie et al., 2014)

8.4 Discussion

This chapter reported the indicative effects and acceptability of the Mind the Bump intervention. The principal result was that Mind the Bump had no significant effects on maternal health behaviours and, that although there were some gains in mindfulness and in positive aspects of mental health, there was no significant alleviation of negative antenatal mental health conditions (objective one).

Objective two was to assess acceptability. The intervention was acceptable, and the benefits of taking part accrued on various dimensions. There were aspects of the intervention which some women disliked, and there was an apparent mismatch between the ethos of mindfulness and focusing on health behaviour goals. There were various practical and psychological barriers to engaging in the mindfulness practices and achieving lifestyle goals. The discussion integrates the indicative effects with the acceptability and thematic data in order to discuss the potential reasons why the intervention did not improve health behaviours. I will discuss the limitations of the study, and draw conclusions.

Exercise

The Mind the Bump intervention did not have positive effects on maternal health behaviours. The women's exercise levels tended to remain stable. Adherence to guidance to eat five portions of fruit and vegetables did not increase, alcohol consumption across the groups did not reduce although there were some individual fluctuations, and no-one was smoking at baseline, so there was no potential for this to improve. This reflected the consistency of adherence to UK guidance for antenatal health behaviours reported in chapter six, although it was interesting to find that the women who were less active at baseline tended to remain inactive, and that the women who were more active at baseline tended to remain sufficiently active, particularly if they were adhering to guidance to exercise for at least 3.5 hours per week at baseline.

This differs to Atkinson et al.'s (2014) finding that British women's activity levels tend to decline during pregnancy, and that only 34% maintain activity levels. As it seems unlikely that I recruited solely from the subset of pregnant women who maintain their activity levels, the stability of exercise might suggest that the intervention generated some protection against decreasing activity levels. This tentative implication is very much constrained by this being a non-controlled snapshot of self-reported activity over 17 weeks, and further evaluation would be enhanced by recording activity from pre-pregnancy to birth.

The qualitative feedback provided some insight into the factors that supported and hindered exercise. Many women reported that the physical effects of pregnancy could hinder their ability to fulfil their intentions to exercise, and that demands on their time made it difficult to increase their activity levels. This suggests that the intervention created some motivation to exercise, even though the women found it difficult to actualise their intentions. This provides some support to the proposal that the intervention might have provided some protection against the normal diminishment of activity during pregnancy. It is difficult to compare this to the literature, as research into barriers to antenatal exercise tends to focus on obese women, but the physical effects of pregnancy, busyness and lower motivation are known capability, opportunity, and motivation barriers to exercise during pregnancy (Olander, Darwin, et al., 2015).

Diet

Mind the Bump did not have a beneficial effect on diet during pregnancy. The diet data was not suitable to test for changes, but the previous chapter reported that whilst women were consistent in described their diet as healthy, fewer were eating five portions of fruit and vegetables a day at week 8 and week 16 than at baseline. The qualitative feedback provided some insight into the temptation of unhealthy foods and the subsequent guilt eating it could create, and informed us about the impact of tiredness and busyness on opportunity and motivation to prepare healthy meals. However, it was evident that planning meals and shopping could help women to adhere to their own goals for eating healthily. These dietary barriers reflect the capability, opportunity, and motivation barriers to exercise during pregnancy.

It is important to acknowledge that the study did not retain the three women whose body mass index was in the obese category at conception, and who might therefore have had potential to benefit from increasing their activity levels and adapting their diet. The qualitative feedback went some way to explaining this, as one woman who was receiving diet and exercise guidance from her midwife (and must therefore have been in the obese BMI category) expressed her response to receiving information about managing gestational weight gain within the intervention, and that this caused her to disengage from the intervention and mindfulness practice.

It is clearly important to be sensitive to this issue, and it reflects some midwives' concerns that talking to women in the higher body mass index categories about weight management might disengage them from maternity care (Furness et al., 2015). However, no objections were raised by the women in the

lower risk body mass index categories. Information was provided about the potential consequences of inactivity, not taking supplements, alcohol, and smoking, so it was reasonable to include gestational weight gain information, particularly as pregnant women report that guidance on gestational weight gain is either vague or inadequate (Johnson et al., 2013).

Alcohol

Alcohol consumption did not change significantly during the intervention, and this reflected the consistency of either continuing to drink small amounts or adhering to UK guidance to abstain reported in chapter six. What is interesting is that, although five women reported drinking less over time, three women who reported not drinking at baseline then reported drinking at a later point, and that the woman who reported drinking two units twice per week at baseline and week 8 reporting drinking more at week 16. It is not possible to say whether this is a genuine effect, or whether it was due to increased accuracy of self-reported consumption, which is often understated in pregnancy studies (Lange et al., 2014).

A caveat is that the questionnaire did not appear to have face validity during pregnancy, as the women who drank tended to write notes about having an occasional sip or half glass of wine or beer rather than the whole drinks measured by AUDIT-C (Bradley et al., 2007). The results were unclear and must be interpreted with caution, but it does not appear that Mind the Bump had any consistent effects on reducing antenatal alcohol consumption.

The qualitative feedback indicated that the women who drank did not perceive any risk or feel guilty about drinking, and in fact one woman said that she allowed herself an occasional drink after finding that no study showed ill-effects for drinking small amounts in late pregnancy. This is interesting because the group were highly educated and therefore perhaps more likely to search for research evidence, although it is not possible to say whether reading the research preceded the decision to drink.

It may be that the intervention was too late in pregnancy to have much potential to reduce alcohol consumption, as women who drank in earlier pregnancy may have been reluctant to acknowledge that this was potentially harmful, which might have inhibited quitting. This type of self-protective reasoning may be based in aversion to accepting the potential ill-effects of drinking whilst pregnant, and a pre-pregnancy or very early pregnancy intervention might have more potential to reduce drinking during

pregnancy, although it will be very difficult to capture women whose pregnancies are unplanned and are at higher risk of inadvertent exposure to alcohol (O'Keeffe et al., 2015; Wellings et al., 2013). It will be interesting to see if the Chief Medical Officer's new recommendation for total abstinence (DoH, 2016) affects the prevalence of drinking during pregnancy, as all but one of the women who reported drinking did so within the no more than one to two units once or twice per week guidance issued by NICE in 2008. It is not possible to comment on the effectiveness of the intervention on smoking, as none of the women were smoking at baseline, and the former smoker had already quit.

The implication is that the Mind the Bump intervention had no beneficial effects on exercise levels, diet, or alcohol consumption where there was potential for improvement. The tentative positive outcomes are that Mind the Bump may have had some protective effect on the normal deterioration of exercise levels, and that it appeared to increase motivation to be active and eat well, even though there were barriers to realising intentions.

Acceptability of the behaviour change techniques

The behaviour change components (goals setting, self-monitoring) of the intervention were not as well rated as the mindfulness aspect of the intervention. Although goal setting was acceptable and most of the women described their goals as highly achievable and realistic at baseline, the high "SMART"ness of goals (Meyer, 2003) did not translate into actual achievability, and women rated their goals as increasingly less achievable and realistic at week 8 and week 16.

As exercise and diet were reasonably stable from baseline to week 16, this implies that the women may have intended to improve their activity levels and diet, but were not able to do so. That one woman suggested removing the lifestyle goals from the diary suggests that her priority was to develop a mindfulness practice and not to improve her health behaviours. This means that, at least for one woman, lifestyle change was not a priority despite it being the overt target of the study. The sample also included 11 women who were already adhering to guidance at baseline, which constrained the potential of the intervention to improve health behaviours.

Self-monitoring was not successfully implemented. Although the Mind the Bump diary was expected to be generally useful, less than half the women used it during the taught course, and very few used it during the self-led period. This indicates that the majority did not use it to self-monitor their adherence to their own goals.

There may be a number of reasons for this. Firstly, each session was summarised in a handout, which included a reminder of home practice, obviating the need to use the diary to find out what the week's recommended practice was. Secondly, the diary may have been poorly designed and not appropriate to the study. Thirdly, it may be that achievement monitoring was not a good fit with a mindfulness course's ethos of self-acceptance and non-striving. The diary was not part of the research materials, and was not collected, which may have reduced women's motivation to complete it.

Whether paper diary based self-monitoring is less acceptable than app-based monitoring (Burke et al., 2011; Carter et al., 2013) was discussed in the previous chapter. It may also be that self-monitoring is less acceptable during pregnancy due to changing weight and the impact of pregnancy on physical capabilities and opportunities (Michie et al., 2011). Decreases in exercise motivation during pregnancy (Newham et al., 2015) might affect motivation to self-monitor.

There was some feedback as to the incompatibility of self-monitoring goal attainment with the self-accepting ethos of mindfulness, and that behaviour lapses could trigger negative moods and self-abrogation. This was the antithesis of my intentions, and suggests a failure to recognise and surmount any tensions between psychological and physical wellbeing.

It may be that redesigning and/or collecting the diary would increase its feasibility, and that having it as the sole source of weekly or daily practice guidance would increase its use. An app-based daily self-monitoring approach might have potential for higher adherence and acceptability.

Mindfulness and mental health

It was evident that there were beneficial effects on mindfulness and positive aspects of antenatal mental health. Scores increased significantly during the mindfulness course, and were largely maintained during the self-led period despite mindfulness practice levels falling considerably. What this means is that factors which may underpin adverse antenatal health behaviours, such as emotional and behavioural reactivity, automaticity, inability to articulate thoughts and emotions, harsh self-judgement, and low mood reduced during the mindfulness course. That gains were largely constrained to the taught course period indicates that the mindfulness sessions were likely to have been a key component.

Other antenatal mindfulness studies have inconsistent effects on mindfulness and positive affect. Woolhouse et al. (2014), Goodman et al. (2014), and Duncan and Bardacke (2010) reported post-

intervention increases, albeit with longer practices; Byrne et al. (2014) and Vieten and Astin (2008) reported non-significant effects; and Guardino et al. (2014) did not report mindfulness. Duncan and Bardacke (2010) reported significant improvements in positive affect, whereas Vieten and Astin's (2008) intervention did not generate improvement in positive affect. This indicates that Mind the Bump was at least as effective as higher-dose antenatal mindfulness-based interventions in improving trait mindfulness and positive mental health.

The women's baseline characteristics suggested that there was room for improvement in negative aspects of mental health, but the intervention was not related to any improvements in antenatal stress, distress, depression, or anxiety. This might reflect a recent review's conclusion that the current evidence base is not sufficient to assert that mindfulness-based interventions improve perinatal mental health (Hall et al., 2015). Nonetheless, the reviewed studies report significant improvements in anxiety, negative affect, depression, maternal self-efficacy, and fear of childbirth, although the implications are limited by the inconsistent measures, small samples, and different target problems and populations (Byrne et al., 2014; Dimidjian et al., 2015; Duncan & Bardacke, 2010; Goodman et al., 2014; Guardino et al., 2014; Vieten & Astin, 2008; Woolhouse et al., 2014).

The effectiveness of mindfulness-based interventions appears to be higher when they are tailored to a specific problem. For example, Mindfulness-based Cognitive Therapy is consistently more effective in preventing relapse in its target audience of people with three or more episodes of depression than people with fewer depressive episodes (Piet & Hougaard, 2011). We can therefore expect antenatal mindfulness programmes tailored to specific antenatal mental health conditions to be more effective than the non-clinical Mind the Bump programme, but it was disappointing that negative aspects of mental health were not alleviated, as poor mental health appears to be a key factor in the adverse antenatal health behaviours the intervention hoped to improve (Blalock et al., 2005; Crawford-Williams et al., 2015; McCormick et al., 1990; Strandberg-Larsen et al., 2008; Vaz et al., 2014).

Benefits of the intervention

Given that this was a relatively low dose mindfulness intervention, it was encouraging to find that mindfulness and positive aspects of mental health improved. The implication is that 10 to 20 minutes of irregular mindfulness practice has potential for beneficial effects on pregnant women's wellbeing. The qualitative feedback indicated that mindfulness practices were used to alleviate stress and anxiety, and that they were thought to protect mental health, particularly after child birth. Women reported

feeling more calm and relaxed, and that some women considered mindfulness practice to be a useful resource with potential long term benefits. It was also encouraging that the intervention was generally regarded as being useful, interesting, and enjoyable, although women who had lower expectations at baseline were more likely to withdraw or attend too few sessions to be counted as completing the intervention.

That the mindfulness practices were seen as a resource to cope with aversive thoughts, emotions, and physical sensations suggests that some women developed a greater capability to ameliorate and/or accept unwelcome experiences, and to moderate emotional reactivity. Particularly notable was that mindfulness techniques were deployed to stop low mood and worries from descending into anxiety, and were felt to be protective against postnatal depression. Although negative mental health was not significantly alleviated, this feedback suggests that the mindfulness techniques afforded some protection against deteriorating mental health. However, it was not possible for this exploratory feasibility study to ascertain the typical trajectory of antenatal mental health, and so this implication is cautious.

It was apparent that some women were aware of the benefits of practicing, and enjoyed the classes and the practices themselves. This suggests that mindfulness practices could become intrinsically motivated, and supports Ryan and Deci's (2000) proposal that a conjunction of enjoyment and recognising benefits creates internalised motivation to autonomously repeat an activity. Although the focus of the intervention was on the period prior to birth, a number of women expected that the mindfulness techniques and attitudes would be useful during labour and the transition into parenting, and some women who had given birth at week 16 reported that they were a valuable resource. This suggests an increase in psychological capability factors of resilience and maternal self-efficacy, also reported by Byrne et al.(2014). Similar themes of empowerment and the practical utility of mindfulness techniques were reported by parents who took part in childbirth-focused mindfulness-based programmes (Duncan & Bardacke, 2010; Fisher et al., 2012), and it is interesting that the same benefits could accrue from Mind the Bump, as it was lower-dose and not overtly about childbirth or parenting.

The apparent increase in competency and confidence to cope with the challenges of parenting and day to day life suggests that the women's self-determination may have increased. Self-determination is a three-component model which proposes that autonomy, competence, and social connectedness are

key aspects of psychological growth (Ryan & Deci, 2000), and Brown, Ryan, et al. (2007) propose that self-determination integrates well with the reflective, self-aware, and self-regulation aspects of mindfulness.

That the group was felt to be a source of support, shared wisdom, experience, and a source of motivation to maintain practice fulfils the social connectedness aspect of the self-determination model. It would be interesting to explore this further, as it appears that the group structure of the mindfulness course provided both opportunity to develop competency in mindfulness skills, opportunity for social connection with like-minded women, and motivation to practice. This reflects findings in previous non-clinical antenatal mindfulness intervention studies, such as Fisher et al. (2012) and Woolhouse et al. (2014), and the suggestion in chapters one and five that the group nature of an intervention might be a factor in behaviour change.

The implication that peer support was an extrinsic motivator for practice is interesting as mindfulness practice is, by its nature, an internal and unobservable activity, although shared experience is fundamental to mindfulness training. A number of women reported that they missed the connection with the group after the course, and some continued to meet. Social cohesion and friendship often arises in pregnancy exercise and antenatal groups (NHS, 2010). It is not possible to say which, if any, part of the gains in psychological health could be attributed to making friends with other pregnant women and which was due to the intervention. It would be interesting to evaluate this in future research.

Barriers

It was clear that Mind the Bump was not a good fit for everyone who took part, but this was as expected. The appeal and effectiveness of mindfulness training varies from person to person (Dobkin, Irving, & Amar, 2012a; S. L. Shapiro et al., 2011) and goodness of fit is a crucial factor in health behaviour change interventions (Michie et al., 2014).

There were psychological barriers to engagement in mindfulness practice, including a tension between the self-accepting ethos of mindfulness and feeling guilty about not practicing. The practices that focused on negative experiences seemed to be particularly counter-intuitive for women who were aiming to develop a greater sense of calm and relaxation. However, mindfulness training includes a portfolio of practices, culminating in exercises that have potential to cultivate the psychological

capability to work with difficulties. There was no compunction to repeat these practices if they were aversive, but non-engagement in this aspect of the course may have contributed to the lack of effects on negative mood.

The practical time and fatigue obstacles to practicing mindfulness are also typical challenges in antenatal weight management interventions for obese women (Olander & Atkinson, 2013), but this is the first study to find that these physical capability and opportunity factors are also barriers to mindfulness practice during pregnancy. The women employed a number of practical strategies to create opportunities to do mindfulness practice, to exercise and to eat well, and focusing on self-care supported the achievement of exercise and diet goals. Suggestions about what might improve the intervention included more resources, such as follow-up classes, inviting partners to a session, and a bank of practices. This implies a desire for continuing motivation and opportunity to practice, and to support this by recruiting partners into practicing and/or understanding mindfulness.

In all, the mindfulness course appeared to be acceptable, and it appeared to have potential to support psychological capability, social opportunity, and intrinsic and extrinsic motivation in the context of mindfulness practice. It was not associated with capability, opportunity or motivation changes in its primary target of health behaviours (Michie et al., 2011). It may be that the multi-target approach of the intervention was overambitious and, if women tend to make decisions about lifestyle changes as soon as they know they are pregnant, pre-pregnancy would be a more effective time to intervene.

Comparison to APEASE criteria

Taking these findings in conjunction with the preceding chapter's practical feasibility outcomes indicated that it was possible to recruit pregnant women to take part in the Mind the Bump intervention, that it could be delivered as written and retain the majority of participants, that it was low risk, but that it did not improve maternal health behaviours. It was a poor fit with APEASE criteria (Michie et al., 2014), which means that it was not implementable in its current form.

8.4.1 Comparison with the Logic Model

Considering the outcomes in comparison to the logic model in Figure 5.1, it appeared that some predicted outcomes occurred. It was not clear if motivation for health behaviours changed, although behaviours did not deteriorate. The qualitative feedback suggested that there were some

improvements in self-care. Increases in mindfulness indicated increased acting with awareness, and there was some suggestion of increased cognitive flexibility. Subjective wellbeing aspects of mental health improved, but clinical symptoms did not, so there was no evidence of substantive gains.

There were indications that emotional regulation improved, but that regulating exercise and diet was challenging. There were indications of learning to deal with stress using mindfulness, but the drop-off in practice in the self-led period suggests that it did not become a habit. There was awareness of gains from mindfulness practice, but also awareness of the negative impact of pregnancy on physical activity and sometimes diet. There was evidence of connectedness, peer support, and new friendships.

However, there were no indications that the proposed short term impacts occurred, other than motivation for self-care, and no evidence of improvements in health behaviours. The lack of control group means that there is no basis for comparison to normal change.

Reviewing the outcomes against the anticipated impacts (Table 7.6) indicated that there were some psychological changes, but that they did not manifest in health behaviour change. There was no convincing evidence of improved knowledge about risks, of this translating into behaviour change, or of goal setting manifesting in improved health behaviours. Training did appear to improve positive aspects of mental health, but not to alleviate negative aspects, although there was evidence of using practical mindfulness skills to cope with difficulties and that this may have protected against deteriorating mental health. There was some evidence of enablement to find opportunities to exercise, but sedentary women did not become more active. Modelling was not measurable, but there was evidence of the women becoming more mindful. There was some evidence that the intervention may have improved self-determination.

8.4.2 Limitations

The a priori decision to use a mindfulness-based intervention meant that the MRC, NICE and BCW's recommendations for developing interventions were not fully implemented (Michie et al., 2014; MRC, 2000, 2008; NICE, 2007, 2014b).

Recruitment

This study was limited by recruitment, which deviated from protocol in that one group was bigger than the other, and that the groups were sequential rather than parallel. This led to inconsistencies in weather-related opportunities to exercise and to venue changes. The cohort was a distinct socio-demographic subsample with little potential for health behaviour gains other than for cutting out

alcohol. Eleven women were adhering to UK guidance for health behaviours at baseline, although the screening process asked about health behaviours.

Conducting the feasibility study on university premises may have deterred women who were not graduates. Recruitment may have been different if the study had been conducted in community settings. The analysis was constrained by retention at each time-point, and neither non-completers nor the 10 women who had given birth at week 16 were excluded from the analysis.

Choice of measures

The choice of measures was constrained to free-to-use measures, and by considering the burdens of time and potential distress. All the women completed the baseline and week 8 measures, no women reported being distressed by the questions. Four women did not return the week 16 survey. All were still pregnant, which suggests that the measures might not have been suitable to late pregnancy. The choice of measures may have affected the outcomes.

Recall and/or social acceptability bias may have affected the data. The idiosyncratic measures may have been inappropriate.

Exercise

Whilst the PPAQ is a reliable and valid pregnancy-specific activity measure (Chasan-Taber et al., 2004), it is not designed to assess adherence to hours-based UK guidance.

Overcoming the problem of self-reported activity data would require the collection of objective activity data using a pedometer or accelerometer, although this may be invasive over a 17-week period. Nonetheless, the potential benefit of ongoing activity monitoring is that it provides feedback to participants and recorded data to researchers (van Hees et al., 2011). It might support the monitoring and feedback behaviour change technique (Michie et al., 2013), which appears to contribute to the effectiveness of gestational weight gain interventions (Soltani et al., 2016).

A caveat is that pedometers measure steps and accelerometers measure dynamic movement around axes. This does not capture all activity, whereas the self-reported PPAQ includes active and sedentary periods (Chasan-Taber et al., 2004). The research questions in this project concerned adherence to moderate activity guidance, meaning that accelerometer data might have been a good fit.

