
# Mindfulness during Pregnancy: An Evaluation of Mindfulness and Negative Mood over the Perinatal Period

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# MINDFULNESS DURING PREGNANCY: AN EVALUATION OF MINDFULNESS AND NEGATIVE MOOD OVER THE PERINATAL PERIOD

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## ABSTRACT

Perinatal depression is widespread and disabling with a number of negative consequences for the mother, father and child. Prenatal depression, stress and anxiety and a history of depression are significant predictors of perinatal depression suggesting a need for preventative interventions. Helpful psychological interventions for this period are currently scarce and expensive and research examining preventative interventions is lacking. Preliminary evidence suggests that generic and pregnancy-tailored mindfulness courses can reduce stress, anxiety and depression in this population. Because, more broadly, access to mindfulness courses is inequitable, research has begun to focus on the possibility of delivering such courses online, resulting in potentially beneficial courses becoming available with a reduction in cost to the participant and health service. The aim of this doctorate was to conduct a series of sequenced studies culminating in an overall evaluation of mindfulness courses for expectant mothers. In cross-sectional analyses, higher levels of dispositional mindfulness were associated with healthier mood levels suggesting that increasing mindfulness in this population (via a course) may be beneficial. A preliminary evaluation of a face-to-face mindfulness-based course for childbirth and parenting showed promising results for prospective mothers and fathers and further research would be useful. An online mindfulness course delivered to expectant mothers improved prenatal mood compared to a waitlist control group but there was a high level of drop-out for course completers. This high attrition rate, though often noted in internet intervention research, is concerning and warrants further investigation. More generally, mindfulness courses for expectant parents show potential and future work would benefit from larger samples and control group comparisons.

# OUTLINE OF CHAPTERS

Chapter 1 explored the background to the studies described in this thesis and outlines the research. The first chapter provides a review of the risk factors and consequences of perinatal negative mood for expectant mothers and fathers and of current psychological interventions available for the perinatal period. The review particularly explored findings for the usefulness of mindfulness therapies during pregnancy, providing a rationale for evaluating the utility of an online mindfulness course during this period.

Before offering an online mindfulness course to a specific sample, i.e. expectant parents, it was appropriate to first evaluate the course for a sample of general service users. Chapter 2 outlines a study exploring the usefulness of an online mindfulness course for stress, anxiety and depression in the general population examining those people choosing to sign-up to and complete the course.

Chapter 3 describes a cross-sectional study evaluating the relationship between general stress and anxiety and pregnancy-related depression, distress, worry and discomfort and dispositional mindfulness in a sample of expectant mothers. This study was intended to pilot measures for subsequent studies, and elucidate possible associations between dispositional mindfulness and pregnancy-specific variables, thus informing future study design and offering an insight into whether an online intervention which may plausibly increase dispositional mindfulness would be beneficial for this population.

Chapter 4 describes an audit study of two mindfulness courses delivered in person to pregnant women and their partners. Previously used measures examining pregnancy related depression, discomfort, worry, distress and experience and general outcomes of anxiety and stress were measured before and after the course to examine the potential benefits in mood

for this sample. The results of this study provided further support for the usefulness of a mindfulness intervention in this population.

Chapter 5 presents a replication of chapter 2, with a further cross-sectional analysis. The analysis is conducted on two samples of pregnant women, recruited to participate in the online mindfulness course studies (one being the pilot). There is very little existing literature examining dispositional mindfulness in relation to mood during pregnancy, so it seemed appropriate to re-evaluate the relationship once more, using general and pregnancy-specific measures of mood, in a larger sample.

Chapter 6 outlines a pilot study and subsequent randomised controlled study examining the impact of the online mindfulness course in reducing general stress, anxiety, depression and pregnancy-specific measures of depression, worry and distress in a sample of expectant mothers, compared to a waitlist control group. The data was collected before the course, after course completion and at two-month post-natal follow-up to investigate whether any course benefits were maintained. Dispositional mindfulness and the amount of mindfulness practice completed were investigated as potential mediators of change and parity was investigated as a potential moderator.

# 1. CHAPTER 1. INTRODUCTION

## 1.1 Current investigation

Few effective mental health interventions for the perinatal period exist for prospective parents (Lewis & Drife, 2004; Bauer et al., 2014; Dennis & Dowswell, 2013). The lack of treatment options is a concern owing to the high rates of low mood around this period and the consequences of such (Paschetta et al., 2014; Lewis & Drife, 2004). There is a growing body of research which outlines a number of detrimental consequences of perinatal depression, anxiety and stress for mother, father and child and detectable risk factors such as previous and current low mood mean that researchers are now calling for preventative interventions which could feasibly be implemented in this population (O'Hara & McCabe, 2013; Edward et al., 2015).