However, pregnant women appear to be more amenable to monitoring their activity levels through self-report than with accelerometers, although women who value health are more likely to maintain accelerometer use (Rousham et al., 2006). Paper-based methods were acceptable (Bowling & Ebrahim, 2005), but the recent advent of app-based methods may have superseded this as app-based self-monitoring appears to be more acceptable and effective than paper diaries (Burke et al., 2011; Carter et al., 2013). The acceptability and effectiveness of apps may vary between individuals, but higher adherence to a smartphone weight app was associated with greater weight loss in 7,633 overweight men and women (Jacobs, Radnitz, & Hildebrandt, 2016). The acceptability of app-based approaches to self-monitoring during pregnancy could be assessed in future studies.

Diet

The idiosyncratic diet measure did not detect overeating, and this may account for the disparity between these women meeting the eligibility criteria at screening and high adherence to guidance at baseline. It would have been useful to provide an open text box for women to comment on their eating. A repeated food frequency questionnaire may have provided more detailed and useful data, but this was considered too burdensome.

The diet scale was a simplistic *all days to never* scale on frequency of “healthy, balanced” diet, elements of the Eatwell Plate, including “five a day”. It may have been more useful to ask women to rate their agreement with statements about diet using *very infrequently to very frequently* Likert scales, and /or to use the self-determination of behaviour scales (Treatment Self-Regulation Questionnaire (C. S. Levesque et al., 2007)) to assess any changes in perceived control and intrinsic motivation for health behaviours.

Alcohol

The reliable and valid AUDIT-C alcohol measure (Bradley et al., 2007) was suitable to detect drinking, but not to identify units of alcohol; the score was converted to approximate units. Given that the women made notes on the survey to indicate lower and more occasional drinking, it would have been useful to provide open text boxes to collect data on low level, occasional drinking, and reasons for it.

Smoking

The smoking measure was idiosyncratic, but no women reported smoking during the intervention, so there was no impact on the data.

Mindfulness

The short form of the FFMQ (Bohlmeijer et al., 2011) may have been less sensitive than the full version (Baer et al., 2008), although the full version may have increased the participant burden. Other measures of mindfulness, such as the MAAS (Brown & Ryan, 2003), may have resulted in different outcomes.

Mental health

The study collected data on mental health using valid and reliable measures, including the subjective wellbeing and stress measures employed in study one, and pregnancy-specific distress and depression scales. Each measure had been used in previous antenatal studies, but other measures may have detected unrecorded changes. Neither of the compassion scales were validated beyond the original studies, and Williams, Dalgleish, Karl, and Kuyken (2014) recently concluded that the Self Compassion Scale is not sufficiently robust in the context of mindfulness-based interventions.

A caveat to these suggestions is that additional and/or objective measures might impact on the ethical consideration of participant burden (chapter two). It might be necessary to remove some of the current measures, and/or to focus on specific behaviours. This could be contrary to the objective of investigating whether mindfulness training has any potential to change a range of maternal health behaviours in lower risk women.

Post-intervention semi-structured interviews might provide an approach to obtaining more nuanced understanding of what, if anything, changed, and why. This approach was not considered to be feasible in the current study as I delivered the intervention, which increased the likelihood of respondent bias.

Biases

The reliance on self-report means that the outcomes may be inaccurate. Although the questionnaires were anonymous, they may have been subject to social desirability bias. The responses may have been subject to response bias because I taught the course and developed relationships with the women.

Feedback was not gathered from women who withdrew, meaning that negative experiences may be under-reported. There was no control group, meaning that any suggestion that the intervention may have protected activity levels and mental health is highly speculative.

Using repeated measures without a control group increased the likelihood of not detecting regression towards the mean. This might account for some of the changes in psychological scores, which emphasises the importance of interpreting the outcomes with caution.

As the intervention developer, mindfulness teacher, and researcher, I was aware of my biases towards mindfulness and to the outcomes of the intervention. My relationships with the women may have been biased by their attendance and engagement in the course. It was not possible to suppress my recognition of individual women when analysing the data, although this occurred after the self-led periods concluded. A greater focus on alleviating negative aspects of antenatal mental health might have had greater potential to improve antenatal lifestyle, but this was beyond my professional capability.

Family wise errors

Multiple testing may have resulted in Type I errors (false positives), and non-parametric tests may have failed to detect genuine changes (Type II errors), meaning that the results should be interpreted with caution. The potential effects of FWERs are discussed in 3.4.2.

Professional competency

A further limitation is that I should not have been teaching mindfulness to the women with clinical mental health scores, and that I was not aware of their clinical levels of distress and depression.

Inconsistent delivery of the intervention

I followed the session plan and delivered the core content. However, as each session was taught twice each week during each course, and the intervention was taught twice, my delivery changed as I learned to improve the timing and learned more about the women's experiences of being pregnant. I responded to the apparent needs and interests of the women in each session, rather than being dogmatic about repetitive delivery. The strength of this is that I was able to assess whether it was possible to deliver each session to four times to different groups with different on-the-day needs and interests. The weakness is that aspects of the delivery were inconsistent.

This is typical of teaching mindfulness, as some of the psycho-education aspect is based in participants' accounts of their experiences of practicing and day to day life. It may also be typical to feasibility testing, as the MRC (2008) guidance for developing complex interventions recognises that providers

become more experienced, and that they individualise the intervention to meet participants' needs during the piloting stage. However, lack of consistent may have resulted in variations in the delivery to each woman.

Lack of control group

The limitation of not knowing a similar group's trajectory of mindfulness, psychological health, and health behaviours during pregnancy might be addressed by having a matched control group. The decision not to have one was determined by the ethics of not being able to offer an intervention which might have improved mental health and/or health behaviours to a control group within the pregnancy period, and anticipated practical challenges in recruiting a matched pregnant control group. Moreover, an objective of this study was to evaluate the feasibility of recruitment, retention, adherence, acceptability, costs, and safety, which does not require a control group.

8.4.3 Implications for future studies

Controlled study with a general population group

A potential solution to the control group limitation might be to adjust the intervention in response the outcomes of the current study, remove the pregnancy-specific elements, and to evaluate it in a non-pregnant community sample of women with a matched control group. The control group could be offered the programme after the intervention group. This approach might indicate whether the intervention has any potential to improve health behaviours, or capability, opportunity, and motivation mechanisms of change, before exploring future iterations with women who are planning pregnancy or who are pregnant.

Revisiting goals

It may be useful to include steps to revisit and adjust goals on a regular basis. This might reduce any disparity between early intentions and current capability to meet them. This might maintain perceived behavioural control and self-efficacy, which are associated with behaviour change, illustrated in Table 1.2 and the logic model in Figure 5.1.

Evaluating the effect of the group

Chapter five identified the group as a potential factor in the effectiveness of mindfulness-based interventions, and the qualitative data suggested that this was the case in the current study. It may be that the group effect was associated with the apparent psychological gains. Collecting exploratory quantitative data on the effect of taking part in a group-based intervention might help to identify mechanism of change. This should be assessed in future studies.

8.5 Conclusion

This chapter completes step five of the project by reporting the indicative effectiveness and acceptability aspects of whether mindfulness training was feasible behaviour change intervention for pregnant women. Mind the Bump appears to have limited feasibility and it is not implementable in its current format.

The intervention was acceptable, and appeared to be related to gains in mindfulness and subjective wellbeing, but neither negative mood, mental health, nor health behaviours improved. The indicative effects were very much constrained by the apparent appeal of the intervention to higher socio-demographic status women who were already health conscious. There were many limitations to the study.

As Mind the Bump did not alleviate stress or distress, the study did not provide evidence to confirm or discount the proposal that improving negative aspects of mental health might improve antenatal health behaviours. If, as tentatively suggested, the intervention has some potential to protect against deteriorating health behaviours and mental health during pregnancy; this may be a promising development in finding effective ways to improve women's health behaviours and mental health during pregnancy. However, there is probably more potential in addressing these issues prior to pregnancy.

9

Chapter Nine: Integrating the findings.

9.1 Introduction

The overarching aim of this project was to explore whether mindfulness training had any potential to improve women's health behaviours during pregnancy. There were two principal research questions:

To what extent is trait mindfulness related to women's health behaviours during pregnancy?

Is mindfulness training a feasible behaviour change intervention for pregnant women?

The project met the overall aim in a series of five steps, employing two original research studies in a mixed methods design. The analysis of each study was conducted separately, and the results are presented in the preceding chapters. This chapter is step six of the project. It integrates the findings of the preceding chapters, and aims to present an overall discussion of the work presented in this thesis.

9.2 Overview of the project

The first step (chapter one) of the project identified the problem of non-adherence to UK guidance for maternal health behaviours, including physical activity, diet, alcohol, smoking, and body mass index (BMI) at conception. A review of the maternal health behaviour literature considered how known factors in non-adherence fit within the capability, opportunity, and motivation model of behaviour (COM-B) (Michie et al., 2014). This process identified factors which might be amenable to change including psychological capabilities such as mental health, coping strategies, and self-regulation; social opportunities such as peer support; and reflective and automatic motivations such as risk appraisal, goals, self-efficacy, self-care, beliefs, and habits. It also identified factors in health behaviours which are not easily amenable to change, such as time, income, local social norms, and the physical effects of pregnancy.

A review of the mindfulness literature identified emergent evidence of relationships between trait mindfulness and health behaviours. It discussed the potential of mindfulness-based interventions to impact on health behaviours and on the psychological capabilities, social opportunities, and reflective and automatic motivation factors in maternal health behaviours. Whilst mindfulness training had not been assessed in the context of maternal health behaviours, there were some indications that it can impact on maternal mental health, coping, self-care, and emotional self-regulation.

The review raised three questions: whether trait mindfulness is related to maternal health behaviours, whether it is related to antenatal mental health, and whether a mindfulness-based intervention might have some potential to alleviate adverse maternal health behaviours.

Step two of the project (chapters three and four) aimed to answer the first two questions. It found that trait mindfulness, as measured by the short form of the Five Facet Mindfulness Questionnaire (FFMQ-SF) (Bohlmeijer et al., 2011), was not related to maternal health behaviours. However, trait mindfulness was related to maternal mental health, and to intention, confidence, and temptation for maternal health behaviours, i.e. psychological capability and reflective and automatic motivation. The study also identified risk prevalence and the extent to which risk behaviours co-occurred.

The next step (chapter five) discussed the theory and evidence for the mechanisms by which mindfulness training impacts on mental health and health behaviours. Mindfulness training's fit with behaviour change theories, particularly the Behaviour Change Wheel (BCW) (Michie et al., 2014), was considered. These processes culminated in a COM-B framed logic model of how mindfulness training might impact on maternal health behaviours. The various domains of the hypothesised intervention were mapped against the BCW's intervention functions and implementation criteria.

Step four (chapter six) developed the Mind the Bump intervention. Various mindfulness programmes were reviewed for best fit and adaptability to the context of pregnancy and behaviour change. Mindfulness, A Practical Path to Finding Peace in a Frantic World (MaPP) (Williams et al., 2013) was selected. The MaPP programme was tailored to pregnancy by adapting and adding to the mindfulness-focused content. It was tailored to behaviour change by integrating behaviour change techniques: knowledge about maternal health behaviours, goal setting, and self-monitoring. The intervention's functions, behaviour change techniques, and mode of delivery were identified according to the BCW's intervention functions, taxonomy of behaviour change techniques (BCTT v.1), and modes of delivery. Mind the Bump's anticipated impact on maternal health behaviours and mindfulness practice was mapped against COM-B (Michie et al., 2014).

Step five (chapter seven and eight) was the feasibility evaluation of the intervention. The first chapter focused on recruitment, participants' characteristics, retention, adherence, costs, and safety. The intervention was feasible in terms of numbers recruited, retention, and safety. However, the participants tended to be highly educated women in settled relationships who planned their pregnancies and were reasonably adherent to health behaviour guidelines. Adherence to mindfulness

practice recommendations and self-monitoring recommendations were low. The per capita material and delivery costs were low, but one-off development costs were high.

Chapter eight focused on the impact of the intervention on health behaviours and mental health, and on the women's opinions of the intervention. There was no impact on maternal health behaviours. Individual adherence to exercise guidance did not improve, although there was a small increase in average activity time. Diet was generally healthy at baseline and did not improve. Average alcohol consumption increased slightly, although it remained within guidance.

There was impact on mindfulness and mental health. There was a significant increase in trait mindfulness and in positive aspects of maternal mental health. Negative aspects of mental health did not change significantly. It was not possible to evaluate whether the lack of change in health behaviours and negative mental health was related to low adherence to key components of the intervention (mindfulness practice and self-monitoring). Nor was it possible to evaluate whether the lack of change in maternal health behaviours was related to the lack of change in negative mental health.

The acceptability of the intervention was moderate to high. As expected, the intervention was a better fit for some women than for others. Initial credibility ratings, inclination towards mindfulness practice, and compatibility with existing goals appeared to be relevant factors. Thematic analysis of written feedback suggested that there were capability, opportunity and motivation factors which hindered health behaviour goal achievement and mindfulness practice. Practical and physical barriers to exercise were consistent across women with normal and higher BMI. It was evident that COM-B factors which can hinder exercise can also impact on diet and mindfulness practice. Nonetheless, benefits accrued on various dimensions, including ability to self-care and to achieve calm and relaxation, greater resilience to low mood and reductions in discrepancy-based processing (wishing things were different), and greater confidence to manage the challenges of childbirth and parenting.

In all, the Mind the Bump intervention was feasible in terms of recruitment, delivery, safety, and acceptability, but it was not feasible in terms of its impact on maternal health behaviours. It did not appear to be equitable, as the volunteer sample did not include women from diverse socio-economic backgrounds, or with higher levels of non-adherence to UK guidance for maternal health behaviours. This may mean that the intervention's recruitment potential is limited to more educated, affluent women with planned pregnancies and generally healthy lifestyles.

The answer to the first research question “*to what extent is trait mindfulness related to women’s health behaviours during pregnancy?*” was trait mindfulness was not directly related to women’s health behaviours during pregnancy. However, trait mindfulness was related to psychological capability and health behaviour motivation.

The answer to the second research question “*is mindfulness training a feasible behaviour change intervention for pregnant women?*” was the current intervention was not feasible. The principal problem was that it did not impact on maternal health behaviours even though there was scope for improvement in some women’s exercise and for reductions in some women’s alcohol consumption, and that adherence was low.

Strengths of the project

This project took a novel approach to understanding and intervening in maternal health behaviours. It approached maternal health as a whole, rather than focusing on individual health behaviours or mental health. This is the first project to try to intervene in maternal health behaviours by combining mindfulness training with behaviour change techniques, and to develop a mindfulness-based maternal behaviour change intervention using the BCW (Michie et al., 2014). A such, it is the first project to specify a mindfulness-based intervention according to the BCW’s BCTT v.1, and to consider its potential mechanism of change according to the BCW’s COM-B, Theoretical Domains Framework (TDF), intervention functions, and Implementability criteria. A strength of the project is that this process conformed with the MRC (2000, 2008) and NICE (2007, 2014b) guidance to theorise and specify novel behaviour change intervention.

The BCW framed approach of this project adds to recent work on maternal health, including recent identification of COM-B factors in obese women’s barriers to engaging in exercise and weight management interventions, and socio-economically disadvantaged mothers infant feeding beliefs and behaviours; the retrospective identification of the elements of effective gestational weight gain and exercise interventions according to the BCTT v.1; and the COM-B framed development of an online intervention to reduce diabetes risk in post-partum women who suffered gestational diabetes (Atkinson et al., 2015; Currie et al., 2013; Handley et al., 2016; Michie et al., 2011; Olander, Darwin, et al., 2015; Russell et al., 2016; Soltani et al., 2016).

The project had good ecological validity, as the studies were conducted with pregnant women. Although recruitment into the first study was not sufficient to test for small differences in mindfulness between higher and lower risk behaviour groups, recruitment into the intervention study was sufficient to conduct feasibility testing.

Limitations of the project

The project was limited by non-representative samples, as it tended to recruit women with higher social-demographic characteristics and higher adherence to maternal health behaviours guidance. The indicative effects of the feasibility study were constrained by the women's generally good adherence to UK guidance for maternal health behaviours, and inability to compare the indicative outcomes of the intervention to the normal trajectory of maternal health behaviours, mindfulness, and mental health.

The reliability and generalisability of findings were limited by multiple testing on self-report measures, some of which were idiosyncratic. Whilst it is important to consider the burden of completing long questionnaires, the survey data and analysis were constrained by the lack of clinical mental health measures and reliable and valid motivation measures. Similarly, the intervention study data and analysis were constrained by idiosyncratic rather than Likert scale frequency measures.

The project was limited by lack of expert verification of the mapping of health behaviours, mechanisms, and the intervention to the various BCW components, and by lack of consultation with experienced intervention developers. Nonetheless, this project contributes to a nascent field, and may provide a basis for other researchers to consider mindfulness training, maternal health behaviours, and behaviour change interventions.

9.3 Contributions to knowledge about maternal health behaviours.

Trait mindfulness and maternal health behaviours

This is the first study to indicate that that trait mindfulness was related to higher subjective wellbeing, lower perceived stress, and health behaviour motivation during pregnancy. A caveat is that motivation may have reflected actualised behaviours rather than early intentions, and the measures may have been inadequate. It is the first study to demonstrate that more affluent, university-educated pregnant

women appear to have higher trait mindfulness, which might suggest that MBIs are a better fit for this group.

The feasibility of a mindfulness-based behaviour maternal behaviour change intervention

The intervention study was the first to demonstrate that it was feasible to recruit and retain pregnant women into an eight-week mindfulness-based behaviour change intervention with an eight week follow up period, and that the intervention was acceptable. It illustrated that increasing mindfulness and positive aspects of mental health did not improve maternal health behaviours, although there were tentative indications that the intervention protected negative aspects of mental health and health behaviours from deteriorating. The project suggests that there may be more potential to improve women's health behaviours prior to pregnancy but, given that half of pregnancies are not planned, this limits the scope to recruit into pre-pregnancy "get fit first" interventions.

Prevalence of maternal health risk behaviours

This project found that 79% of women did not adhere to one or more of UK maternal health behaviour guidance (hours of moderate exercise per week, Vitamin D supplementation, normal range BMI at conception, no alcohol, no smoking). 59% of the women in the cross-sectional study took Vitamin D, which exceeded the 42% reported in the 2010 Infant Feeding Survey (HSCIC, 2012b). This may mean that awareness and adherence to this recommendation is increasing, although White British or Irish women were less likely to adhere to the Vitamin D guidance than women from other ethnic backgrounds.

39% had concurrent risks, and the most common cluster was insufficient activity plus overweight/obese BMI at conception. Concurrent health behaviour risks were more common in multiparous women and in women who reported lower subjective wellbeing. However, drinking and smoking did not co-occur, which reflects the non-representative sample and may reflect reporting biases.

9.4 Using the the Behaviour Change Wheel to develop a mindfulness-based maternal health behaviour change intervention

My experience was that the BCW and attendant COM-B, BCTT v1, and TDF provided valuable guidance on how to conceptualise and identify factors in maternal health behaviours, to identify potential

theoretical and practical mechanisms of change, and to develop and specify the intervention. Its steps are clearly specified, and it allowed flexibility. The BCW does not currently include guidance on feasibility testing, but it provided a foundation from which to apply the NICE and NIHR feasibility criteria (NICE, 2007; NIHR, 2015).

A caveat to the application of the BCW is that Ogden (2016a) raises concerns that systemising intervention development might hinder flexibility and not acknowledge variation between theories, practitioners, and participants. This may mean that a “one size fits all” approach to health behaviour change limits impact, and that interventions should be flexible to the needs of individuals. However, if, as Ogden (2016a) suggests, the individual should be at the heart of an intervention, then Mind the Bump’s appeal to a distinct group of women is not a meaningful challenge to the BCW’s equity criterion. Nevertheless, it is important to consider the individual needs of pregnant women, whilst also considering whether targeted or universal interventions are a better way to intervene in specific problems in an effective and cost-effective way. The following section considers what might be learned from other effective interventions.

9.5 Comparing Mind the Bump to other interventions

Although the potential of Mind the Bump to impact maternal health behaviours was constrained by the baseline characteristics of the women who volunteered to take part in the study, there was some potential to reduce drinking and increase exercise. Pregnancy factors appeared to impede the latter, but it would be useful to consider how Mind the Bump differed from effective mindfulness-based behaviour change interventions. A challenge is the limited amount of evidence on the impact of mindfulness-based interventions on health behaviours. This might be because it is an emergent field, or it might reflect publication bias towards effective interventions. Nonetheless, there are indications that tailored MBIs can improve targeted health behaviours in people who are ready to change, including smoking (de Souza et al., 2015), prevention of weight gain (Timmerman & Brown, 2012), and cutting down on sugary snacks (Arch et al., 2016; Jenkins & Tapper, 2013). Whilst different in focus to the current study, mindfulness-based relapse prevention (MBRP) appears to reduce the likelihood of relapse into drug and alcohol use post-rehabilitation (Witkiewitz & Bowen, 2010; Witkiewitz, Bowen, Douglas, & Hsu, 2013).

Mindfulness-based smoking cessation interventions are derived from MBRP (de Souza et al., 2015), and diet-focused interventions include MBRP’s “urge surfing” technique (Timmerman & Brown, 2012).

The review in chapter one did not identify literature on mindfulness-based interventions for exercise or non-dependent drinking, and it may be that other types of interventions have more potential in these contexts.

Analysing how effective behaviour change MBIs match to the BCW's behaviour change techniques, intervention functions, and theoretical domains, per Soltani et al.'s (2016) approach to gestational weight gain interventions, might offer some insight into how MBIs can impact on health behaviours. The MBRP course is manualised (Bowen et al., 2011), and it may be possible to obtain the protocols for other effective MBIs. A "what works" analysis could inform adaptation of Mind the Bump and/or the development of other mindfulness-based behaviour change interventions, and identify the effective combinations of mindfulness practices, mindfulness-focused techniques, and behaviour change techniques. Mind the Bump's weighting towards developing a mindfulness practice was illustrated in Table 6.5. It may be that BCTs need to be centre stage in order to have greater potential to impact health behaviours, with mindfulness practice as the supporting act.

It is not possible to compare Mind the Bump to other types of maternal health behaviour Interventions because they tend to aim to reduce smoking or to support obese women to manage their weight gain. Mind the Bump was not effective in either context because the single pre-pregnancy smoker had quit at baseline and the three obese women who volunteered to take part either withdrew or did not complete the programme. The participants' feedback included some suggestions as to how the intervention might be improved; the following section expands on this.

9.6 Changes which might improve the impact of Mind the Bump

Knowledge: Health behaviour guidance

That the women with obese range BMI withdrew from or did not complete the raises the question of whether they were marginalised by the intervention and/or by their perception of the opinions of the predominantly normal range BMI participants. Chapter one considered the marginalisation of obese women, their perceptions of treatment and attitudes towards them during pregnancy, and health care professionals' views on obese pregnant women (Furber & McGowan, 2011; Lindhardt et al., 2013; Mulherin et al., 2013).

Qualitative feedback received from one participant made it clear that her disengagement from the intervention was triggered by the weight management guidance. Increasing awareness through

providing information may have had unintended consequences of triggering guilt about potential impact on the baby and the stigmatisation of obesity (Arden et al., 2014). This problem might be overcome by asking participant panels about acceptable ways of discussing weight management in community interventions.

Health behaviour goals

Given the apparent impact of pregnancy on capability and opportunity to exercise, it appears that regularly reminding, revisiting and feeding back on lifestyle goals and self-monitoring would be an important step in optimising the potential of the intervention to improve maternal health behaviours.

Self-monitoring

Low adherence to recommendation to the self-monitoring aspect of the intervention may have constrained health behaviour change. Monitoring and feedback are described as “the cornerstone of behavioural treatment for weight loss” by Zheng et al. (2015), and are key components of effective gestational weight management interventions (Soltani et al., 2016). App-based self-monitoring is superseding paper-based methods in the general population (Burke et al., 2011; Carter et al., 2013; Jacobs et al., 2016), and can offer instantaneous feedback. Automatic activity trackers and/or smart phone apps might improve self-monitoring and increase the potential to impact behaviours. A caveat is that, although self-monitoring appears to be generally effective and acceptable, this may be confined to people who are ready to change their behaviours, who see improvements from early in the intervention, and do not feel marginalised by their health behaviours.

Mindfulness practices

A recent study indicated that priming self-compassion or secure attachment in first-time engagers in mindful meditation increased willingness to participate in a mindfulness training course (Rowe, Shepstone, Carnelley, Cavanagh, & Millings, 2016). Whilst being cautious of coercion, priming self-compassion or secure attachment to the baby or another person at the beginning of a mindfulness course might have supported engagement in the potentially challenging experience of establishing and maintaining a mindfulness practice.

A lesson from the study was that there may be tension between how participants conceptualise mindfulness as a way to relax and accept things as they are and struggling to achieve formal mindfulness practice and/or lifestyle goals. Increasing the amount of informal practices such as

mindful eating, mindful walking, and “urge surfing” techniques for resisting temptation might integrate more easily with normal daily activities, and reduce this tension.

Supporting materials

Changing the accompanying book to one that is tailored to mindfulness during pregnancy might have greater potential to engage women in regular practice. The recent pregnancy-specific meditations on the existing Headspace app and accompanying book, “The Headspace Guide to a Mindful Pregnancy” (Puddicombe, 2015) may be a more suitable companion to Mind the Bump than the Mindfulness, a Practical Guide to Finding Peace in a Frantic World (Williams & Penman, 2011). Not only is the programme tailored to pregnancy, the app is less repetitive than the MaPP CD, and may be more likely to create and sustain engagement in home practice.

Format: Mode of delivery

Although the taught course was preferred to the self-led part of Mind the Bump, an online or book-based intervention may be more accessible. This option would preclude the need for teacher training, and is likely to minimise per participant costs once development costs were met. Another option would be to integrate online and taught sessions. Further research is required on the optimal format.

Timing

A maternal behaviour change intervention (of any type) may have more potential if they are delivered prior to or early in pregnancy. Rescheduling the intervention so that it includes regular monthly meetings throughout pregnancy could reinforce pre-pregnancy or early pregnancy mindfulness practice and strategies to optimise health behaviours. This option would require sessions to be led by mindfulness teachers, and there are costs associated with their training. However, it might be less costly than an eight-week taught course, and maintaining contact with the trainer throughout pregnancy may ameliorate the mindfulness practice drop-off seen in this study.

Whilst implementing all these suggestions might improve the potential of an intervention like Mind the Bump to impact on maternal health behaviours, the project raised some interesting questions about maternal health, mindfulness, and interventions. The following section identifies these questions and suggests future studies.

9.7 Suggestions for future studies

Mindfulness: Does mindfulness training have any potential to improve health behaviours?

An investigation of whether trait mindfulness is associated with adherence to UK health behaviour guidance would be a useful addition to this field, and might indicate whether MBIs have any potential to impact on British health behaviours. It may be possible to access the large amount of data collected by Camilleri et al. (2015), although French data might not generalise to the UK population.

Investigating the extent to which trait mindfulness is stable or dynamic across time, and whether any association with health behaviours alters across transitions such as adolescence and pregnancy, as suggested by Guardino et al. (2014), would help to target MBIs at appropriate populations. A question which depends on the above is, if mindfulness is related to health behaviours:

What is the best mindfulness measure to use in health behaviour and/or pregnancy contexts?

There are diverse measures of mindfulness, which mean that it is difficult to compare mental health, health-behaviour, and maternity studies. It would be useful to investigate whether different measures of mindfulness indicate similar or different associations between a sample's mindfulness, mental health and health behaviours.

In addition to the established measures, such as the MAAS (Brown & Ryan, 2003) and the FFMQ (Baer et al., 2006; Baer et al., 2008), it may be useful to include the new nine facet CHIME measure (Bergomi, Tschacher, & Kupper, 2014). It identifies nine aspects of mindfulness (observe, act with awareness, non-judgement, self-acceptance, non-avoidance, non-reactivity, non-identity, insight, and describe), and may offer a more comprehensive way to measure mindfulness. However, the MAAS has recently been validated with a sample of 1,375 pregnant women (O' Leary et al., 2016), which may increase its use in the mindfulness and maternity field.

A further option is the behavioural measure of ability to maintain focus on breath counting (Levinson, Stoll, Kindy, Merry, & Davidson, 2014). This approach may offer a more objective way to assess ability to control focused attention. However, it is lab-based, will not capture the open monitoring aspect of mindful awareness, and is not suitable for anonymous data collection.

The 28 item Mindful Eating Questionnaire has recently been validated for pregnant women (Apolzan et al., 2016). Although it overlaps with items in the FFMQ, it may be useful in investigating maternal diet and developing interventions.

What happens in the longer term?

Mindfulness training courses and behaviour change interventions are designed as “driving lessons” to help individuals to establish a mindfulness practice or to change their health behaviours, but maintaining practice and behaviour change after the intervention period can be challenging. This project was a pre-post feasibility study. It would be useful to conduct longer-term evaluations of meditation practice and gains following antenatal and/or behaviour change MBIs. This might indicate whether these interventions have any potential for sustained effects, and identify what helps participants to maintain gains and reduce relapse.

Health behaviours: Minding the gap

Recognising potential divergence between actualised maternal health behaviours and women’s initial intentions might support tailored intervention development. This work could build on the findings about COM-B barriers to change from this study and Atkinson et al. (2015) and Olander and colleagues (2015) investigations of challenges to engagement in maternal exercise and diet interventions.

It would also be useful to identify the reason(s) for non-adherence to Vitamin D guidance. It might be due to a knowledge gap, but there may be other barriers to taking this recommended supplement.

Intervention: What difference does the group make?

There were indications that some of the women valued their Mind the Bump peer groups. Formal and informal social support are recognised BCTs (number 3.1 – 3.3), but group/peer support does not appear to feature as a potential mechanism of change in health behaviour, pregnancy, and/or mindfulness interventions. It would be useful to investigate this, particularly in comparison to digital ehealth interventions.

The following section considers what can be learned from this project in terms of intervention development.

9.8 Recommendations for other developers

Intervention development

My recommendations to anyone developing a mindfulness intervention to address health behaviours include considering using the Behaviour Change Wheel: A Guide to Designing interventions (Michie et al., 2014). A caution is that an a priori decision to use a mindfulness programme means that the BCW's bottom-up approach to intervention development may be curtailed by the standardised attention training-insight-compassion stages of mindfulness training.

I would recommend mapping effective MBIs to the BCW to identify effective ingredients, as suggested above, and considering what formal and informal mindfulness practices might integrate most easily into the target groups' daily lives. I would also recommend careful consideration of the balance of direct behaviour change techniques, such as goal setting, to the indirect mindfulness techniques, such as greater ability to tolerate urges. Regularly revisiting and revising goals may help to maintain motivation. I would advise avoiding overburdening participants with health behaviour and mindfulness practice goals, as finding oneself striving for one at the expense of another is counter to the ethos of mindfulness.

Whilst this project added BCTs to an MBI, it may be useful to investigate the reverse approach, i.e. whether adding mindfulness training to effective interventions for smoking, exercise, and weight management might sustain gains and/or reduce relapse, or whether this would overburden participants and reduce effectiveness.

I would advise developers to engage with experts during the intervention development process. I suggest undertaking a Delphi review process to attain and collate the opinion of maternal health and behaviour change experts. For pregnancy interventions, no one is more expert about what it like to be pregnant than pregnant women, and I suggest running focus groups with women who are planning pregnancy, currently pregnant, or recently pregnant to obtain their views on what might and might not form part of a feasible behaviour change intervention. I would ask them to review the intervention prior to feasibility testing. Consultation with people who are similar to the target group would be useful in other life stage and health behaviour contexts. This type of consultation may have increased the feasibility of Mind the Bump by identifying and addressing some of its weaknesses prior to feasibility testing.

Feasibility testing

The small changes in the standard deviations of the health behaviour, mindfulness and mental health scores suggest that future studies will require a larger sample to assess the impact on maternal health behaviours.

The current study was a non-controlled feasibility assessment. Whilst this is a recognised approach to an initial evaluation, a waitlist control group would have provided a basis for comparison to normal change in health behaviours and mental health. However, there are ethical issues in not offering pregnant control group participants an intervention which might have benefits to their own and their infants' health. A suggestion is to evaluate the outcomes of a novel pregnancy intervention in a non-pregnant community sample of women with a matched control group. This might be a useful step in evaluating its potential to improve health behaviours. This approach would decrease ecological validity, and pregnant women may have different incentives to optimise their lifestyle, but an intervention which does not improve health behaviours in the general population is unlikely to do so in a pregnant population.

9.9 Reflections on the process

When I began this project my belief in the potential of mindfulness training to improve maternal health behaviours was grounded in emergent evidence that mindfulness-based cognitive therapy improved mental health symptoms, mindfulness-based childbirth and parenting improved women's mental health and alleviate pregnancy and childbirth related anxieties, and mindfulness based relapse prevention improved resilience to drug and alcohol urges. My previous research on the effects of diverse meditation practices for community adults and Mindfulness in Schools Project programmes for adolescents contributed to my belief that MBIs had potential to improve mental health and behavioural and emotional self-regulation.

However, it soon became apparent that maternal health behaviours are complex, and that there is a multitude of reasons why women do not adhere to health behaviour guidance during pregnancy. Even when people are motivated and ready to change, behaviour change is challenging. This may be compounded when the body is engaged in the phenomenal, albeit normal, activity of growing another human.

Mind the Bump's balance of mindfulness training and behaviour change techniques coupled with low adherence was evidently not sufficient to impact on maternal health behaviours. To achieve behaviour change, an intervention might need to be much more focused on behaviour(s) rather than potential psychological factors. Mindfulness training might be a useful adjunct to maternal health behaviour interventions, but it seems likely that it has little potential as a standalone intervention for multiple health behaviours.

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Appendices

Appendix A: Approvals

1. NHS Trust Senior Midwifery Manager letter of approval
2. Ethics committee approvals: NRES Committee South West Frenchay; Oxford University Hospitals R & D; Oxford Brookes UREC.

Appendix B: Cross-sectional survey

1. Invitation letter
2. Information Sheet
3. Questionnaire

Appendix C: Intervention

1. Handouts
 - i. Introduction presentation
 - ii. Do's and Don'ts: Guidelines for Health Pregnancy
 - iii. Weight gain
 - iv. Pregnancy exercise classes around Oxford
 - v. Weekly handouts
2. Diary

Appendix D: Feasibility study

1. Poster
2. Information sheet
3. Screening questions
4. Invitation letter
5. Consent form
6. Socio-demographic questionnaire
7. Health behaviour, mindfulness, and mental health questionnaire
8. Feasibility questionnaire
9. Sample transcript coding

Appendices

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Oxford University Hospitals
NHS Trust



PRIVATE AND CONFIDENTIAL

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28.6.2012

Dear Hazel

RE: Associations between mood, mindfulness and health behaviours in pregnancy: a cross-sectional survey

I would like to offer my support for this study to take place within the Oxford University Hospitals NHS Trust.

However, this support is given on the condition that the study receives a Favorable Ethical Opinion from an NHS Research Ethics Committee and a full R&D Review from the Trust R&D Department before any study activity or recruitment takes place in Oxford University Hospitals Trust

In summary you have explained that this study consists of:

- Community midwives to hand out study information to pregnant women in their care who are aged 16 years or more.
- Community midwives to hand out a paper copy of the questionnaire with a FREEPOST envelope on request to participants to be returned to you.

We are aware that this study would take place at any point after September 2012, and is anticipated to take about six months to recruit 300 women.

We will provide a summary of the study findings to the community teams, and give face-to-face presentations about the study to community midwife teams as requested.

The resource use associated with this activity will be solely met by the researcher. The Data Protection implications of the study will also be reviewed before any study paperwork can be given to any potential recruits.

Please let me know if you have any questions about this letter or the R&D process.

Yours sincerely

Rosalie Wright
Senior Midwifery Manager

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16 August 2012

Ms Sarah Elizabeth Hennelly
PhD Student
Oxford Brookes University
Faculty of Health and Life Sciences
Jack Straws Lane
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Dear Ms Hennelly

Study title: Associations between mood, mindfulness and health behaviours in pregnancy: a cross-sectional survey
REC reference: 12/SW/0246
IRAS project number: 992053

Thank you for your letter of 09 August 2012, responding to the Proportionate Review Sub-Committee's request for changes to the documentation for the above study.

The revised documentation has been reviewed and approved by the Sub-Committee.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised.

Ethical review of research sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study.

- On this occasion, the Committee are happy to approve the inclusion of those aged 16 and 17 without the consent of their parent for the reasons you have stated, i.e. that this age group are most likely to display unhealthy behaviours and that anonymity will increase response rates. However, the Committee agreed that you should explicitly state this rationale in your study protocol, therefore please add the

text from your letter to the Committee of 9th August 2012 (the two paragraphs which begin 'It is important...') into your protocol.

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

Management permission ("R&D approval") should be sought from all NHS organisations involved in the study in accordance with NHS research governance arrangements.

Guidance on applying for NHS permission for research is available in the Integrated Research Application System or at <http://www.r4forum.nhs.uk>.

Where a NHS organisation's role in the study is limited to identifying and referring potential participants to research sites ("participant identification centre"), guidance should be sought from the R&D office on the information it requires to give permission for this activity.

For non-NHS sites, site management permission should be obtained in accordance with the procedures of the relevant host organisation.

Sponsors are not required to notify the Committee of approvals from host organisations.

It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

You must notify the REC in writing once all conditions have been met (except for site approvals from host organisations) and provide copies of any revised documentation with updated version numbers. The REC will acknowledge receipt and provide a final list of the approved documentation for the study, which can be made available to host organisations to facilitate their permission for the study. Failure to provide the final versions to the REC may cause delay in obtaining permissions.

Approved documents

The documents reviewed and approved by the Committee are:

Document	Version	Date
Advertisement	Wall (v.1)	25 July 2012
Advertisement	Box (v.1)	25 July 2012
Covering Letter		09 August 2012
Evidence of insurance or indemnity		08 July 2011
Investigator CV		25 July 2012
Letter from Sponsor		03 May 2012
Letter of invitation to participant	2	08 August 2012
Other: Debrief sheet	1	25 July 2012
Other: NHS letter of support		28 June 2012
Other: CV Lesley Smith		
Other: CV David Foxcroft		
Other: CV Jilly Martin		
Protocol	1	25 July 2012
Questionnaire	2	08 August 2012
REC application		25 July 2012
Referees or other scientific critique report		03 May 2012

Response to Request for Further Information	09 August 2012
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Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical reviewReporting requirements

The attached document 'After ethical review – guidance for researchers' gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Notification of serious breaches of the protocol
- Progress and safety reports
- Notifying the end of the study

The NRES website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

Feedback

You are invited to give your view of the service that you have received from the National Research Ethics Service and the application procedure. If you wish to make your views known please use the feedback form available on the website.

Further information is available at National Research Ethics Service website > After Review

12/SW/0246	Please quote this number on all correspondence
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With the Committee's best wishes for the success of this project


Yours sincerely


Mrs Kate McMahon-Parkes
Vice-Chair

Email: ubh-tr.SouthWest5@nhs.net

Enclosures: "After ethical review – guidance for researchers"

Copy to: Hazel Abbott, Oxford Brookes University
Ms Lorna Henderson, Thames Valley Primary Care Research Partnership

Oxford University Hospitals 
NHS Trust

HH/GR/JC/10241

Ms Sarah Elizabeth Hennelly
PhD Student
Oxford Brookes University
Faculty of Health and Life Sciences
Jack Straws Lane
Oxford
OX3 0FL

From the R & D Lead
OUH Research & Development
Joint Research Office
Block 60, Churchill Hospital
Old Road, Headington
Oxford OX3 7LE

Tel: (01865) 572237
Fax: (01865) 572242
Email: james.cooper2@ouh.nhs.uk

16 October 2012

Dear Ms Hennelly

Title: Associations between mood mindfulness and health behaviours in pregnancy: a cross sectional study

Research and Development Reference: 10241
Research Ethics Committee Reference: 12/ SW/U246

Thank you for notifying R&D of the above study, which received Research Ethics approval on 16 August 2012

I note that the only involvement for the OUH NHS Trust is as a Patient Identification Centre. The approved written information sheet will be given to potential participants by Antenatal Clinic Staff

If there is any protocol amendment which changes the involvement of the OUH Trust this should be notified to R&D for assessment of whether Trust Management Approval would be necessary.

Please send copies of Annual Progress Reports submitted to the REC for the study to R&D to enable us to update our records.

Approved Documents

Oxford University Hospitals NHS Trust

Dr Lesley Smith
Director of Studies
Department of Psychology, Social Work and Public Health
Faculty of Health and Life Sciences
Oxford Brookes University
Marston Road

15 May 2013

Dear Dr Smith

UREC Registration No: 130724

Mind the Bump: an investigation of the effect of a mindfulness-based intervention on health behaviours during pregnancy

Thank you for the email of 26 April 2013, outlining the response to the points raised in my previous letter about the PhD study of your research student Sarah Hennelly, and attaching the revised documents. I am pleased to inform you that, on this basis, I have given Chair's Approval for the study to begin.

The UREC approval period for this study is two years from the date of this letter, so 15 May 2015. If you need the approval to be extended please do contact me nearer the time of expiry.

In order to monitor studies approved by the University Research Ethics Committee, we will ask you to provide a (very brief) report on the conduct and conclusions of the study in a year's time. If the study is completed in less than a year, could you please contact me and I will send you the appropriate guidelines for the report.

Yours sincerely

Hazel Abbott
Chair of the University Research Ethics Committee

cc: David Foxcroft, Co-Director of Studies
Sarah Hennelly, Research Student
Jill Organ, Graduate Office
Louise Wood, UREC Administrator

UNIVERSITY RESEARCH ETHICS
COMMITTEE, FACULTY OF HEALTH AND
LIFE SCIENCES

Headington Campus Gypsy Lane
Oxford OX3 0BP UK

Tel: 01865 482639
heabbott@brookes.ac.uk

[RAS Questionnaire 10th November 2012 Version 3

Invitation to take part in a research study

Oxford University Hospitals 
NHS Trust

Faculty of Health and Life Sciences
Department of Social Work and Public Health
Jack Straws Lane, Oxford OX3 0FL

National Research Ethics Committee reference: 12/SW/0246
Oxford University Hospitals NHS Trust Research and Development reference: 10241
Oxford Brookes University FREC reference: 2011/19

10th November 2012

A study of women's health and well-being during pregnancy.

Dear Madam

I am inviting you to take part in a research study about women's health and well-being during pregnancy. Taking part means completing a questionnaire about your thoughts, feelings and health. If you are interested in doing this, please read the attached information sheet.

If you decide to take part, you can complete the survey in two ways. There is an on-line survey on an Oxford Brookes University website called www.oxbump.org.uk. Your answers will go directly into a secure electronic database.