While many risk factors are present during pregnancy and could therefore be screened, many prospective parents are still not receiving effective help when needed (Bauer et al., 2014). This seems to be related to a number of reasons: there is debate about how effective screening is and methods vary depending on the clinician (Gaynes et al., 2005; Mallikarjun & Oyebode, 2005); expectant parents would need to come forward in order to receive any treatment and stigma seems a particular problem, especially given the added fear of being labelled an incapable parent which prohibits sufferers from coming forward (Dennis & Dowswell, 2013; Edward et al., 2015); fathers have less contact with clinicians during pregnancy and are often overlooked (Edward et al., 2015); there is a lack of consensus in the literature for useful interventions at this time and particularly for ones which prevent low mood from developing into a more severe issue (Dennis & Dowswell, 2013).

Preliminary investigations have shown promise for the use of mindfulness-based courses during pregnancy (see detailed review below). Mothers and fathers tend to attend

mindfulness-based courses for pregnancy and parenthood together and so this may present an opportunity to deliver an effective intervention for low mood and the courses seem acceptable to both parents (Fisher, Hauck, Bayes, & Byrne, 2012; Gambrel & Piercy, 2014b). However, access to courses is limited and attendance of a face-to-face course is costly and dependant on location. Online interventions are in development to improve access to therapy more generally and there are now many types of course available online, including mindfulness-based ones (Finucane & Mercer, 2006; Dennis & Dowswell, 2013).

The aim of the current studies is to explore the potential of mindfulness courses delivered to prospective parents to add to the growing literature in this area. Further, the current investigations will begin exploring the potential of a mindfulness course delivered online to expectant mothers to investigate whether offering this type of course to pregnant women may be a viable option to help with low mood during pregnancy.

## 1.2 Research Background: The problem under investigation

Depression in the general population is a common and disabling condition, affecting an estimated 8-12% of the population in Britain in a year (Singleton, Bumpstead, O'Brien, Lee, & Meltzer, 2003). The prevalence of the condition generates large health care costs as well as severely lowering the quality of life for the individual suffering (Ebmeier, Donaghey, & Steele). Depression and anxiety are commonly co-morbid (Wilhelm, Parker, Dewhurst-Savellis, & Asghari, 1999). Indeed, mixed depression and anxiety is the most common mental disorder in Britain with 10% of the respondents to The Office for National Statistics Psychiatric Morbidity survey, 2001, indicating that they had these symptoms (Singleton et al., 2003). Survey respondents also reported rates of 19% to 29% for worry. Persistent worrisome thoughts and stress can have a number of negative physical and mental effects (Brosschot, Gerin, & Thayer, 2006; Davey, Tallis, & Capuzzo, 1996; Segerstrom & Miller, 2004) and have often been linked to general anxiety, (Pine, Cohen,

Johnson, & Brook, 2002) anxiety disorders (Davey et al., 1996), and depression, both in terms of onset (Hammen, 2005; Pine et al., 2002) and recovery time (Wilhelm et al., 1999).

## 1.3 Perinatal Depression

### *1.3.1 Prevalence and onset*

Postnatal (or 'peripartum') depression, meeting Diagnostic and Statistical Manual of Mental Disorders (DSM-IV and DSM-V) diagnostic criteria,(American Psychiatric Association, 1994, 2013) is a disabling and widespread condition in mothers and fathers (Cooper & Murray, 1998; Cox, Murray, & Chapman, 1993; Oates et al., 2004; Ramchandani, Stein, Evans, & O'Connor, 2005). There is a lack of consensus in the literature for the rates of maternal postnatal depression, likely due to differences in time of onset considered, the method of assessment and criteria and population used (O'Hara & McCabe, 2013; O'Hara & Swain, 1996; O'Hara & Wisner, 2014), with some suggesting that it affects 12-15% of women (Bennett, Einarson, Taddio, Koren, & Einarson, 2004; Gavin et al., 2005; Mallikarjun & Oyebode, 2005; Scott, 2014) and others suggesting rates as high as 27% (Milgrom & McCloud, 1996).

The DSM-IV (American Psychiatric Association, 1994) defined maternal postnatal depression as having onset within the first four weeks post-delivery, and although the definition has remained, there was discussion to amend this in the updated DSM-V (American Psychiatric Association, 2013) to include episodes with onset up to six months post-delivery because of more recent research (Jones & Cantwell, 2010). Onset is usually within the first three months after childbirth (Cooper & Murray, 1998) and particularly within the first five (Cox et al., 1993), or six to eight weeks post-delivery (Forty et al., 2006). Depending on the criteria used by the researcher, postnatal depression can be defined as an episode of depression beginning at any time during the first year after

delivery (O'Hara & McCabe, 2013; O'Hara & Wisner, 2014). Indeed, the DSM-V reports that 50% of postnatal depressive episodes actually begin prior to delivery and so now define depressive episodes during this time as 'peripartum' episodes (American Psychiatric Association, 2013).