If you prefer to complete a paper copy, please collect one from your clinic. If you would like to complete it here and now, you can seal it into the envelope and put it into the "Completed Oxford Brookes University Questionnaires" box in your clinic's reception, or you can take it away and post it to me in the FREEPOST envelope when you have completed it. Please return the questionnaire within the next two weeks.

To thank you for taking part in the study, you can enter a prize draw for one of three £50 Amazon vouchers. If you would like to enter the draw, please provide an email address or telephone number to contact you if you win. Your number or email will be separated from your answers; it will not be shared with anyone or used to identify your answers.

Oxford University Hospitals NHS Trust has given permission for its patients to be invited to take part in this study, and your clinic is facilitating this by giving you this invitation.

Your answers will be useful and important because they will help me to understand women's experience of being pregnant, and to design a course to support pregnant women's health and well-being. Your data will be confidential and anonymous. Please answer the questions as genuinely as you are able.

Yours faithfully
Sarah Hennelly
sarah.hennelly-2011@brookes.ac.uk
PhD student at Oxford Brookes University
Director of studies: Dr Lesley Smith, lesleymith@brookes.ac.uk

Page 1

RAS Questionnaire 10th November 2012 Version 3

OXFORD
BROOKES
UNIVERSITY

Information sheet

Oxford University Hospitals 
NHS Trust

Faculty of Health and Life Sciences
Department of Social Work and Public Health
Jack Straws Lane, Oxford OX3 0FL

Supervisor: Dr Lesley Smith, lesleysmith@brookes.ac.uk
Researcher: Sarah Hennelly, sarah.hennelly-2011@brookes.ac.uk

10th November 2012

A study of women's health and well-being during pregnancy.

You are being invited to take part in a research study. *Before you decide whether to take part, I would like you to understand why the research is being done and what it will involve for you. Please read this information carefully.*

What is the purpose of the study?

The purpose of the study is to understand women's health and well-being whilst they are pregnant.

Why have I been invited?

You have been invited to take part because you are thirteen weeks or more pregnant.

Do I have to take part?

No, taking part is completely voluntary.

What will happen to me if I take part?

Reading this information and completing the questionnaire should take less than 30 minutes. If you decide to take part, you will be asked to answer questions about your thoughts and feelings, and your alcohol consumption, smoking, diet and exercise. You can fill in the questionnaire on-line, or complete a paper copy and either put in a marked box at your clinic, or send it to me in the envelope provided.

What are the possible disadvantages and risks of taking part?

There are no risks to you or your baby in taking part, but if the questions cause you any concerns about your health and well-being, please do ask your midwife or GP for advice, or contact the agencies listed at the end of the questionnaire.

What are the possible benefits of taking part?

There is no direct benefit to you in filling in the survey, but the information you give will improve understanding about women's health and well-being during pregnancy, and to contribute the development of a new service for pregnant women.

You can decide to enter the prize draw for one of three £50 Amazon vouchers by giving a contact email address or phone number when you complete and return the survey.

Will my taking part in the study be kept confidential?

Your clinic will not know whether you have taken part in the survey or what your answers are. Several clinics are offering pregnant women invitations to take part in the survey, so your answers will not be linked to your clinic. The questionnaire is anonymous, which means that I will not know your name and you will not be identified in my report about the findings. If you decide to enter the prize draw, your email address or phone number will be kept separate from your answers to the other questions, and they will not be shared with anyone.

What will happen if I don't want to carry on with the study?

You can decide to stop completing the on-line questionnaire at any point, in which case your answers will not be used. If you decide not to complete the paper survey, please recycle it.

What if there is a problem?

If you have any concerns about how the research has been carried out, please contact the Departmental Research Ethics Officer on heabbott@brookes.ac.uk.

Will my taking part in this study be kept confidential?

Yes - your answers will not be identifiable by your email address, phone number or clinic. The survey's anonymous, encrypted electronic data and anonymous paper questionnaires will be securely stored by Oxford Brookes University for 10 years and then destroyed, in accordance with the University's policy on Academic Integrity.

What will happen to the results of the research study?

This survey is part of my PhD at Oxford Brookes University, and I will use the results to understand pregnant women's health and well-being. I will also use the information to help design a course to support women's health and well-being during pregnancy, which I will test as part of my PhD.

A report of my findings will be sent to your clinic, and it will be available on the www.oxbump.org website. It may be presented at conferences and submitted for publication in academic journals. You can also contact me for a copy of the report after 1st June 2013 at the email address above.

Who has reviewed the study?

All research in the NHS is looked at by an independent group of people, called a Research Ethics Committee, to protect your interests. This study has been reviewed and given a favourable opinion by NRES Committee South West ~~Frenchay~~ and Oxford University Hospitals NHS Trust Research and Development Lead. The research has been approved by the Faculty of Health and Life Sciences Research Ethics Committee at Oxford Brookes University.

Who is funding the research?

My research is funded by Oxford Brookes University.

Further information

For further information about the study, please contact me, or my supervisor Dr Lesley Smith, at the email addresses above.

How do I start the survey?

If you would like to take part in the study, please go to www.oxbump.org.uk and click on "Mindful". The questionnaire's unlock code is ~~MyBump~~ **MyBump**. This code is case sensitive. When you have completed the questions, please click on "Submit Answers".

Alternatively, you can complete and post the paper questionnaire to me.

Thank you very much

IRAS Questionnaire 10th November 2012 Version 3

Thank you so much for taking part in this piece of scientific research, which will be used to understand women's experience of pregnancy, and to improve the care of pregnant women like you.

If you are less than 13 weeks pregnant, please wait until you are 13 weeks pregnant to complete the survey.

Please answer every question, even if you are not absolutely certain what the question means or the question seems strange. There are no right or wrong answers, just answer the questions as honestly as you can. Do not spend long on any question about your thoughts and feelings, just go with the first answer that comes to mind.

Please do not discuss the questionnaire with anyone who may also complete it as this may affect their answers. It is best completed in private, without the need to hurry.

Your replies will be confidential, and only the researchers, not your carers, will see them.

Firstly there are some questions about your age, job, etc. These are followed by some questions about your thoughts and feelings, your well-being, how you cope with stress, and about how much alcohol you drink, how much you smoke, how much you exercise you do and which food supplements you take.

The last question is about your email address or contact phone number. Please complete this if you would like to enter the prize draw.

IRAS Questionnaire 10th November 2012 Version 3

How many weeks pregnant are you now? (13- 44) _____

If you are less than 13 weeks pregnant, please wait until you are 13 weeks pregnant to complete the survey

What is the first part of your post-code? _____

e.g. full postcode is OX34 9FL, answer is OX34, full postcode is OX2 4JF, answer is OX2

	Yes	No
Is English your first language?		

What is your ethnicity?

White British		Bangladeshi	
White Irish		Any other Asian background	
Any other White background		Black- Caribbean	
Mixed: White and Black Caribbean		Black- African	
Mixed: White and Black African		Any of Black background	
Mixed: White and Asian		Chinese	
Any other Mixed background		Any other Ethnic Group	
Indian		I do not wish to give Ethnic Group	
Pakistani		I do not know my Ethnic Group	

What is your age group?

16-20		26-30		36-40	
21-25		31-35		41+	

	Yes	No
Is this your first pregnancy?		
Was this pregnancy planned?		
Is this pregnancy the result of assisted conception e.g. IVF?		

How many weeks pregnant were you when you found out you are expecting this baby? (2-44) _____

Not counting this pregnancy, how many children do you have in these age-ranges? Please do not include adopted or step-children.

0-5 years	5-10 years	11-15 years	16-17 years	18 years and over

How tall are you? Feet & inches _____ or Metres _____

What was your pre-pregnancy weight: Stones & pounds _____ or kilos _____

What is your current weight: Stones & pounds _____ or kilos _____

What is your employment status?

Employed full time		Student	
Employed part-time (less than 16 hours)		Not employed but looking after home & family	
Unemployed		Not employed because of illness or disability	
Government work/training scheme		Retired	

What is your approximate household annual income, including any benefits?

£5,000 or less		£40,001 to £50,000	
£5,001 to £10,000		£50,001 to £60,000	
£10,001 to £20,000		£60,001 to £70,000	
£20,001 to £30,000		£70,001 to £80,000	
£30,001 to £40,000		£80,001 or more	

What is the highest level of education you have completed?

No formal qualifications		BA/BSc	
GCSE's		MA/MSc	
A' levels		Doctorate	
College-level vocational qualifications		Chartership	

Below is a collection of statements about your everyday experience. Please indicate how frequently or infrequently you have had each experience in the last month. Please answer according to what really reflects your experience rather than what you think your experience should be.

	Not at All	Rarely	Sometimes	Often	Almost always
I'm good at finding the words to describe my feelings					
I can easily put my beliefs, opinions and expectations into words					
I can watch my feelings without getting carried away by them					
I tell myself I shouldn't be feeling the way I'm feeling					
It's hard for me to find the words to describe what I'm thinking					
I pay attention to physical experiences, such as the wind in my hair or sun on my face					
I make judgements about whether my thoughts are good or bad					
I find it difficult to stay focused on what's happening in the present moment					
When I have distressing thoughts or images, I don't let myself get carried away by them					
Generally, I pay attention to sounds, such as clocks ticking, birds chirping or cars passing					
When I feel something in my body, it's hard for me to find the right words to describe it					
It seems I am "running on automatic" without much awareness of what I am doing					

IRAS Questionnaire 10th November 2012 Version 3



	Not at All	Rarely	Sometimes	Often	Almost always
When I have distressing thoughts or images, I feel calm soon after					
I tell myself I shouldn't be thinking the way I'm thinking					
I notice smells and aromas of things					
Even when I am terribly upset, I can find a way to put it into words					
I rush through activities without really being attentive to them					
Usually when I have distressing thoughts or images, I can just notice them without reacting					
I think some of my emotions are bad or inappropriate and I shouldn't feel them					
I notice visual elements in art or nature, such as colours, shapes, textures or patterns of light and shadow					
When I have distressing thoughts or images, I just notice them and let them go					
I do jobs or tasks automatically without being aware of what I'm doing					
I find myself doing things without paying attention					
I disapprove of myself when I have illogical ideas					

This scale consists of a number of words that describe different feelings and emotions. Please indicate the extent to which you have felt this way **over the past week**.

	Not at All/ Very Slightly	A Little	Moderately	Quite a Bit	Extremely
Interested					
Distressed					
Excited					
Upset					
Strong					
Guilty					
Scared					
Hostile					
Enthusiastic					
Proud					
Irritable					
Alert					
Ashamed					
Inspired					
Nervous					
Determined					
Attentive					
Jittery					
Active					
Afraid					

I

People have a variety of ways of relating to their thoughts and feelings. For each of the items below, rate how much each of these ways applies to you.

	None of the time	Rarely	Some of the time	Often	All of the time
I've been feeling optimistic about the future					
I've been feeling useful					
I've been feeling relaxed					
I've been feeling interested in other people					
I've had energy to spare					
I've been dealing with problems well					
I've been thinking clearly					
I've been feeling good about myself					
I've been feeling close to other people					
I've been feeling confident					
I've been able to make up my own mind about things					
I've been feeling loved					
I've been interested in new things					
I've been feeling cheerful					

The questions in this scale ask you about your feelings and thoughts **during the last month**. In each case, you please mark *how often* you felt or thought a certain way.

	Never	Almost Never	Sometimes	Fairly Often	Very Often
In the last month, how often have you been upset because of something that happened unexpectedly?					
In the last month, how often have you felt that you were unable to control the important things in your life?					
In the last month, how often have you felt nervous and "stressed"?					
In the last month, how often have you felt confident about your ability to handle your personal problems?					
In the last month, how often have you felt that things were going your way?					
In the last month, how often have you found that you could not cope with all the things that you had to do?					
In the last month, how often have you been able to control irritations in your life?					
In the last month, how often have you felt that you were on top of things?					
In the last month, how often have you been angered because of things that were outside of your control?					
In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?					

Please answer these questions about your alcohol consumption in the year before you knew about this pregnancy

How often did you have a drink containing alcohol?	Never	Monthly or less	2-4 times a month	2-3 times a week	4 or more times a week
How many drinks containing alcohol did you have on a typical day when you were drinking?	1 or 2	3 or 4	5 or 6	7 to 9	10 or more
How often did you have six or more drinks on one occasion?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
How often did you find that you were not able to stop drinking once you had started?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
How often did you fail to do what was normally expected of you because of drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
How often did you need a first drink in the morning to get yourself going after a heavy drinking session?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
How often did you have a feeling of guilt or remorse after drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
How often were you unable to remember what happened the night before because of your drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
Have you or someone else been injured because of your drinking?	No		Yes, but not in the last year		Yes, during the last year
Was a doctor or a health care worker concerned about your drinking in the last year, or suggested you cut down?	No		Yes, but not in the last year		Yes, during the last year

Please answer these questions about your alcohol consumption **during this pregnancy**

How often do you have a drink containing alcohol now?	Never	Monthly or less	2-4 times a month	2-3 times a week	4 or more times a week
How many drinks containing alcohol do you have on a typical day when you are drinking now?	1 or 2	3 or 4	5 or 6	7 to 9	10 or more
How often do you have six or more drinks on one occasion?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
Since you have known you are pregnant, how often have you found that you were not able to stop drinking once you had started?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
Since you have known you are pregnant, how often have you failed to do what was normally expected of you because of drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
Since you have known you are pregnant, how often have you needed a first drink in the morning to get yourself going after a heavy drinking session?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
Since you have known you are pregnant, how often have you had a feeling of guilt or remorse after drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
Since you have known you are pregnant, how often have you been unable to remember what happened the night before because of your drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
Since you have known you are pregnant, have you or someone else been injured because of your drinking?	No		Yes, but not in the last year		Yes, during the last year
Since you have known you are pregnant, has a doctor or a health care worker been concerned about your drinking, or suggested you cut down?	No		Yes, but not in the last year		Yes, during the last year

I intend to abstain from alcohol	Every day	Most days	Some days	Rarely	No days
I feel tempted to drink alcohol	Every day	Most days	Some days	Rarely	No days
I feel confident that I can resist drinking alcohol	Every day	Most days	Some days	Rarely	No days

IRAS Questionnaire 10th November 2012 Version 3

How many cigarettes did you smoke each day before you knew about this pregnancy?	0	1-5	6-10	11-15	16-20	21 or more
How many cigarettes do you smoke each day now?	0	1-5	6-10	11-15	16-20	21 or more

If you smoke, how soon after you wake up do you smoke your first cigarette?	Within 5 minutes	6-30 minutes	31-60 minutes	After 60 minutes
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I intend to abstain from smoking	Every day	Most days	Some days	Rarely	No days
I feel tempted to smoke	Every day	Most days	Some days	Rarely	No days
I feel confident that I can resist smoking	Every day	Most days	Some days	Rarely	No days

	Yes	No
Has your GP or midwife advised you NOT to exercise?		
Do you an injury or condition (except for pregnancy) which prevents you from exercising?		

In a normal week, how many hours do you usually spend:

	None	Less than 1/2	1/2 to almost 1	1 to almost 2	2 to almost 3	3 or more
Walking slowly						
Walking quickly or uphill						
Jogging						
Pre-natal exercise class						
Swimming						
Dancing						
Low-intensity yoga or pilates						
High-intensity yoga or pilates						
Cycling						
Other low-intensity exercise						
Other high-intensity exercise						

I intend to exercise for 30 minutes each day	Every day	Most days	Some days	Rarely	No days
I feel tempted to not do any exercise	Every day	Most days	Some days	Rarely	No days
I feel confident that I can exercise	Every day	Most days	Some days	Rarely	No days

	Yes	No
Are you vegetarian?		
Are you vegan?		
Has your GP or midwife advised you NOT to take supplements?		
Do you take "Healthy Start" vitamins?		
Do you take folate/folic acid supplements?		
Do you take Vitamin B12 supplements?		
Do you take Vitamin C supplements?		
Do you take Vitamin D supplements?		
Do you take Iron supplements?		
Do you take Calcium supplements?		

I intend to eat healthily	Every day	Most days	Some days	Rarely	No days
I feel tempted to eat unhealthy foods	Every day	Most days	Some days	Rarely	No days
I feel confident that I can eat healthily	Every day	Most days	Some days	Rarely	No days

	Yes	No
Have you completed a mindfulness training course, e.g. MBCT, MBSR?		
Do you have another meditation practice, e.g. Vipassana, transcendental?		

	Less than 1	1 to 2	3 to 4	5 or more
If yes, how many years have you had a mindfulness practice?				
If yes, how many days do you meditate each week?				

	Yes	No
Do you practice yoga?		

	Less than 1	1 to 2	3 to 4	5 or more
If yes, how many years have you had a yoga practice?				
If yes, how many days do you do yoga each week?				

Debrief sheet

What these questions have been about

Firstly you answered questions about mindfulness, which is how aware and accepting people are of present moment experience. Your mood was measured by the questions asking about how you've been feeling recently and how you cope with stress. You answered questions about alcohol, smoking, exercise and dietary supplements, and how in control you feel of what you drink, eat and so on. The reason for this is that I am investigating whether there are the associations between mindfulness, mood and health behaviours during pregnancy.

If answering any of the questions has caused you to feel concerned about your health and well-being, please do speak to your midwife or GP. Depression and anxiety is common in pregnancy, and your GP can support you. Your GP clinic will also offer a smoking cessation programme. The following organisations and websites also offer support and advice:

Alcohol

"Drinkaware" <http://www.drinkaware.co.uk/alcohol-and-you/family/alcohol-and-pregnancy>

"Drinkline" The UK's national alcohol helpline. You can call this free helpline, in complete confidence, 24 hours a day on 0800 917 8282

"Down your drink" <http://www.downyourdrink.org.uk/> This is an NHS service which tells individuals what they need to know to stay drinking sensibly. The free and confidential programme takes less than an hour a week over six weeks, but it is not specifically for pregnant women

Smoking <http://smokefree.nhs.uk/smoking-and-pregnancy/> and
<http://www.nhs.uk/tools/pages/stopsmoking.aspx>


Diet <http://www.nhs.uk/planners/pregnancy-care-planner/pages/Health-in-pregnancy-home.aspx>

Exercise <http://www.nhs.uk/planners/pregnancy-care-planner/pages/Stay-active.aspx>

Stress NHS Stressline , telephone 0300 123 2000, open daily from 8am-10pm.

Do speak to your GP or midwife if you have any concerns, they will support you in being as healthy and well as you are able to be.

Sarah Hennelly
PhD student
Funded by Oxford Brookes University



**OXFORD BROOKES
UNDERSTANDING MATERNITY PROJECT**

FACTS ABOUT FOETAL HEALTH



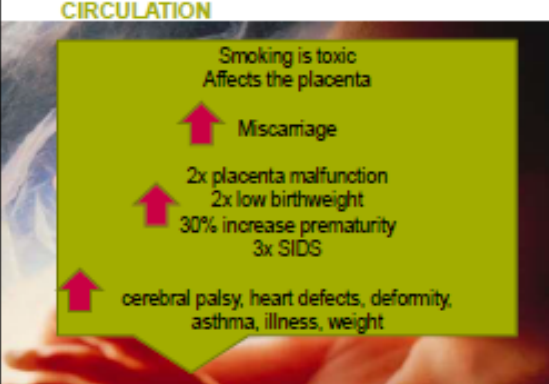
ALCOHOL IS A NEUROTOXIN



Nervous system and brain damage

- ↑ Miscarriage
- Foetal Alcohol Spectrum Disorder
- Lifetime effect
- ADHD-like
- Movement & speech
- Memory & logic

SMOKING IS TOXIC & HINDERS CIRCULATION



Smoking is toxic
Affects the placenta

- ↑ Miscarriage
- ↑ 2x placenta malfunction
- ↑ 2x low birthweight
- ↑ 30% increase prematurity
- ↑ 3x SIDS
- ↑ cerebral palsy, heart defects, deformity, asthma, illness, weight

WEIGHT MANAGEMENT



- ↑ Obesity & excessive weight gain
- ↑ Pre-eclampsia, gestational diabetes, hypertension
- ↑ Prematurity, still birth
- ↑ C-section, infection, macrosomia
- ↑ Adult obesity, diabetes

NUTRITION



5 a day

Vitamin C
Healthy Cells

Iron
Prevents Anaemia

Fibre

Fluids

Calcium
Builds cells, bones & teeth

Healthy plate

SUPPLEMENTS

↑ Vitamin D
Calcium metabolism

↓ Folic Acid
Spina Bifida & Anencephaly

"EXERCISE FOR TWO, EAT FOR ONE"

2 hours moderate exercise each week

→ Weight management

↑ Stamina & fitness

GUIDELINES

Alcohol
Smoking

Diet
Exercise



"Automaticity"
habitual, automatic reactions to experience

IT'S NOT ROCKET SCIENCE, BUT IT IS NEUROSCIENCE!

INTENTION – BEHAVIOUR GAP



EMOTIONAL AND PHYSICAL HEALTH

Low mood and depression are linked with unhealthy lifestyle during pregnancy



ONE SLIP.....



BREAKING OUT OF AUTOPILOT

Notice the urge
AWARENESS



Tolerate the urge
RESILIENCE

"SURFING THE URGE"



And this is where
mindfulness comes
in.....

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WHAT IT ISN'T

Mindlessness




mind full ness

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MINDFULNESS


"Mindfulness means paying attention in a particular way; on purpose, in the present moment, and non-judgmentally."

"Set aside time every day for just being. Sit & watch the moments unfold, with no agenda other than to be fully present."

It's a natural psychological characteristic. Mindfulness is in each of us already. It's not like we have to go out and "get it".

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WHAT'S HAPPENING RIGHT NOW?



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MINDFULNESS TRAINING



Year	Number of Publications
1980	0
1981	0
1982	0
1983	0
1984	0
1985	0
1986	0
1987	0
1988	0
1989	0
1990	0
1991	0
1992	0
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2006	0
2007	0
2008	0
2009	0
2010	0
2011	0
2012	0

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FULFILLING POTENTIAL

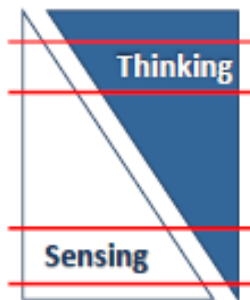


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IMPROVING HABITS



WHAT CHANGES?



'DOING MODE' & 'BEING MODE':

Doing, Automatic Pilot	v	Being, Conscious choice
Analysing	v	Sensing
Striving	v	Accepting
Thoughts as facts	v	Thoughts as mental events
Avoiding	v	Approaching
Past / Future	v	Present
Depleting	v	Nourishing

MINDFULNESS TRAINING

Increases awareness of snakes...

- Automatic reactions to experience: Thinking & Sensing - emotions, thoughts, physical sensations
- Automatic thinking & behaviour habits
- Urges to change the way we feel using alcohol, smoking, food, activity, etc

Builds ladders of concentration, awareness, resilience to discomfort & self-regulation



Mind the Bump

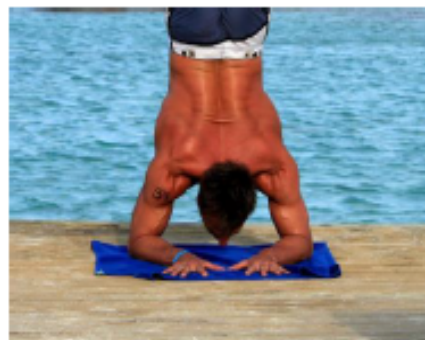
Mindfulness Programme for Healthy Pregnancy



"We can't stop the waves, but we can learn to surf"

Jon Kabat-Zinn

REGAIN BALANCE





MIND THE BUMP

1. Set own goals for health-related behaviours and mindfulness practice each day
2. Take part in 8 week taught mindfulness course, using the Frantic World book for home reading and the CD for home practice
3. A diary

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MEASURING

Health & Mood	Feasibility
Pre course	What you think of the course
Post course	
Follow up	
Mood	
Mindfulness	
Health-related factors	

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POTENTIAL

Unassessable....

Immediate benefits to unborn child

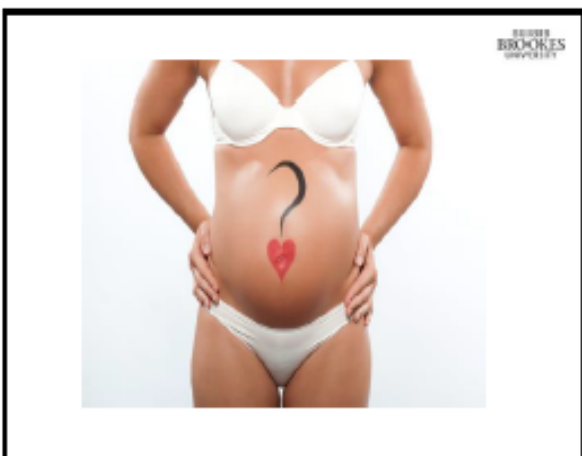
Long term benefits to mother and child

Foundation for Public Health programme using a course that can be taught by any mindfulness teacher

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Thank you!

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Do's & Don'ts, Guidelines for Healthy Pregnancy

The Department of Health (DoH), National Institute of Health and Clinical Excellence (NICE) and the Royal College of Midwives (RCM) advice is:

Alcohol

No alcohol during pregnancy.

In 2006, they said that "small amounts of alcohol during pregnancy (not more than one to two units, not more than once or twice a week) have not been shown to be harmful." However, they are reconsidering this as a result of recent studies.

This is one unit of alcohol



...and each of these is more than one unit



Smoking

No smoking during pregnancy.

Supplements

Folic Acid for first trimester. Vitamin D throughout pregnancy.

Diet

No additional calories in the first & second trimester, 200 more in third trimester. Healthy, balanced mix of food. "5 a day" fruit and vegetables.

Exercise

The guidelines for exercise during pregnancy are 4 x 30 minutes of moderate exercise each week. This can include walking at a 3 mph or more, or walking up hills, swimming, yoga and pilates, pregnancy exercise classes, and cycling on a road or exercise bike. If you're new to exercise, begin with 3 x 15 minutes a week.

Work with your body, be gentle and friendly to its needs, drink plenty of fluids, avoid painful exercises (unless prescribed by a health care professional), rest when you're tired.

A useful motto is "Eat for one, exercise for two".

Weight gain

There is no requirement for extra calories in the first and second trimester. Just 200 calories more are needed each day in the third trimester.

Examples of healthy snacks containing 200 kcal are as follows:

- 2 rice cakes with low fat hummus and a piece of fruit
- 2 portions of fruit, some carrot & cucumber sticks and low fat hummus
- Sandwich with low fat cream cheese
- 1 slice of cheese on toast
- 25g (1oz) nuts and a piece of fruit

Expectant mothers who put on excessive weight early during pregnancy have an almost three times higher risk of delivering bigger and fatter babies. Maintaining a healthy gestational weight can protect your baby from premature death and make him or her less vulnerable to obesity and, by controlling your pregnancy weight gain, you'll also reduce your risks of pre-eclampsia, gestational diabetes and hypertension.

Larger Infants tend to become larger children, which creates a risk of developing into obese and overweight children and adults. Overweight or obese people are at much higher risks of serious diseases like diabetes, cardiovascular diseases, certain cancers, renal failure and Alzheimer's disease.

We do not have guidelines for weight gain in the UK, but the American Institute of Medicine made these recommendations in 2009

Singleton

Pre-pregnancy BMI	Category	Recommended weight gain	Stones & pounds	Kilos
Below 18.5	Underweight	28-40 lbs	1st 10lbs to 3st 8lbs	12-18
18.5 -24.9	Normal weight	25-35 lbs	1st 9lbs to 2st 3lbs	11-16
25-29.9	Overweight	15-25 lbs	1st 3lbs to 1st 9lbs	7-11
30 and above	Obese	11-20 lbs	11 lbs to 1st 6lbs	5-10

Twins

Pre-pregnancy BMI	Category	Recommended weight gain	Stones & pounds	Kilos
18.5 -24.9	Normal weight	37-54 lbs	2st 5lbs to 3st 6lbs	17-25
25-29.9	Overweight	31-50 lbs	1st 13lbs to 3st 2lbs	15-23
30 and above	Obese	25-42 lbs	1st 9lbs to 2st 10lbs	11-20

Pregnancy Exercise classes around Oxford

Fit & Healthy Mums

Prenatal classes are:

Mon 7.30pm Wootton and Dry Sandford Community Centre Tues 7.30pm

The Manor Prep School, Abingdon.

£5 each or 10 for £45.

Contact Keri on keri@fitandhealthymums.com or 07870 833 016

Zumba for Bump

Monday 10-11, followed by informal talks with Brookes midwives about the aspects of pregnancy the group members want to know more about from 11-12.

Brookes Gym at Gipsy Lane campus, Oxford

First 4 free, then £3 per class

Contact Ethel on eburns@brookes.ac.uk

Aquanatal in Oxford

7.15pm Tuesdays at Ferry Pool, Summertown and Thursdays at Temple Cowley Pool.

£8.50 per class. Contact the sports centres: Cowley 01865 467124 and Ferry 01865 467060

Pregnancy Yoga

Yoga Birth www.activebirth-oxford.co.uk

7 til 9 pm Monday

Mortimer Hall, Old Marston

4 weeks £45. 8 weeks £75.

Contact Kay Millar on kay.millar0@gmail.com

North Oxford Pregnancy Yoga

7.30 til 8.30 pm Thursday

Yoga Garden, Summertown

Contact Emma on emma@northoxfordpregnancyyoga.co.uk or 07743 128 471

Yoga Garden, Cowley Road

Six week course, £66

Contact info@yogagarden.co.uk or 01865 245 754

Birthlight pregnancy yoga www.HandsOnFamilyHealth.co.uk

Thursdays, 7.00 – 8.30 pm, from week 14 of pregnancy

St Albans Hall, Charles Street, East Oxford, OX4 3AH

Start at any time, £8 per class by term, or £11 drop-in

Contact Sara Barker on 07974 647124, email sara.b.oxford@gmail.com

Harmony of the Heart Pregnancy Yoga www.harmonyoftheheart.co.uk/yoga/

Thursday 6.15-7.15 pm

Crowmarsh Pavilion, Wallingford

£9 drop-in, or £55 for a block of 8

Call Louise Hurford on 07719 716273, email louisedixon@gmail.com to book a place

Week 1

Mindfulness starts when we recognise the tendency to be on automatic pilot, and we make a commitment to learning how best to step out of it in order to become more aware of each moment.

This is highlighted by comparing the experience of eating one raisin mindfully, engaging all the senses, with our habitual, automatic way of eating. The mindfulness of body and breath practice is an opportunity to practice engaging more with sensing than thinking, and to start training attention to come back to the present moment each time we notice the mind has wandered.

Raisin Exercise

Using all the senses, really slowing down the experience of eating, savouring the present moment.

If you are not able to come to class, or want to try it again at home, you can use the script in the book, or try the Mindfulness of Chocolate exercise here <http://franticworld.com/free-meditations-from-mindfulness/>

- Seeing
- Hearing
- Smelling
- Touch
- Placing
- Chewing
- Swallowing
- After-effects

Small fruit, big message!

- Mindful awareness v autopilot
- Richness of experience
- Minds wander!
- We can be missing out on vast portions of everyday life.

Mindfulness of Body and Breath (Track 1)

- Settling
- Attitude of curiosity and kindness
- Bringing awareness to the body
- Focusing on sensations of breathing
- Noticing mind-wandering

Intentions

Breath as an anchor for attention, and learning how to gather and focus attention.

Concentration is challenging; minds are designed to think! The more times the mind wanders, the more opportunity there is to practice gathering attention again. This is good.

Repeatedly noticing mind wandering and acknowledging this without engaging in the story, practices the skill of disengaging from habitual thought patterns.

Cultivating an attitude of kindness and gentleness with ourselves helps to reduce judgement and self-criticism. There is no wrong way of doing this practice – whatever happens, it's perfectly okay. The important thing is doing it, and repeating it regularly. Like all new exercises, it can get easier with time.

Recognising that we can't control the weather patterns in our minds, but we can have some control over how we relate to our thoughts.

Week 2

Body reflects our emotional state - bad news, good news, laughter, misery, heart lift, heart sink – a feedback loop of phenomenal power. Fears and tensions get locked on the body as much as in state of mind.

Research shows - pencil between teeth or pursed lips affects mood, posture affects testosterone and mood - literally lifting ourselves into assertive open relaxed posture v slouching.

Altering relationship with body can profoundly change our lives - it is the only body we have after all! Connecting with the body is especially helpful at this time, when your body is doing such profound and wonderful things without any conscious effort from your mind. This can lead to a sense of loss of control, but perhaps last week's practice increased your awareness of how much is going on in the body - of how the body is naturally so dynamic - all the life-giving process which happen without any conscious effort.

On a very simplistic level, the oldest, deepest part of the brain masterfully coordinates the minutiae of moment by moment processes, whilst the front part of the brain thinks, and plans, and tells stories and imagines. We can easily spend so much time in our head, and engaging with other people's heads, it's only new sensations or discomfort that re-mind us we have a body - you're undoubtedly going to experience this during pregnancy!

Through formal mindfulness practice, we can begin to inhabit the body again, reconnecting and tuning into its messages. These messages can arise anywhere in the body - the twitch or bracing or sense of unease that heralds stress, the lifting feeling of joy, the opening sensations of relaxation, your baby's dance, the tingle of readiness for fight/flight in fingers and toes when someone cuts us up in traffic! Developing awareness and interest in these signals can help us to disengage from the

"thinking about" the thoughts and emotions that link with these bodily sensations - noticing the pulse and echo of adrenalin is more useful for me than plotting revenge on the other driver!

The way we cultivate attention and awareness of the body is the Body Scan. Unlike the Body and Breath practice, we move the close spotlight of kind and friendly attention from one area to another, until we've scanned the whole body from the inside. It's a lot like being a naturalist, observing without interfering, or a meteorologist, looking at the weather systems, and learning to interpret the systems. In this way, we can get to know our own weather systems.

During the body scan

If feelings of restlessness, frustration or boredom arise, that's fine - the mind's resisting your attempts to improve your concentration and awareness.

Instead of fighting with these thoughts and feelings, accept they're here. It can be helpful to name them - thinking, worrying, restlessness - simply acknowledging their presence and perhaps saying to yourself "here is worry" or "so this is what boredom feels like".

Your baby may find this a great time to dance, so settling your full attention on this experience, conveying with your baby as well as you're able. Then coming back to the Practice when the party quiets. This is a time to nurture yourself and your baby.

Not trying to change anything, letting go of any wishing that things were different, cultivating the ability to recognise and then let go of thoughts and sensations, recognising how attention gets drawn to intense sensations whatever our conscious intention.

Teaching points

Why is it so difficult? We're retraining attention and attitude. Our existing habits are coded into the brain's neural structure, and we're breaking connection and literally rewiring the brain. This takes time, like strengthening any system in the body - one day in the gym does not transform the body :-). However, eight weeks of regular practice is enough for real change to occur.

At this stage, it can be difficult to tune into the smaller senses of being alive. There's nothing wrong, it can just take time to rewire attention. The mind can often get very busy during the body scan, switching to Doing Mode - judging, comparing, striving, fixing, time travelling, avoiding. Noticing that, bringing it back to Being mode, is the mindful moment. Befriend the wandering mind, and its puppy-like tendencies :-)

Homework

Track 2 at least once a day for 6 days this week. A different mindful activity

The Habit Releaser on p107 - paying full attention to going for a walk

Noticing the Here and Now - 3 things that make you feel good - giving them your full attention, noticing thoughts, emotions, physical sensations.

Appreciation exercise – 10 finger gratitude practice - tiny things to huge things!

Week 3

Attitude to experience

This week is about the attitude with which we approach our experiences – being open & curious about what happens, which increases our propensity for creativity and flexibility. It's the inverse of being cautious or anxious, as if we're bracing against our experiences.

The spirit in which we do something is often more important than the act itself.

A mindful attitude is

Versus

Accepting how things are right now	Striving for things to be different right now
Approaching	Avoiding
Curious	Detached
Friendly	Hostile
Open	Closed
Self-appraising	Self-criticising

So far the formal mindfulness practices have been about training attention by focusing and stabilising the mind. Perhaps you're beginning to notice how the mind works – its wandering, its story telling, its wishing things were different. It's rarely quiet, but what we're trying to cultivate is freedom with thoughts, not freedom from thoughts, so that's completely normal.

Paying attention to routine activities may have begun to help you to weave mindfulness into your everyday experience.

Bringing mindfulness into daily life

Instead of the mindful movement exercises in the book, we're going to do mindful walking instead, as this is something we do frequently.

Mindful walking

The idea is to pay attention to the body as we walk. This can be easier if we slow down the movement, but it's not necessary.

Coming to stand, and tuning into the feet and legs holding us upright. Then noticing the sensations in the body of lifting, moving and placing the foot, and natural roll of the next step, and the next, etc. Where does it feel most intense? Is it possible to tune into the contraction and relaxation of muscles, of changing pressure in the soles of the feet? Can you get a sense of the whole body moving? Just being curious about how it feels to do this thing we usually do so automatically.

Gentle movement to open the posture

- Allowing the arms to hang naturally from the shoulders, roll hands slowly in and out by rotating the wrists.
- Roll arms in and out, rotating from the shoulders.
- Roll shoulders in and out.
- Tune into sensations, opening the chest gently, noticing shoulder blades coming together and apart. Opening the posture.
- Allow the body to stretch in any way that feels right for you right now.
- Coming to sit, however is comfortable for you.

Breath and body practice

- Full in breath & outbreath
- Full body
- Coming up close to intense sensations – breathe with, etc.
- Not trying to change anything, letting go of any wishing that things were different, cultivating the ability to recognise and approach intense sensations for a moment, and be with them as they are right now, without wishing things were different, then returning to a place of stability and less intensity.

Teaching points

Attention is attracted to intense sensations

Pain is real, but being open and curious about the sensation can help to reduce the suffering

3 stage breathing space

When we notice that we're suffering, it can be very useful to do a short practice called the 3 minute breathing space (Track 8).

This is a condensed version of everything we've practiced so far. We can use it as a regular practice to tune us into what's going on, and as an emergency stop when we realise we're angry, upset, worried, frustrated, tired, etc.

The first stage is to tune **awareness** into what's going on

The weather pattern

- What thoughts are here?
- What emotions are here?
- What sensations are here?

Then to **gather** attention on to the breath for one minute, wherever you feel it most strongly

Then to **expand** attention to include the whole body – posture, facial expression, inside & outside the body.

Attention moves like an **hourglass**, out, in, out again. We can use the acronym **AGE** for awareness, gather, expand.

Regular practice of the Breathing Space allows us to the **weave the parachute** before the emergency – it's too late when we're already in a tail spin!

Homework

- Try bringing an attitude of curiosity to the body as you do everyday tasks – reaching for a cup, moving from one room to another, pelvic floor exercises. It's likely you'll be very aware of this already if your body is in pain, but we often pay no attention if the body's moving easily. Tune into the sensations of stopping movement, as muscles relax.
 - Pay attention to the body during any pregnancy exercises you do, without striving or competing with yourself or other people.
 - Track 4 at least once a day for 6 days this week, try some very gentle mindful stretches or movements before sitting or lying down to practice, whatever feels right for you.
 - 3 minute breathing space at least 2x each day (Track 8).
-

Week 4

Following on from last week, we can feel very reluctant to come up close to discomfort, whether it's in the body or in emotions. The practice is about coming up alongside these feelings, but not jumping right inside them.

So, if we're carrying a big ball of pain, anxiety and worry, we're not going to immerse ourselves in it during the practices. Mindfulness is about learning to surf the waves of experience, rather than being submerged by them. We can't stop the tide, but perhaps we can come up close to discomfort for a short while, even for a moment or two, and maybe explore one small part of it, before returning a steady, safe place.

These knots of discomfort are a bit like having a knot in our kite string - as long we keep the kite at its furthest distance, the knot will always be tight. If we slacken off a bit, and come close to the knot in a friendly and curious way, we may be able to begin to unravel it, even if it's only for a moment. Over time, we may be able to loosen the knot, and begin to move more freely. The alternative is to ignore the knot, or push it away, but it won't unravel, and we can't cut our own kite strings.

A more visceral example is the way in which our bodies tighten up around injuries, and stay tight even when the hurt has healed. By working gently at the edges of the tension, we can begin to unlock the tight muscles strand by strand, and move more easily again.

Making time for practice

<http://news.hult.edu/hult-labs/understanding-the-science-of-distractions-working-memory-vs-mind-wandering/>

This recent study found that the average person is distracted 47% of the time. If we're engaged in activity for 10 hours a day, that means we're not focusing on what we're doing for 4.7 hours every day! Doing some mindfulness practice each day can improve our ability to focus on what we're doing. 20 minutes practice could help us to reclaim some of those hours.

When we're distracted, our minds get caught up in lots of stories. Even when we're thinking about positive things, the research says that we're less happy than if we're actually focusing on what we're doing. Being absorbed in activity, whatever it is, is more likely to bring us into a state of "flow", where we're really in the moment, and performing at our best, whatever that is. It's not just confined to musicians, to dancers, to sportspeople – we're all more likely to drop into the zone when we're focusing on what we're doing. According to Mihaly Csikszentmihalyi (pronounced chick-sent-me-high), flow has these elements

- A Challenging Activity that Requires Skills - it's not easy
- The Merging of Action and Awareness - being here now
- Clear Goals and Feedback - goals are not so important in mindfulness practice, but true of other activities; feedback is just being able to notice where our minds are
- Concentration on the Task at Hand - focus
- The Paradox of Control - letting go
- The Loss of Self-Consciousness - not being so preoccupied with ourselves
- The Transformation of Time – being so absorbed, time can seem to stand still or slow/speed

Flow activities are rewarding – we do them because we like them, so it's great if we can get the most out of them by really being there.

Focusing on the breath can sometimes feel unsettling

If you're experiencing anxiety about focusing on breathing, this is what my mindfulness supervisor said about it:

This is really common when we start to meditate, and it may be that feel out of control as we recognise that breathing just happens, or feel the need to control the breath in some way.

The advice is to notice the anxiety, and then, as best you're able, to label the emotion by saying to yourself "I'm noticing anxiety". or "anxiety is present". This labelling can decentre you slightly from the feeling, as it's different to saying "I am anxious".

Then escort attention gently back to the sensations of breathing - coolness & warmth in the nostrils, rise & fall of the chest and stomach. This again helps to disengage us for a moment from the anxious thinking, by coming back to the body.

If it begins to feel too much, stop paying attention to the breath, and move it elsewhere, to a place of steadiness in the body, This could be contact with the chair or floor, hands on thighs, or wherever is steady for you.