Although the role of depression in fathers has received relatively little attention, studies suggest it is widespread with rates varying between 3-25% (Deater-Deckard, Pickering, Dunn, & Golding, 1998; Edoka, Petrou, & Ramchandani, 2011; Edward, Castle, Mills, Davis, & Casey, 2015; Goodman, 2004; Ramchandani et al., 2005). In a recent review, prevalence rates of 10% were found for paternal postnatal depression, and the episodes were usually found to follow the onset of prenatal or postnatal depression in the mother (Edward et al., 2015).

### *1.3.2 Defining a postnatal depressive episode*

Definition of a general major depressive episode, according to the DSM-V (American Psychiatric Association, 2013) includes five or more of the following symptoms which represent a change from normal behaviour: depressed mood; loss of interest or pleasure in activities; significant weight loss or weight gain or change in appetite; insomnia or hypersomnia; agitation or retardation; feelings of worthlessness or extreme guilt; difficulty thinking or concentrating or being indecisive; a suicide attempt or plan or recurrent thoughts about death or suicide; for most of the day, nearly every day for at least two or more persistent weeks. Maternal postnatal depression, while not seen as phenomenologically different from other depressive episodes, is therefore characterised by the DSM (American Psychiatric Association, 1994, 2013) as the above symptoms occurring within four weeks postpartum (Romans & Seeman, 2006). This criterion is potentially problematic when diagnosing perinatal depression in that the somatic symptoms (fatigue, diminished ability to concentrate, weight change, lack of sleep) are likely to occur during

this period (Cox, Holden, & Sagovsky, 1987; Hostetter & Stowe, 2002) . However, recent review findings suggest that depressive episodes be they postnatal or otherwise in onset are structurally similar and that postnatal somatic depressive symptoms can actually be indicators of a postnatal depression episode (O'Hara & McCabe, 2013).

'Baby-blues', which can include weepiness, emotional instability and cognitive disturbances, are also commonly reported with onset up to ten days following childbirth, usually lasting for a few days in total and potentially affecting up to 84% of women (Henshaw, 2003). While the 'baby-blues' usually dissipate quickly and spontaneously without requiring treatment, for some women the 'baby-blues' can persist and become a more severe problem developing into postnatal depression (Robertson, Grace, Wallington, & Stewart, 2004; Robinson & Stewart, 2001). While severe episodes of postnatal depression and risk factors of such could be discovered at healthcare visits, similar symptoms and a less severe presentation can go unnoticed especially because the 'baby-blues' are so common and considered normal following childbirth. This can result in a lack of treatment (Robertson et al., 2004). For these reasons, screening tools for postnatal and prenatal depression have been modified to include emotional symptoms pertaining to the prior seven days (e.g. The Edinburgh Postnatal Depression Scale, EPDS, Cox et al., 1987).

### *1.3.3 Risk factors of postnatal depression*

The cause of maternal postnatal depression seems to be related to many contributory factors both prior to and during pregnancy (Lewis & Drife, 2004). One meta-analysis of 84 studies revealed thirteen significant predictors of postnatal depression including low social support; prenatal depression; high life stress; troubled marital relationship; a history of depression; a difficult current infant temperament; low socioeconomic status; high childcare stress; low self-esteem; unplanned/unwanted pregnancy; maternity blues; prenatal anxiety; and single marital status. Prenatal depression, low self-esteem, high childcare

stress and prenatal anxiety were found to be the strongest predictors of postnatal depression (Beck, 2001).

More recent reviews replicated the results finding prenatal depression, prenatal anxiety, stressful life events, low social support, a history of depression, troubled marital relationship and low socioeconomic status as risk factors of postnatal depression (Paschetta et al., 2014; Robertson et al., 2004). High levels of trait neuroticism and complications during pregnancy (Paschetta et al., 2014; Robertson et al., 2004) and a history of premenstrual syndrome, a history of abuse, unfavourable pregnancy outcomes and current physical illness or domestic abuse were also found to be small to moderate risk factors (Paschetta et al., 2014) suggesting that these warrant further investigation. Age, number of previous children, education and relationship duration were not found to be associated with the onset of postnatal depression.

Prenatal depression, a history of depression, low partner or social support, childcare and life stress and prenatal anxiety and stress related to the life-event of having a new baby are repeatedly found as significant predictors of postnatal depression (Cox et al., 1993; Leigh & Milgrom, 2008; Milgrom et al., 2008; O'Hara & Swain, 1996; Scott, 2014). These risk factors are present and recognisable during pregnancy indicating that preventative measures are necessary to inhibit postnatal suffering.