The learning is twofold - one is the practical skill of noticing the escalation of storytelling that the mind can tend to hook into as soon as we feel the anxiety, and how we can begin to worry about worry. In time, we may be able to recognise the cycle starting, and unhook, coming to a gentle stop.

The other is to notice the pattern of mind. To use the over-used mindfulness teacher phrase "isn't it interesting that" the mind can start to worry when something shakes its illusion of control.

Week 5

Although the diary is there to guide you through the series of practices on the CD, it's fine to go back to an earlier practice if that's what feels right for you on a certain day. The more frequently we can do the formal practices, the more likely we are to benefit and be able to draw on them when difficult things happen.

The 3 stage breathing space may be the most useful practice we learn, as it can help us to pause and then re-engage with experiences in a wiser way, and doing the longer practices helps to build the "mindfulness muscles" of attention, awareness and attitude, and gives us the chance to increase our awareness of our habits of mind.

One of our mind's activities is time travel! It's natural and important for thoughts to travel into the unknown of our own and others' futures, for birth and parenthood, and to plan in order that everything we can do is done. However, the more we build up our expectations of how things "ought" to be, the more likely we are to feel disappointed when things turn out however they turn out. It's easier on us if we accept the way events are as they unfold.

Importantly, acceptance doesn't mean we should meekly accept poor treatment from people, or detach ourselves from real problems. It's about recognising how things really are right now,

whether they're good, bad or indifferent, what we're thinking, what we're feeling in our emotions and bodies.

I love this quote from "Sitting Still Like a Frog" by Eline Snel, which is a book of mindfulness for children and parents "Acceptance is not the same as "putting up with everything". Instead, it is the profound realisation that, as a parent, you don't need to have an opinion on the feelings, thoughts, and actions of either your child or yourself. Acceptance originates in the profound realisation that you and your children are not out for each other's blood! Even lifelong unconditional love has its ups and downs. Practicing acceptance will give you endless opportunities to open your heart and welcome *everything* that arises, and work with it as mindfully as you can"

Introduction

Up until now, we've practiced noticing what's here in the body, however that is, and beginning to recognise how the mind processes the raw experiences of daily life, and its tendency to embellish and interpret them to make some "sense" of them. We might also have noticed our tendency to get caught up in legitimate worries and anxieties. These difficulties contain real pain, but we can add to the suffering if we get caught up in the what if's, recriminations and criticisms. This is not to say we shouldn't reflect on past events or plan our futures – we can learn to keep ourselves out of danger this way - but slipping into cycles of negative thinking about ourselves and the wider world can cause us to feel vulnerable.

Undoubtedly there are moments when it's simply not the right time to be with these difficulties – we have busy lives and often have other people to care for, but denying or avoiding troubles can be exhausting.

This week, we're going to work gently with our innate vulnerabilities - the more difficult thoughts and emotions we experience – and begin to learn to deal with intrusive thoughts in a slightly different way, by connecting with the physical sensations they carry, rather than getting carried away in the currents of thoughts and emotions.

The Exploring Difficulties meditation very gently invites you to bring an unsettling situation to mind, and then to observe how your body reacts. In this way, you are using the body to turn towards the difficulty, with curiosity, friendliness and compassion, and processing the same raw experience in a different way.

It's important to choose a difficulty which won't overwhelm you right now. Choose something small, not a recent loss or trauma. An example might be a difficulty at work, an irritation with someone who is not very close to you, someone pushing in front of you - not something which is loaded with heartfelt pain.

If you are currently upset or very anxious, don't do this practice. It's one for when we're experiencing minor irritations.

If you do the practice, the invitation is to use the attention and attitude skills we have cultivated in the first half of the course to turn towards and befriend aspects of experience that we might otherwise avoid because they're uncomfortable.

Curiosity, kindness, self-compassion & acceptance are the keys to doing this in ways that alleviate rather than add to suffering, and help us to respond rather than to react.

Practice

Settle with breath & body

Maybe attention pulled away to difficult thoughts / feelings. Otherwise, bring to mind a minor difficulty.

- Allow thoughts & emotions to be on the workbench of the mind
- Shift attention to body sensations
- Move gentle, friendly curiosity to where sensations are strongest. Breathe into / out from these sensations
- Sensations are centre-stage, remind yourself that you're not trying to change them but explore them, with friendly curiosity, as they manifest in the body. *"It's ok. Whatever it is, it's ok to allow myself to be open to it."*
- Notice attitude. Softening. Opening. Allowing
- When you notice they're no longer here, return to breathing. Practise breathing into & out from whatever body sensations are here.

Developing the Breathing Space to include the difficult

1. Recognising and acknowledging what's present in body and mind (mood, thinking patterns). Naming mood, for example, "irritation is like this"
2. Gathering attention in sensations of breathing, wherever you feel it most strongly
3. Expanding awareness to whole body and including mind state, difficult thoughts, echoes of the difficulty in the body

The key message of this practice is that we might as well feel things, as they're already here. Befriending ourselves when troubles arise is kinder than criticising ourselves, and we're more likely to be able to act wisely to alleviate any aspects of the problem we can resolve when we're in this frame of mind. This poem by Jalaluddin Rumi (12th century) puts it well:

This being human is a guesthouse
Every morning a new arrival.

A joy, a depression, a meanness,
some momentary awareness
comes as an unexpected visitor.

Welcome and entertain them all!
Even if they're a crowd of sorrows,
who violently sweep your house
empty of its furniture,

Still treat each guest honourably.
He may be clearing you out
for some new delight.

The dark thought, the shame, the malice,
meet them at the door laughing
and invite them in.

Be grateful for whoever comes,
because each has been sent
as a guide from beyond.

Home practice

- Breath & Body Meditation (track 4)
- Exploring Difficulty meditation (track 6)
- Breathing Spaces at least x2 per day, including the difficult if it's present, especially when you notice cravings or are struggling with motivation

Week 6

You may be noticing yourself dropping in a 3 minute breathing space when you're busy. This is really great, and a good example of "State" mindfulness, where we switch on a mindfulness attitude. Regular formal practice builds up characteristic "Trait" mindfulness, where we're more naturally mindful more of the time. A good allegory for this is regular exercise to build strength and stability so that we can exert ourselves when we need to.

This week's lesson is simply about self-compassion and kindness. This is an invaluable attitude when life's difficulties arise, whether they're small irritations or serious traumas. It's easy to get carried away on the tide of thoughts and feelings about these experiences, and to be caught up in a cascade of negative memories and emotions. Not only do we have the initial hurt, which may be unavoidable, but then we add to it.

Treating ourselves kindly when troubles hit may reduce the tendency to get caught up in

additional suffering. Whilst we've been working with simply noticing what is, there's a way of building up kindness and compassion called Loving Kindness practice.

In this practice, we begin by wishing ourselves well, then connecting with our baby and wishing him or her well too. We then focus this good will on someone close to us. If you wish to, you can then send good wishes to someone you barely know but see regularly, such as a shop keeper or someone who works in your building. If it feels like the right thing to do, try extending good wishes to someone who you find difficult, and then to all beings. Finally, coming back to sending kind, friendly, loving wishes to ourselves and our babies.

If you want to, play with tuning into how sending these good wishes feels in the body, perhaps sending these wishes in harmony with the flow of the in breath and the out breath. Remembering that we all want to be happy, to feel well, to move with ease, for our children to flourish and thrive.

It can be hard to look after ourselves in this way; it can feel selfish, but as we've already seen, only by nourishing ourselves can we nourish other people. This is especially true now, during pregnancy.

Bear in mind we're not doing this practice to directly benefit other people; it's about opening up to ourselves in a kind and compassionate way, befriending ourselves and perhaps reducing our reactivity to life's normal ups and downs.

By simply acknowledging how we feel, we can then cradle ourselves in compassion and empathy, just like our own baby in our own arms. This won't change the tiredness, frustration, anger, anxiety, or sadness we feel in that moment, but we can stop ourselves from feeling bad about feeling bad!

Random acts of kindness can help us to feel good, and help others to feel that the world is a good place too. How great is it when someone lets us go first, or gives us their car park ticket?

Home practice

Track 4 & 7 on the CD, Breath & Body + Befriending

Experiment with (silently) sending good wishes to people you see when you're out and about, especially people who might normally cause you to brace or avoid them. This doesn't mean we rush up and embrace trouble, but just noticing any difference this attitude can make to our normal, automatic judgements reactions about people who are not like us in some way.

Three minute breathing space.

After you've completed this, take a few moments to notice thoughts and feelings. You might try:
Writing thoughts and feelings down.
Watching them arise, linger and pass through.

Notice the different types of thoughts - which characters are on stage right now? What tone of voice do they use? Is it kind or harsh? What's their personality? Anxious, perfectionist, shoulds, exaggerating, worrying, dreamy, happy, amusing? What is your theme tune? Are thoughts linked, or random? Are the thoughts true?

Not trying to change or solve anything, just noticing what's going on.

Week 7

If you missed it, part of last week's lesson was about nurturing ourselves. The aim is to recognise how we spend our time, and how the choices we make support our wellbeing within the normal, and unavoidable, busyness.

A way of doing this is to recall all the activities we did today/yesterday, and to recognise whether these activities nurture us, or deplete us, and the frame of mind in which we do these things. Activities which nurture us can be more nurturing if we're really present for them, and depleting activities can be less depleting if we don't spend our time wishing we weren't doing them. Sometimes the thought of doing something can be worse than the actually activity itself!

The key question in this exercise is **"How do I spend my time?"**

Write down the 10-15 key activities that you do in a typical day

"Do the choices I make really support my health and wellbeing?"

- Mark each activity with an N for nurture and/or a D for deplete
- Are there any which give you a sense of mastery or achievement? Mark them with an A.

If the balance is in favour of depletion, what might you be able to do to change this?

- Could you include more Nourishing activities or savour them more?
- Could you let go of any Depleting activities, or do them in a different frame of mind by being more playful, more curious and open, more mindful?
- Could you do Breathing Spaces before and after Depleting activities? And for Nourishing activities too, to appreciate them more fully?

It can feel easy to do nourishing activities when we're feeling good, but it's harder when we're feeling down. Research shows that exercise, and nurturing activities, cause us to feel happier, more energised, more calm, so experiment with caring for yourself in this way, and see what happens to your mood and energy levels. Be kind to yourself during this experiment.

Adding an Action Step into the Breathing Space

This week, when you feel stressed or depleted, try taking a breathing space and then consider what action you can take. Ask yourself

- What do I need right now?
- How can I best take care of myself right now?

There are 3 options for skilful action

- Doing something pleasurable – being kind to your body, engaging in an enjoyable, nourishing activity
- Doing something which gives you a sense of achievement or satisfaction – perhaps taking care of something on the “To Do” list
- Continuing with what you were doing, but doing it mindfully, maybe noticing the attitude of mind, widening attention to include the whole body or coming more into your senses as well as your thoughts.

Keep your list of nourishing activities to hand when you chose how best to take care of yourself. Are there other things you can add to the list?

GUIDED PRACTICE

Befriending

Choosing your own words, with the intention to send yourself good wishes.

Maybe including things like

- May I be as healthy and as well as I am able to be,
- May I be peaceful and content,
- May I feel kindness and ease

As last week, we begin by wishing ourselves well, then connecting with our baby and wishing him or her well too. We then focus this good will on someone close to us. If you wish to, you can then send good wishes to someone you barely know. If it feels like the right thing to do, try extending good wishes to someone who you find difficult, and then to all beings, maybe sensing our connection to the endless cycle of mothers and babies we're all part of. Finally, coming back to sending kind, friendly, loving wishes to ourselves and our babies.

As before, play with tuning into how sending these good wishes feels in the body, perhaps sending

these wishes in harmony with the flow of the in breath and the out breath. Remembering that we all want to be happy, to feel well, to move with ease, for our children to flourish and thrive.

This practice is about opening up to ourselves in a kind and compassionate way, befriending ourselves, and perhaps reducing our reactivity to life's normal ups and downs. We can't stop waves, but we can learn to surf



 HOLLADAYPHOTO

It can feel selfish to look after ourselves in this way, but only by physically and emotionally nourishing ourselves can we nourish other people. This is especially true now, during pregnancy. We are worth it ☺

Making the most of the last week of the course

You have talked about noticing how you're dropping mindfulness into daily life, which is great! Try using regular activities, such as putting the kettle on, turning on the computer, traffic lights, waiting for buses, walking, and waiting as "mindfulness bells" which prompt you to tune in to yourself for a few breaths. Try silently sending good wishes to people as you walk along the street, and finding out if it has any effect on the way you feel.

Home

practice

Chose the CD tracks which most nourishes you, and/or try practicing in silence, without the CD. You could try setting a gentle alarm for the length of time you want to try practicing, so that there's no need to open your eyes to check the time.

Breathing Space + Action Steps at least twice a day, and when you noticed you feel stressed or depleted.

And finally.....

Please complete the questionnaire and bring it to the last class next week. If you are not able to attend, please send it back to me by post.

Week 8

Letter to yourself and your baby, perhaps including your intentions to be mindful.

Home practice, aka the rest of your life....

Chose the CD track which most nourishes you, and/or try practicing in silence, or try it without the CD, as often as you're able to.

Stick with your lifestyle goals as best you're able. Adjust them for what's best for you as your pregnancy progresses. Be kind to yourself and, as best you're able, let go of rigid expectations about how things need to be. Whatever you're doing, no matter if it's pleasant or unpleasant, nurturing or depleting, give it as much of your attention as you're able to. Check in with yourself regularly. Keep in contact with your body, and your baby within it. Try setting gentle reminders on your phone. Keep in touch with each other, and me.

I will send out follow-up questionnaires in 6 weeks, and I will invite you to a get-together after your babies are all in the world.

Reading list

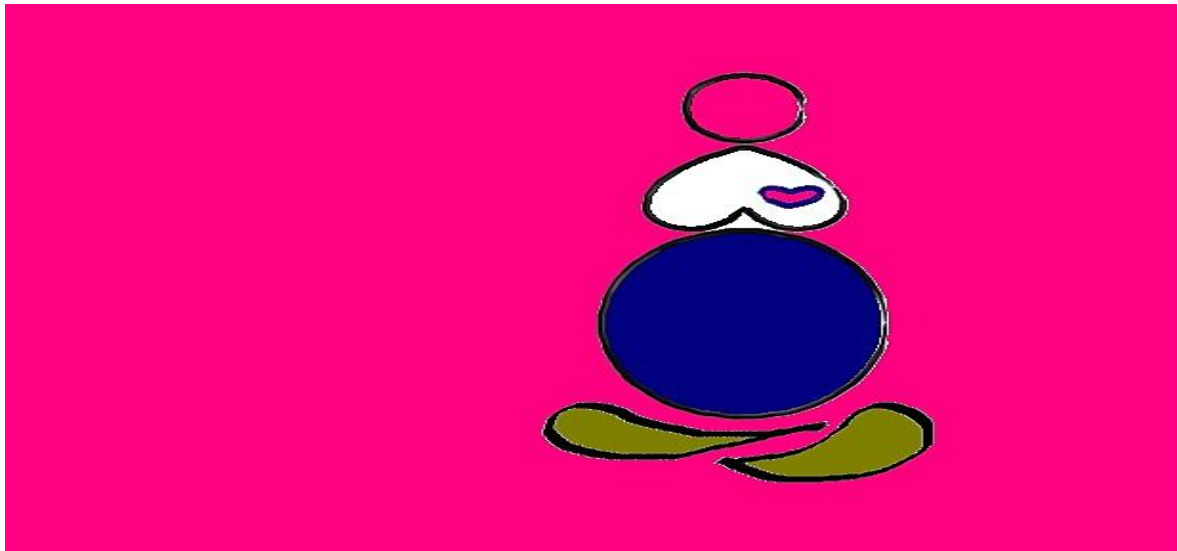
Mindful Birthing: Training the Mind, Body, and Heart for Childbirth and Beyond by Nancy Bardacke
Everyday Blessings: The Inner Work of Mindful Parenting by John and Myla Kabat-Zinn.

Sitting groups in Oxford

Oxford Mindfulness Centre Thursday 6 -7.45pm every week in Headington, £5, contact Stephanie midweekmindfulnessoxford@yahoo.co.uk

Oxford Student Mindfulness 7-8.15 pm every Monday in term time, usually at Worcester College, £5, oxfordstudentmindfulnesssoc@gmail.com

Mind the Bump Study



Diary

My goals

My alcohol consumption
My smoking
My diet
My exercise
My mindfulness practice

You've set your healthy lifestyle goals

Week 1

Tick the box which fits best with how things go this week

Routine Activity:

Goal	I achieved my goal	I almost achieved my goal	I missed my goal
Alcohol			
Smoking			
Diet			
Exercise			
Mindfulness practice			

Mindfulness practice this week

1. Chapter 5
2. CD track 1, Mindfulness of Body & Breath, once a day (p.82-86)
3. Mindfulness of a Routine Activity
4. One mindful mouthful in each meal

The challenge is to find time each day, and remembering to be mindful! Try adding your practice onto an established daily routine. Stick a post-it next to your routine activity. Congratulate yourself each time you remember. Treat yourself with kindness and compassion.

Week 2

Tick the box which fits best with how things go this week

Routine Activity:

Goal	I achieved my goal	I almost achieved my goal	I missed my goal
Alcohol			
Smoking			
Diet			
Exercise			
Mindfulness practice			

Mindfulness practice this week

1. Chapter 6
2. CD track 2, Body Scan, once a day (p. 98-101)
3. Habit releaser & appreciation of the here & now (p. 107-109)
4. A different routine activity

Try setting an alarm to remind you to notice how things are now.

Post-it Routine Activity. Notice the challenges you overcome to look after yourself.

Reflect on why you're making lifestyle changes.

Week 3

Tick the box which fits best with how things go this week

Goal	I achieved my goal	I almost achieved my goal	I missed my goal
Alcohol			
Smoking			
Diet			
Exercise			
Mindfulness practice			

Mindfulness practice this week

1. Chapter 7
2. CD track 3, Mindful Movement, once a day (p.119-122)
3. CD track 4, Breath & Body, once a day (p.125-127)
4. CD track 8, Breathing Space, twice a day (p.130-131)

Surf the Urge - try a Breathing Space when you're tempted.

Stretch without striving, it's not a competition!

AGE - Awareness, Gathering, Expanding.

Mind the Gap!

Week 4

Tick the box which fits best with how things go this week

Goal	I achieved my goal	I almost achieved my goal	I missed my goal
Alcohol			
Smoking			
Diet			
Exercise			
Mindfulness practice			

Mindfulness practice this week

1. Chapter 8
2. CD track 4, Breath & Body, (p.125-127) followed by CD track 5, Sounds & Thoughts, once a day (p.143-146)

CD track 8, Breathing Space, twice a day and when needed

We're half way there! Notice the labels you give to sounds, and the stories they trigger. Try a breathing space when you're feeling stressed or tempted – what happens to the feeling? Queues are cues.

Week 5

Tick the box which fits best with how things go this week

Goal	I achieved my goal	I almost achieved my goal	I missed my goal
Alcohol			
Smoking			
Diet			
Exercise			
Mindfulness practice			

Mindfulness practice this week

1. Chapter 9
2. CD track 4, Breath & Body, (p.125-127) followed by CD track 5, Sounds & Thoughts, (p.143-146) followed by CD track 6, Exploring Difficulty, (p.169-172) once a day
3. Breathing Space, breathing with difficulties, twice a day.

This is the longest practice period in the course.

When attention wanders, bring it back gently.

AGE gracefully; it's okay to feel whatever's here.

Week 6

Tick the box which fits best with how things go this week

Goal	I achieved my goal	I almost achieved my goal	I missed my goal
Alcohol			
Smoking			
Diet			
Exercise			
Mindfulness practice			

Mindfulness practice this week

1. Chapter 10
2. CD track 4, Breath & Body, (p.125-127) followed by Track 7, Befriending, (p.195-198) once a day
3. Breathing Space including negative thoughts twice a day, and ideas on page 204 for relating differently to thoughts
4. Habit releaser - do a good deed for someone

Kindness in practice – well done on being friendly to yourself and to others. Difficult moments are an opportunity to recognise and be with feelings.

Week 7

Tick the box which fits best with how things go this week

Goal	I achieved my goal	I almost achieved my goal	I missed my goal
Alcohol			
Smoking			
Diet			
Exercise			
Mindfulness practice			

Mindfulness practice this week

1. Chapter 11
2. Nourishing activities – what lifts your mood, energises you, helps you feel calm and centred?
3. It's your choice - pick the CD tracks you want each day
4. Breathing Space twice a day + action steps on p. 225-232.

Treat yourself well – how can you take best care of health & wellbeing right now?

You're more likely to feel the benefits if you practice regularly. Vary the CD tracks; it's okay to find that some are tougher to follow. Mind the Gap!

Week 8

Tick the box which fits best with how things go this week

Goal	I achieved my goal	I almost achieved my goal	I missed my goal
Alcohol			
Smoking			
Diet			
Exercise			
Mindfulness practice			

Mindfulness practice this week

1. Chapter 12
2. Nourishing activities
3. Your choice of CD tracks each day
4. Breathing Space when things feel difficult

We're at the end of the course, and have had time to build some new healthy habits– how do you feel about this?

Week 9

Tick the box which fits best with how things go this week

Goal	I achieved my goal	I almost achieved my goal	I missed my goal
Alcohol			
Smoking			
Diet			
Exercise			
Mindfulness practice			

Mindfulness practice this week

1. Nourishing activities
2. Your choice of CD tracks each day
3. Breathing Space when things feel difficult

It's over to you! The challenge now is to keep up the practice – reflect on **why** you're being as healthy as you can be. Surf the Urge. Notice thoughts, feelings and sensations coming and going. Look after yourself. Mind the gap between intention & action.

Week 10

Tick the box which fits best with how things go this week

Goal	I achieved my goal	I almost achieved my goal	I missed my goal
Alcohol			
Smoking			
Diet			
Exercise			
Mindfulness practice			

Mindfulness practice this week

1. Nourishing activities
2. Your choice of CD tracks each day
3. Breathing Space when things feel difficult

Contact the group whenever you want to.

Connect with yourself and other people.

Move mindfully, care for your mind and body.

Walk the talk!

Week 11

Tick the box which fits best with how things go this week

Goal	I achieved my goal	I almost achieved my goal	I missed my goal
Alcohol			
Smoking			
Diet			
Exercise			
Mindfulness practice			

Mindfulness practice this week

1. Nourishing activities
2. Your choice of CD tracks each day
3. Breathing Space when things feel difficult

Look after yourself with a healthy and nourishing activity every day.

Connect with friends and family.

Work with the difficulties and discomforts.

You're worth the time and effort.

Week 12

Tick the box which fits best with how things go this week

Goal	I achieved my goal	I almost achieved my goal	I missed my goal
Alcohol			
Smoking			
Diet			
Exercise			
Mindfulness practice			

Mindfulness practice this week

1. Nourishing activities
2. Your choice of CD tracks each day
3. Breathing Space when things feel difficult

Hours of practice and exercise, nutritious diet and low on toxins! Remind yourself why you're doing this.

Acknowledge the challenges you've overcome.

Week 13

Tick the box which fits best with how things go this week

Goal	I achieved my goal	I almost achieved my goal	I missed my goal
Alcohol			
Smoking			
Diet			
Exercise			
Mindfulness practice			

Mindfulness practice this week

1. Nourishing activities
2. Your choice of CD tracks each day
3. Breathing Space when things feel difficult

Keep going! There are lots of things you can't control.

Focus on your attitude, intention and awareness.

Breathe with whatever it is.

Week 14

Tick the box which fits best with how things go this week

Goal	I achieved my goal	I almost achieved my goal	I missed my goal
Alcohol			
Smoking			
Diet			
Exercise			
Mindfulness practice			

Mindfulness practice this week

1. Nourishing activities
2. Your choice of CD tracks each day
3. Breathing Space when things feel difficult

More than 3 months now!

It's okay to feel what ever is already here. Breathe with it.

Treat yourself with kindness and compassion.

You're worth it.

Week 15

Tick the box which fits best with how things go this week

Goal	I achieved my goal	I almost achieved my goal	I missed my goal
Alcohol			
Smoking			
Diet			
Exercise			
Mindfulness practice			

Mindfulness practice this week

1. Nourishing activities
2. Your choice of CD tracks each day
3. Breathing Space when things feel difficult

Nearly there.... just one more week!

Stay in touch.

May you be well!

Week 16

Tick the box which fits best with how things go this week

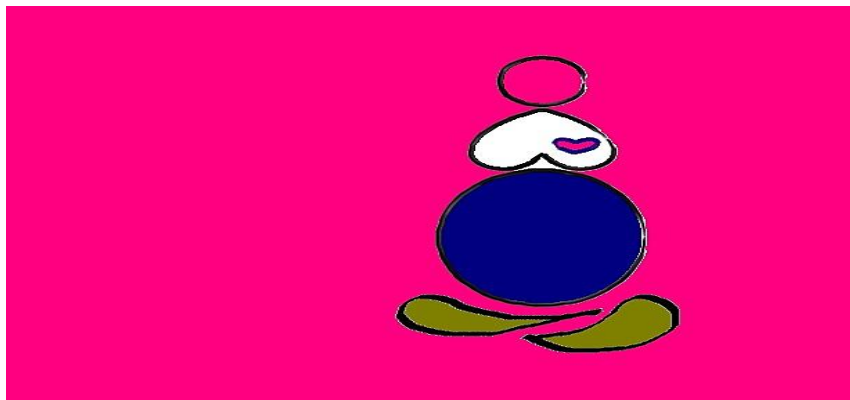
Goal	I achieved my goal	I almost achieved my goal	I missed my goal
Alcohol			
Smoking			
Diet			
Exercise			
Mindfulness practice			

Mindfulness practice this week

1. Nourishing activities
2. Your choice of CD tracks each day
3. Breathing Space when things feel difficult

It's the last week of the research. Reflect on how far you've come!

Come to the reunion meeting



Thank you for taking part in this study. Your contribution is very important and it will add to knowledge which will be used to help other women in the future.

Recruitment poster 05.08.13 version 2

This research has been approved by the University Research Ethics Committee, reference 130724

OXFORD
BROOKES
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Mind the Bump

A study at the Faculty of Health and Life Sciences

Are you between 6 and 21 weeks pregnant? Do you sometimes struggle to exercise or to have a healthy diet, or feel tempted to drink alcohol or smoke?

Mindfulness is a natural way of paying attention to everyday life, and it can be increased using concentration and breathing exercises

Would you like to take part in a study to find out if learning mindfulness makes it easier for pregnant women to look after themselves by having a healthy diet and exercise routine and avoiding alcohol and smoking?



To find out more, please contact Sarah Hennelly

email sarah.hennelly-2011@brookes.ac.uk

send a message to "Mind the Bump Study" on Facebook,

Tweet us [@mindthebumpOBU](https://twitter.com/mindthebumpOBU)

Text or call us on 07554 32 02 06 |

Find us on www.oxbump.org.uk

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Researcher: Sarah Hennelly, sarah.hennelly-2011@brookes.ac.uk
Telephone: 01865 48 27 54
University Research Ethics Committee reference 130724

25th November 2013

Mind the Bump: A study of the effects of mindfulness training on women's health and well-being during pregnancy.

This information is about a research study. Before you decide whether to take part, I would like you to understand why the research is being done and what it will involve for you. Please read this information carefully.

What is the purpose of the study?

The purpose of the study is to evaluate the feasibility of "Mind the Bump", a mindfulness-based training course, and to measure its effects on pregnant women's health-related behaviours and psychological well-being, with particular focus on whether it makes a difference to how able pregnant women are to meet their own health-related goals.

What is Mindfulness Training?

Mindfulness Training is a practical course which includes breathing exercises and homework activities to help people become more aware of the present moment, including getting in touch with moment-to-moment changes in mind and body.

Why will I be invited to take part in the study?

You will be invited to take part you meet the eligibility criteria for the study.

Will I have to take part?

If you are invited, it is up to you to decide whether or not to take part. If you decide to do so, you will be given a copy of this information sheet to keep and be asked to sign a consent form.

What will happen to me if I take part?

If you are eligible to take part in the study, I will send you an invitation letter. You will be asked to come to ten classes in all, including an introductory meeting, an eight

Week mindfulness course, and a reunion meeting eight weeks later. Each class will last 90 minutes.

Your height and weight will be measured before the course, and you will be weighed at each class. You will be asked to practice mindfulness between classes by listening to a CD for 10-15 minutes each day, and to complete a brief daily diary about how you are doing in meeting your goals. You will be asked to complete anonymous questionnaires about your thoughts, feelings and health-related behaviours, and your thoughts about the course itself, before it starts, as soon as it finishes, and again eight weeks later.

If everyone in the group consents to it, the classes may be video-recorded. Only the researcher's face will be shown in the video, and this is so that the quality of the teaching can be assessed against guidelines. A research assistant will be present during classes in order to help with administration and to offer practical help to the researcher and women taking part in the study.

Refreshments will be available at every meeting.

What are the possible disadvantages and risks of taking part?

You will be asked to put aside 15 to 30 minutes each day to do mindfulness practice using a CD. You will be asked to complete three sets of questionnaires, and this may take up to two hours in all, but this is not on top of normal lessons times. Meditation can cause blood pressure to fall a little, and this can be linked with feeling faint or dizzy, or fainting. If you feel faint or dizzy, you will be asked to lie on the floor in the recovery position until you feel well, and we will ask you if you would like us to call your Emergency Contact. If you faint, an ambulance and your Emergency Contact will be called.

What are the possible benefits of taking part?

Mindfulness training has been shown to benefit many people in a wide variety of situations. You may notice improvements in your physical and psychological health and well-being, and the mindfulness training may help you to meet your own health-related goals. This may benefit the immediate and lifetime physical health and development of your unborn child. You may develop practical ways to manage stress, which can also benefit your unborn child, and some people find that mindfulness practice can help them to overcome sleep problems. In the longer term, mindfulness skills may be helpful in meeting the challenges of parenthood.

Taking part in the study will contribute to greater scientific understanding of the potential of mindfulness training for pregnant women, and this may form the

foundations of a new way to support the health and wellbeing of pregnant women and their unborn children in the future.

Will my taking part in the study be kept confidential?

Your participation in the study will be kept confidential. You will be given a unique identity number to use on questionnaires; the researcher will not know this number, your questionnaire answers will be anonymous, and your name and identity number will be not included in any reports, presentations or posters. The researcher will not inform your GP or midwife that you are taking part in the study, although you can tell them if you wish to. If the classes are video-recorded, only the researcher's face will be in-shot, and the video will only be used to check the quality of the course. Everything you say during will be confidential, unless you tell me something that indicates that you or someone else is at risk of harm, in which case I would discuss this with you before telling a named Safeguarding Midwife, preferably with both of us present. The questionnaires' anonymous electronic data will be encrypted, and the anonymous paper questionnaires will be securely stored by Oxford Brookes University for 10 years and then destroyed, in accordance with the University's policy on Academic Integrity.

What will happen if I don't want to carry on with the study?

You can decide to withdraw at any time. If you withdraw during the mindfulness course, your answers will not be used. If you withdraw after the course, you will not be asked to complete the follow-up questionnaires, but your earlier answers will be used if you agree to this.

What if there is a problem?

If you have any concerns about how the research has been carried out, please contact the Chair of the University Committee at Oxford Brookes University on ethics@brookes.ac.uk.

What will happen to the results of the research study?

This study is part of my PhD at Oxford Brookes University, and I will use the results to understand the effect of mindfulness training on pregnant women's health and well-being. A report of my findings will be sent to you, and it will be available on the www.oxbump.org.uk website. It may be presented at conferences and submitted for publication in academic journals. You can also contact me for a copy of the report after 1st June 2014 at the email address or phone number above.

Who has reviewed the study?

This study has been reviewed and approved by the Oxford Brookes University Research Ethics Committee. In the event of any concerns about the conduct of the research, please contact the Chair ethics@brookes.ac.uk.

Who is funding the research?

This research is funded by Oxford Brookes University.

Further information

For further information about the study, please contact me, or my supervisor Dr Lesley Smith, at the email addresses above.

Thank you very much for taking the time to read this.

What do I do if I would like to take part in the study?

Please call me on 07554 32 02 06, or email me on sarah.hennelly-2011@brookes.ac.uk

Please include your name, a contact phone number, and a convenient time to call you. I will pick up voicemail messages each working day.

Sarah Hennelly

Telephone Screening Guide: (Eligibility criteria in brackets)

Part 1: Exclusion criteria

1. Please can you tell me how many weeks pregnant you are now? (6-23, depending on intervention start date)
2. Please can you tell me how old you are? (16 or older)
3. Do you currently meditate? (No)
4. Are you under the care of Oxford University Hospitals NHS Trust Silver Star team? (No)
5. Are you currently taking part in a psychological or health behaviour intervention? (No)
6. Do you have any of the following medical conditions? Clinical depression, alcoholism, drug-dependency, psychosis, personality disorder, suicidal ideation. (No)

If Yes to any, non-eligible.

Part 2: Health-risk factors

Please can you me about your current

1. alcohol consumption (any amount > nil)
2. smoking (any amount > nil)
3. amount of exercise (< 15 minute per day)
4. diet (poor diet, under/overeating, no supplements)

5. Please can you tell me how tall you are and what your pre-pregnancy weight was?
6. How has your weight changed since you became pregnant?

Compare against:

Pre-pregnancy BMI	Descriptor	Recommended gain
18.5–24.9	Healthy	11.5-16 kg, 25-35 lbs
25-29.9	Overweight	7-11.5 kg, 15-25 lbs
=>30	Obese	5-9 kg, 11-20 lbs

Part 3: Eligible. Non-eligible

Eligible

1. If women smoke or drink
2. If women have two or more health-risk factors
3. Ask if they can attend on the available course times & days
4. If so, issue verbal invitation and send formal invitation letter (Appendix 10) and information sheet (Appendix 11) by post or email

Not eligible

1. Explain why
2. If excluded for Part 1: 1/3/5, Part 2, or time/date ask if willing to be contacted about other OxBump studies by email or post
3. If so, confirm/collect contact details and send thank you letter (Appendix 12)
4. If not, say thank you

Faculty of Health and Life Sciences
Department of Social Work and Public Health
Jack Straws Lane, Oxford OX3 0FL



Supervisor: Dr Lesley Smith, lesleysmith@brookes.ac.uk
Researcher: Sarah Hennelly, sarah.hennelly-2011@brookes.ac.uk
Telephone: 01865 48 2754 or 07554 32 02 06

Today's XXX

Inviting you to take part in the Mind the Bump Study: A study of the effects of mindfulness training on women's health and well-being during pregnancy

Dear ~~xxxx~~

Thank you very much for your interest in taking part in this study and for talking to me about your pregnancy and your health.

I am inviting you to take part in the study.

If you decide to take part, you will be asked to attend a nine session mindfulness training course which will run on Tuesdays from 7 pm until 8.30 pm beginning September XXX. Each session will last 90 minutes, and you will be asked to do mindfulness practices at home each day for about 15 minutes. Mindfulness practices are breathing and concentration exercises which help people to become more aware of the present moment, including getting in touch with moment-to-moment changes in the mind and the body.

The venue is Room 2 in Willow Building on Oxford Brookes University Headington Hill site (link to map below). This site is on the bus route between central Oxford and Thornhill "Park and Ride", and parking is available on-site. You will not need to bring anything with you, but please wear comfortable clothes. Drinks and fruit will be provided.

Your participation in this study is useful and important because it will help me to understand how effective a new programme is in supporting your health and well-being, and this may be helpful for other pregnant women in the future.

Please call or email me when you have decided if you would like to take part in the study.

I look forward to hearing from you.

Yours sincerely

PhD researcher at Oxford Brookes University
Map of Headington Hill site <http://www.brookes.ac.uk/about/findus/documents/headington.pdf>.

This research has been approved by the University Research Ethics Committee; reference 130724

Invitation Letter Version 1



www.brookes.ac.uk



Mind the Bump: A study of the effects of mindfulness training on women's health and well-being during pregnancy

Supervisor: Dr Lesley Smith, lesleymith@brookes.ac.uk

Researcher: Sarah Hennelly, sarah.hennelly-2011@brookes.ac.uk

Please initial box

I confirm that I have read and understand the information sheet for the above research study and have had the opportunity to ask questions.

I understand that my participation is voluntary and that I am free to withdraw at any time, or to withdraw any unprocessed data previously supplied, without giving reason.

I agree to take part in the above study.

I agree that my data gathered in this study may be stored (after it has been anonymised) in a specialist data centre and may be used for future research.

Please tick box

Yes

No

I agree to the classes being video recorded for quality assurance purposes

Name of Participant

Date

Signature

Name of Researcher

Date

Signature

I



Mind the Bump Study

An investigation of the effect of a Mindfulness-based Intervention on health and wellbeing during pregnancy

Demographics Questionnaire

Week 0

Your id number



Researcher: sarah.hennelly-2011@brookes.ac.uk, 01865 48 2754, 07554 320206



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I

What is the first part of your post-code? _____

e.g. full postcode is OX34 9FL, answer is OX34, full postcode is OX2 4JF, answer is OX2



	Yes	No
Is English your first language?		

What is your ethnicity?

White British		Bangladeshi	
White Irish		Any other Asian background	
Any other White background		Black- Caribbean	
Mixed: White and Black Caribbean		Black- African	
Mixed: White and Black African		Any of Black background	
Mixed: White and Asian		Chinese	
Any other Mixed background		Any other Ethnic Group	
Indian		I do not wish to give Ethnic Group	
Pakistani		I do not know my Ethnic Group	

What is your age group?

16-20		26-30		36-40	
21-25		31-35		41+	

	Yes	No
Is this your first pregnancy?		
Was this pregnancy planned?		
Is this pregnancy the result of assisted conception e.g. IVF?		

How many weeks pregnant are you now? _____

How many weeks pregnant were you when you found out you are expecting this baby? _____

Not counting this pregnancy, how many children do you have in these age-ranges?

0-5 years	5-10 years	11-15 years	16-17 years	18 years and over

How tall are you? Feet & inches _____ or Metres _____

What was your pre-pregnancy weight: Stones & pounds _____ or kilos _____

What is your current weight: Stones & pounds _____ or kilos _____

What is your employment status?

Employed full time		Student	
Employed part-time (less than 16 hours)		Not employed but looking after home & family	
Unemployed		Not employed because of illness or disability	
Government work/training scheme		Retired	

What is your approximate household annual income, including any benefits?

£5,000 or less		£40,001 to £50,000	
£5,001 to £10,000		£50,001 to £60,000	
£10,001 to £20,000		£60,001 to £70,000	
£20,001 to £30,000		£70,001 to £80,000	
£30,001 to £40,000		£80,001 or more	

What is the highest level of education you have completed?

No formal qualifications		BA/BSc	
GCSE's		MA/MSc	
A' levels		Doctorate	
College-level vocational qualifications		Chartership	



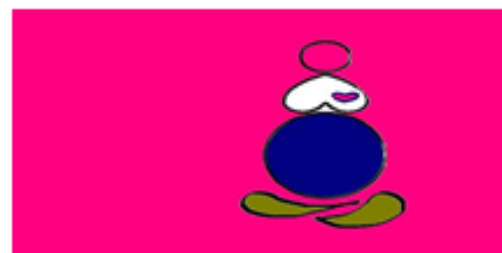
Mind the Bump Study

An investigation of the effect of a Mindfulness-based Intervention on health and wellbeing during pregnancy

Health Questionnaire

|

Your id number



Researcher: sarah.hennelly-2011@brookes.ac.uk, 01865 48 2754, 07554 320206

Mindfulness

Below is a collection of statements about your everyday experience. Please indicate how frequently or infrequently you have had each experience **in the last month**. Please answer according to what really reflects your experience rather than what you think your experience should be

In the last month	Never, or very rarely true	Not often true	Sometimes true, sometimes not true	Often true	Very often or always true
I'm good at finding the words to describe my feelings					
I can easily put my beliefs, opinions and expectations into words					
I can watch my feelings without getting carried away by them					
I tell myself I shouldn't be feeling the way I'm feeling					
It's hard for me to find the words to describe what I'm thinking					
I pay attention to physical experiences, such as the wind in my hair or sun on my face					
I make judgements about whether my thoughts are good or bad					
I find it difficult to stay focused on what's happening in the present moment					
When I have distressing thoughts or images, I don't let myself get carried away by them					
Generally, I pay attention to sounds, such as clocks ticking, birds chirping or cars passing					
When I feel something in my body, it's hard for me to find the right words to describe it					
It seems I am "running on automatic" without much awareness of what I am doing					
When I have distressing thoughts or images, I feel calm soon after					
I tell myself I shouldn't be thinking the way I'm thinking					
I notice smells and aromas of things					
Even when I am terribly upset, I can find a way to put it into words					
I rush through activities without really being attentive to them					

In the last month	Never, or very rarely true	Not often true	Sometimes true, sometimes not true	Often true	Very often or always true
Usually when I have distressing thoughts or images, I can just notice them without reacting					
I think some of my emotions are bad or inappropriate and I shouldn't feel them					
I notice visual elements in art or nature, such as colours, shapes, textures or patterns of light and shadow					
When I have distressing thoughts or images, I just notice them and let them go					
I do jobs or tasks automatically without being aware of what I'm doing					
I find myself doing things without paying attention					
I disapprove of myself when I have illogical ideas					

Your health

How have you been feeling during this pregnancy?

	Not at all	A little	Sometimes	A lot	All the time
Tired					
Morning sickness					
Unwell for other reasons					

Have you been diagnosed with any pregnancy-related conditions, such as high blood pressure, perinatal depression, gestational diabetes, or problems which reduce your ability to exercise? Please tell us a little about this

Emotions

This scale consists of a number of words that describe different feelings and emotions. Please indicate the extent to which you have felt these over the last week.



	Not at All/ Very Slightly	A Little	Moderately	Quite a Bit	Extremely
Interested					
Distressed					
Excited					
Upset					
Strong					
Guilty					
Scared					
Hostile					
Enthusiastic					
Proud					
Irritable					
Alert					
Ashamed					
Inspired					
Nervous					
Determined					
Attentive					
Nervous					
Active					
Afraid					

Wellbeing

People have a variety of ways of relating to their thoughts and feelings. For each of the items below, rate how much each of these ways applies to you.

	None of the time	Rarely	Some of the time	Often	All of the time
I've been feeling optimistic about the future					
I've been feeling useful					
I've been feeling relaxed					
I've been feeling interested in other people					
I've had energy to spare					
I've been dealing with problems well					
I've been thinking clearly					
I've been feeling good about myself					
I've been feeling close to other people					
I've been feeling confident					
I've been able to make up my own mind about things					
I've been feeling loved					
I've been interested in new things					
I've been feeling cheerful					

Stress

The questions in this scale ask you about your feelings and thoughts **during the last month**. In each case, you please mark **how often** you felt or thought a certain way.

	Never	Almost Never	Sometimes	Fairly Often	Very Often
How often have you been upset because of something that happened unexpectedly?					
How often have you felt that you were unable to control the important things in your life?					
How often have you felt nervous and "stressed"?					
How often have you felt confident about your ability to handle your personal problems?					
How often have you felt that things were going your way?					
How often have you found that you could not cope with all the things that you had to do?					
How often have you been able to control irritations in your life?					
How often have you felt that you were on top of things?					
How often have you been angered because of things that were outside of your control?					
How often have you felt difficulties were piling up so high that you could not overcome them?					

Compassion

The questions in this scale about how you generally feel about yourself. In each case, please mark how often you feel or think a certain way.

	Almost Never	Occasionally	About Half Of The Time	Fairly Often	Almost Always
I'm disapproving and judgmental about my own flaws and inadequacies					
I try to be loving towards myself when I'm feeling emotional pain					
When times are really difficult, I tend to be tough on myself					
I'm intolerant and impatient towards those aspects of my personality I don't like					
When I'm going through a very hard time, I give myself the caring and tenderness I need					
When I see aspects of myself that I don't like, I am hard on myself					
I'm kind to myself when I'm experiencing suffering					
I can be a bit cold-hearted towards myself when I'm experiencing suffering					
I'm tolerant of my own flaws and inadequacies					
I try to be understanding and patient towards those aspects of my personality I don't like					

Compassion

The questions in this scale are about how you generally feel about others. In each case, you please mark how **often** you feel or think a certain way.

	Almost Never	Occasionally	About Half Of The Time	Fairly Often	Almost Always
When people cry in front of me, I often don't feel anything at all					
Sometimes when people talk about their problems, I feel like I don't care					
I don't feel emotionally connected to people in pain					
I pay careful attention when other people talk to me					
I feel detached from others when they tell me their tales of woe					
If I see someone going through a difficult time, I try to be caring toward that person					
I often tune out when people tell me about their troubles					
I like to be there for others in times of difficulty					
I notice when people are upset, even if they don't say anything					
When I see someone feeling down, I feel like I can't relate to them					
Everyone feels down sometimes, it is part of being human					
Sometimes I am cold to others when they are down and out					
I tend to listen patiently when people tell me their problems					
I don't concern myself with other people's problems					

	Almost Never	Occasionally	About Half Of The Time	Fairly Often	Almost Always
It's important to recognize that all people have weaknesses and no one's perfect					
My heart goes out to people who are unhappy					
Despite my differences with others, I know that everyone feels pain just like me					
When others are feeling troubled, I usually let someone else attend to them					
I don't think much about the concerns of others					
Suffering is just a part of the common human experience					
When people tell me about their problems, I try to keep a balanced perspective on the situation					
I can't really connect with other people when they're suffering					
I try to avoid people who are experiencing a lot of pain					
When others feel sadness, I try to comfort them					

Alcohol

Please answer these questions about your alcohol consumption **during this pregnancy**

This is one unit of alcohol...



...and each of these is more than one unit



How often do you have a drink containing alcohol now?	Never	Monthly or less	2-4 times a month	2-3 times a week	4 or more times a week
How many standard drinks (i.e. units) do you have on a typical day when you are drinking now?	1 or 2	3 or 4	5 or 6	7 to 9	10 or more
How often do you have six or more drinks (i.e. units) on one occasion?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily

If you drank before you knew you were pregnant, how much do you drink now?	More	The same	Less
--	------	----------	------

Smoking

Please answer these questions about smoking

How many cigarettes do you smoke each day now?	0	1-5	6-10	11-15	16-20	21 or more
If you smoke, how soon after you woke up do you smoke your first cigarette?	Within 5 minutes	6-30 minutes	31-60 minutes	After 60 minutes		

Exercise

During this trimester, when you are **NOT at work**, how much time do you usually spend:

Activity	None	Less than ½ hour per day	½ to almost 1 hour per day	1 to almost 2 hours per day	2 to almost 3 hours per day	3 or more hours per day
Preparing meals (cook, set table, wash dishes)						
Dressing, bathing, feeding children whilst you are sitting						
Dressing, bathing, feeding children whilst you are standing						
Playing with children whilst you are sitting						
Playing with children whilst you are standing						
Playing with children whilst you are walking or running						
Carrying children						
Taking care of an older adult						
Sitting and using a computer or writing, whilst not at work						

During this trimester, when you are **NOT at work**, how much time do you usually spend:

Activity	None	Less than ½ hour per day	½ to almost 2 hours per day	2 to almost 4 hours per day	4 to almost 6 hours per day	6 or more hours per day
Watching TV, films, videos, DVDs, or online media						
Sitting and reading, talking, or on the phone, whilst not at work						

Activity	None	Less than ½ hour per day	½ to almost 1 hours per day	1 to almost 2 hours per day	2 to almost 3 hours per day	3 or more hours per day
Playing with pets						
Light cleaning (make beds, laundry, iron, put things away)						
Shopping (for food, clothes, or other items)						

Activity	None	Less than ½ hour per week	½ to almost 1 hour per week	1 to almost 2 hours per week	2 to almost 3 hours per week	3 or more hours per week
Heavier cleaning (vacuum, mop, sweep, wash windows)						
Mowing the lawn riding on a riding mower						
Mowing the lawn using a lawn mower, raking, gardening						

Going to Places

During this trimester, how much time do you usually spend:

Activity	None	Less than ½ hour per day	½ to almost 1 hour per day	1 to almost 2 hours per day	2 to almost 3 hours per day	3 or more hours per day
Walking slowly to go places (such as to the bus, work, visiting) Not for fun or exercise						
Walking quickly to go places (such as to the bus, work, or school) Not for fun or exercise						
Driving or as a passenger in a car, bus, train or plane						

Cycling

Activity	None	Less than ½ hour per week	½ to almost 1 hour per week	1 to almost 2 hours per week	2 to almost 3 hours per week	3 or more hours per week
Cycling quickly or up hills to get to places						
Cycling at moderate effort to get to places						
Cycling quickly up or up hills for fun or exercise						
Cycling at moderate effort for fun or exercise						

For Fun or Exercise

During this trimester, when you are NOT at work, how much time do you usually spend:



Activity	None	Less than ½ hour per week	½ to almost 1 hour per week	1 to almost 2 hours per week	2 to almost 3 hours per week	3 or more hours per week
Walking slowly for fun or exercise						
Walking quickly for fun or exercise						
Walking quickly up hills for fun or exercise						
Jogging						
Prenatal exercise class						
Swimming						
Dancing						

Doing other things for fun or exercise; please tell us what they are

Activity	None	Less than ½ hour per week	½ to almost 1 hour per week	1 to almost 2 hours per week	2 to almost 3 hours per week	3 or more hours per week

Please fill out this section if you work for wages, as a volunteer, or if you are a student. If you are a homemaker, out of work, or unable to work, you do not need to fill in this section.

At Work



Activity	None	Less than ½ hour per day	½ to almost 2 hours per day	2 to almost 4 hours per day	4 to almost 6 hours per day	6 or more hours per day
Sitting at work or in class						
Standing or walking slowly at work whilst carrying things heavier than 2 packs of A4 paper						
Standing or <u>walking</u> slowly at work whilst <u>not</u> carrying anything						
Walking <u>quickly</u> at work whilst carrying things heavier than 2 packs of A4 paper						
Walking <u>quickly</u> at work whilst <u>not</u> carrying anything						

Diet

Please answer these questions about your normal diet

	Yes	No
Are you vegetarian?		
Are you vegan?		
Has your GP or midwife advised you NOT to take supplements?		

During this pregnancy	Yes	No
Do you take "Healthy Start", "Pregncare", or other pregnancy multivitamins?		
Do, or did, you take Folic Acid supplements?		
Do you take Vitamin D supplements?		
Do you take other vitamins or supplements? Please tell us what they are		

How would you describe your diet now?	All days	Most days	Some days	Rarely	Never
Healthy, balanced					
Starchy carbohydrates (bread, pasta, wholegrain cereals)					
"5 a day" fruit and vegetables					
Protein-rich foods (meat, fish, eggs, beans, nuts, pulses, seeds)					
Milk & dairy products (milk, cheese, yoghurt)					
Foods & drinks high in fat &/ sugar (sweets, crisps, biscuits, chips, "fast food", chocolate, fizzy drinks)					

Mood

Please mark the answer that comes closest to how you have felt in the past 7 days, not just how you feel today.

I have been able to laugh and see the funny side of things	As much as I always could	Not quite so much now	Definitely not so much now	Not at all
I have looked forward with enjoyment to things	As much as I ever did	Rather less than I used to	Definitely less than I used to	Hardly at all
I have blamed myself unnecessarily when things went wrong	Yes, most of the time	Yes, some of the time	Not very often	No, never
I have been anxious or worried for no good reason	No, not at all	Hardly ever	Yes, sometimes	Yes, very often
I have felt scared or panicky for no very good reason	Yes, quite a lot	Yes, sometimes	No, not much	No, not at all
Things have been getting on top of me	Yes, most of the time I haven't been able to cope at all	Yes, sometimes I haven't been coping as well as usual	No, most of the time I have coped quite well	No, I have been coping as well as ever
I have been so unhappy that I have had difficulty sleeping	Yes, most of the time	Yes, sometimes	Not very often	No, not at all
I have felt sad or miserable	Yes, most of the time	Yes, quite often	Not very often	No, not at all
I have been so unhappy that I have been crying	Yes, most of the time	Yes, quite often	Only occasionally	No, never
The thought of harming myself has occurred to me	Yes, quite often	Sometimes	Hardly ever	Never

Anxiety

Over the last 2 weeks, how often have you been bothered by any of the following problems?

	Not at all	Several days	More than half of the days	Nearly every day
Feeling nervous, anxious or on edge?				
Not being able to stop or control worrying?				
Worrying too much about different things?				
Trouble relaxing?				
Becoming so restless that it is hard to sit still?				
Becoming easily annoyed or irritable?				
Feeling afraid as if something might happen?				

Feelings about pregnancy

The following questions relate to the way you perceive your pregnancy. Mark the box that best reflects how you felt during the last 7 days

	Very often	Fairly often	Now and then	Rarely or never
I am enjoying my pregnancy				
I feel like my partner and I are enjoying the pregnancy together				
I worry about the pregnancy				
The pregnancy has brought my partner and I closer together				
I worry about the delivery				
I worry about the health of my baby				
I worry about my job once the baby is born				
I feel supported by my partner				
I worry about our financial situation after childbirth				
I am afraid I will lose self-control during delivery				
I often think about choices concerning the delivery				
The delivery is troubling me				
I get very tense hearing stories about deliveries				
I am concerned that the physical discomforts of pregnancy might persist after childbirth				
I can really share my feelings with my partner				
I worry about gaining too much weight				

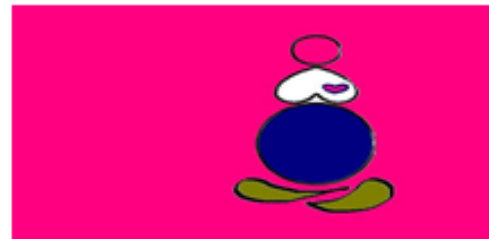
Thank you

Mind the Bump Study

An investigation of the effect of a Mindfulness-based Intervention on health and wellbeing during pregnancy

Course Evaluation

Your id number



Researcher: sarah.hennelly-2011@brookes.ac.uk, 01865 48 2754, 07825 95 26 90

Week 0

Please tick the box that best describes your expectations of the course:

Not at all interesting	A little interesting	Not sure	Mostly interesting	Very interesting

Not at all enjoyable	A little enjoyable	Not sure	Mostly enjoyable	Very enjoyable

Not at all useful	A little useful	Not sure	Mostly useful	Very useful

Please tick the box that best describes your expectations of the Diary:

Not at all useful	A little useful	Not sure	Mostly useful	Very useful

Please tick the circle that best describes your Goals

	Not at all	A little	Not sure	Mostly	Very
Useful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was influenced by what is important to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was influenced by what other people expect me to do	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Specific	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Motivational	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Achievable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Relevant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time-framed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I

	Not applicable	Very uncertain	Rather uncertain	Neither	Rather certain	Very certain
How certain are you to achieve your alcohol goal?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How certain are you to achieve your smoking goal?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How certain are you to achieve your diet goal?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How certain are you to achieve your exercise goal?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How certain are you to achieve your mindfulness practice goal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Week 8

Please can you tick the box that best describes your experience of the Mindfulness Training course

Not at all interesting	A little interesting	Not sure	Mostly interesting	Very interesting
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Not at all enjoyable	A little enjoyable	Not sure	Mostly enjoyable	Very enjoyable
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Not at all useful	A little useful	Not sure	Mostly useful	Very useful
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please tick the box that best describes your experience of the Diary:

Not at all useful	A little useful	Not sure	Mostly useful	Very useful
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Didn't use it all	I used it occasionally	Not sure	I used it most days	I used it every day
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please can you tick the box that best describes your experience of the Mindfulness Training course

Please tick the circle that best described your experience of your Goals during the 8 week course itself

	Not at all	A little	Not sure	Mostly	Very
Useful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Unnecessary	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Specific	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Motivational	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Achievable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Relevant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time-framed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please can you tick the box that best describes your experience of the Mindfulness Training course

On average, how frequently did you do formal mindfulness practice, either using the CD or on your own, each week during the 8 week course?

	No days	1-2 days	3-4 days	5-6 days	Every day
Formal practice each week	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

On average, how frequently did you do informal mindfulness practice, such as paying attention to eating or normal daily activities, each week each week during the 8 week course?

	No days	1-2 days	3-4 days	5-6 days	Every day
Informal practice each week	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

On average, how frequently did you taken breathing spaces each week during the 8 week course?

	No days	1-2 days	3-4 days	5-6 days	Every day
Breathing spaces each week	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

On average, how frequently did you take breathing spaces each week during the 8 week course?

	No days	1-2 days	3-4 days	5-6 days	Every day
Breathing spaces each week	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Which practice, if any, did you find most useful or a "good fit" for you?

Please tick the circle that best describes the last eight weeks

	Not applicable	None of the time	Rarely	Some times	Most of the time	All of the time
I was able to achieve my alcohol goal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was able to achieve my smoking goal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was able to achieve my diet goal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was able to achieve my exercise goal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was able to achieve my mindfulness practice goal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was tempted to drink alcohol	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was tempted to smoke	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was tempted to eat unhealthily	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was tempted to not exercise	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was tempted to not do mindfulness practice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please tick the circle that best describes the next eight weeks

	Not applicable	Very uncertain	Rather uncertain	Neither	Rather certain	Very certain
How certain are you to achieve your alcohol goal?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How certain are you to achieve your smoking goal?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How certain are you to achieve your diet goal?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How certain are you to achieve your exercise goal?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How certain are you to achieve your mindfulness practice goal?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please tell me about anything enjoyed and found interesting about the course

I

Please tell me about anything found difficult or uninteresting about the course

Please tell me what you learned, and any ways in which this was useful for you

Please tell me about the challenges there were in achieving your goals, and any ways you were able to overcome them, including what happened when lapses occurred.

For home practice

For drinking alcohol

For smoking

For eating

For exercise

Please tell me about anything else you think is important for me to know about the course and the study. For example, do you have any suggestions about anything else that would have been useful?

Thank you for taking the time to complete this feedback, it will help me to understand your experiences and it may help other women in the future

Appendix D9 Sample transcript coding

Item	W	Question & id	Text	Notes
1	8	Alcohol10 <i>Intention to drink Occasional drink</i>	I discovered that the no study has proved that very small amount of alcohol affect babies in late pregnancy, so I have allowed myself a few sips here and there.	<i>Evidence → Being abst alcohol</i>
2	8	Alcohol11 <i>Occasional drink</i>	I'm happy not to drink, and this hasn't been particularly difficult. I have had half a small glass of wine on the rare occasions, and enjoyed these.	<i>Enjoyed occasional drink</i>
3	8	Alcohol12	Easy goal	
4	8	Alcohol13 <i>Occasional drink</i>	Sometimes I would have a sip of wine on the rare occasion I was cooking with it, but I never had a whole class, and this was a rare!	<i>Rare drink</i>
5	8	Alcohol18	This is easy; not a big change for me personally.	
6	8	Alcohol19	No particular challenges	
7	8	Alcohol2 <i>tempt to drink</i>	No specific challenges, oh except when out for dinner, but didn't actually drink when out.	<i>tempted to drink but not actual</i>
8	8	Alcohol42 <i>tempt to drink Occasional drink</i>	I'd be tempted by my husband's ale and have a few sips, and I did have some wine now and then - nothing excessive.	<i>tempted, drank a little</i>
9	8	Alcohol45 <i>Occasional drink tempt to drink</i>	I have only had a couple of half glasses of wine in last eight weeks, and have not usually craved it.	<i>Sometimes craving occasional drink</i>
10	8	Alcohol46	I've never drunk alcohol in my life for religious reasons, same for smoking.	
11	8	Alcohol54	No challenges – I found this easy.	
12	8	Alcohol56	Easy I do not drink, and have not done so for about four years.	
13	8	Alcohol57	Okay.	
14	8	Alcohol8 <i>Intent to drink Occasional drink</i>	My goal was for the occasional sip of wine, which has been more than manageable – I haven't felt like I wanted to drink. I'm not a big drinker anyway - I don't believe an occasional drink to celebrate a special occasion could harm the baby anyway.	<i>Goal to drink occasionally. Being abst alcohol</i>
15	8	Difficult10 <i>Conflict b/w mfn & goals ↓ Ethos</i>	I found the nature of having a specific goal in mind slightly at odds with the concept of mindfulness, but this didn't hamper my enjoyment of the course.	<i>Goals conflict with ethos of mfn</i>

67	8	Enjoy8 Enjoy p's Knowledge Practical Knowledge Connection to baby the group	I have really enjoyed the course/it has been thought-provoking and proved practical in my daily life/Each session has introduced me to new ideas and ways of thinking which I found refreshing/guided meditations have been very good and helped me to understand and apply the practices as well as connect with my baby more closely by closely paying greater attention to my body and my breathing/I have found the contributions of others within the group this equally interesting and engaging.	1 Enjoyed the course 2 Practical applications in daily life 3 Learning new ways of thinking 4 Guided practices helped understand applications 5 Connection with baby by paying att. to breathe body 6 Appreciating the group
68	8	Enjoyed10 Skill Good fit	I found it extremely interesting to learn to observe thoughts rather than simply be swept along by them. I was interested to discover that I have a reasonably natural high natural level of mindfulness and it has been useful to acknowledge and develop this further.	1 Interesting to learn a new way to relate to thoughts 2 Good natural fit
69	8	Enjoyed12 Enjoy p's Self care	I enjoyed doing formal practices using the CD. It was also interesting to focus on myself and my own well-being.	1 Enjoyed home practice 2 Enjoyed focusing on self + wellbeing
70	8	Enjoyed13 Practical toolkit Skills Group	I liked having practical tools and exercises to use, depending on my mood and needs, I liked sharing and discussing our experiences within the group. I frequently explored ideas and concepts we were working on in my yoga classes!	1 Also flexible 2 Portfolio of tools & techniques 3 Appreciated sharing with the group 4 Transferred learning into teaching
71	8	Enjoyed14	The meditation times.	
72	8	Enjoyed17 Group knowledge	Make friends, know more about meditation.	Making friends. Learning abt mfn.
73	8	Enjoyed18 Knowledge Group Enjoy p's	The information and science behind mindfulness/ Getting together and discussing and exchanging thoughts and feelings/ The practices themselves.	Evidence-base for mfn. Shared experience Enjoyed the practices

148	8	Useful10 Benefits Benefits Skill	I learnt that mindfulness can be applied to most activities and will generally make them more nurturing and rewarding. I found that when I didn't practice meditations, I missed them. I found learning to focus on the breath extremely helpful, and hope this will come in handy during labour!	Can + mh to daily tasks ↑ nurture + reward - noticed absence - Useful to focus on breath
149	8	Useful11 Toolkit Deploy	That I can take a breathing space anytime, anywhere, and that this really does help with dealings with spiralling anxiety before it gets unmanageable.	Palatable Stop spiralling anxiety
150	8	Useful12 Knowledge Skills Benefit	I have a better idea now what mindfulness is. This was one of the things I wanted to achieve. I learned to meditate and can use it later to relax and to get myself together.	Developed new knowledge & skills
151	8	Useful13 Establishing a practice Pervasive Deploying Skills	I feel more mindfulness training I do, the more it becomes an integral part of my life. I have yet to be able to incorporate it into my daily routine/schedule as much as I hoped to, but I do feel that it influences how I think, and act. Being able to drop in and use certain exercises as needed (when in a challenging situation) was very beneficial.	mh Becoming a part of normal life. Deploying
152	8	Useful14 Self care	Making sure I have time to myself.	Self care
153	8	Useful17 Skills	Notice the breathing patterns, easy to focus. Calm down when stressed.	Utility to calm down
154	8	Useful18 Skills Deploy Benefits Group	Hard to define! I would say I now have quite a powerful tool available to me to ground myself and stop spirals of feeling low or down or stressed; overall definitely happier due to the practices. The exchange with others in the course has also been enormously sustaining and nourishing.	Powerful tool Stop spirals Nourishing & sustaining groups
155	8	Useful19 Skills	I learn some exercises but I know calm me down and focus me, and I can see how there will be occasions in the future when I would like to draw upon these.	Learned practical skills to calm down