### *1.3.4 Risk factors and depression types*

One study found that mothers who develop postnatal depression as a first depressive episode are more likely to have future episodes of postnatal depression and mothers who develop postnatal depression as part of a recurrent depressive disorder are likely to suffer from future depressive episode unrelated to the postnatal period (Cooper & Murray, 1997). This suggests that there may be a difference in the type of postnatal depression experienced,

i.e. whether there is more of a biological or hormonal cause for the episode or a recurrence of depression due to the life-event stress associated with having a baby (O'Hara & McCabe, 2013).

### *1.3.5 Postnatal depression in fathers*

The research examining paternal postnatal depression has recently begun to emerge and to highlight potential implications and risk factors. Where previously postnatal paternal depression was deemed less of a concern, in large part because people assumed that maternal postnatal depression was due to hormonal or otherwise biological changes in the mother, now it is becoming better known with researchers calling for earlier screening and interventions for both parents (Edward et al., 2015).

In terms of risk factors for fathers, maternal pre and postnatal depression seem to be some of the strongest predictors and have been repeatedly associated with paternal postnatal depression where fathers are significantly more likely to develop postnatal depression when their partner is also suffering (Ballard, Davis, Cullen, Mohan, & Dean, 1994; Edward et al., 2015). Rates found in one review increased from between 1.2% and 25.5% in those without a partner suffering to 24% to 50% in those whose partners were also depressed (Goodman, 2004). Other risk factors include an unsupportive or difficult marital relationship, a history of depression and/or anxiety (Edward et al., 2015; Goodman, 2004), lower marital satisfaction or difficult marital communication, financial and life stress, unemployment, older age and unplanned pregnancy (Edward et al., 2015). Indeed, it has been found that unplanned pregnancy leads to higher rates of paternal depression which in turn decreases parental happiness and increases marital conflict (Edward et al., 2015). Similarly, in one ALSPAC study, it was found that high levels of prenatal anxiety and depression and, again, a history of depression, were the strongest predictors of postnatal depression (Ramchandani et al., 2008), once more suggesting that early intervention is

warranted for both expectant parents. Other predictors found in this study were lower educational level, having other children and again, prenatal maternal depression.

The relationship of the prospective parents has been found to be important in the onset of stress and postnatal depression. How women feel about themselves and their relationship with their significant other, as well as a belief that their partner has a more negative view of their relationship have been associated with the onset of postnatal depression (Scott, 2014). Whether the father-to-be has underestimated their partner's stress levels during pregnancy is also associated with lower perceived partner support and increased prenatal stress (Chapman, Hobfoll, & Ritter, 1997).

### *1.3.6 Prenatal negative mood*

Postnatal depression has received a large amount of attention from researchers and the risk-factors and consequences of such are repeatedly replicated. Prenatal stress, anxiety and depression have all been linked to an onset of postnatal depression (Beck, 2001; Paschetta et al., 2014; Robertson et al., 2004) and the consequences of negative prenatal mood are receiving growing attention especially as prenatal maternal depression and anxiety are now known to be as common as postnatal depression and anxiety (Bauer, Parsonage, Knapp, Iemmi, & Adelaja, 2014). One review estimates that the prevalence rate of minor and major depression during pregnancy is between 8.5% and 11% (with 3.1%-4.9% for major depression alone) (Gaynes et al., 2005).

A recent review found that many risk factors associated with the onset of maternal prenatal depression included those for postnatal depression, in particular, previous episodes of non-perinatal depression, low social support, adverse life events, low socioeconomic status, unplanned pregnancy and unfavourable pregnancy outcomes, physical illness and

domestic violence (Paschetta et al., 2014)[1]. Other potential risk factors were, perhaps unsurprisingly, previous miscarriage and previous episodes of postnatal depression. As with postnatal mood disorders, these risk-factors could be identified during prenatal screening resulting in relevant healthcare and a reduction in negative impact (Paschetta et al., 2014).

The field examining prenatal low mood in fathers is currently emerging and so far risk and prevalence rates are unclear. One review reports a rate of 10.4% for paternal depression, from the first trimester of pregnancy to one year postpartum (Paulson & Bazemore, 2010). The authors advise caution with their review results, however, owing to inconsistencies throughout the limited available literature. Research examining prenatal paternal depression is now developing, given that it appears that fathers are also at increased risk for depression during the perinatal period (Paulson & Bazemore, 2010).

## 1.4 The Impact of Maternal Perinatal Negative Mood

### *1.4.1 Interacting with the infant & cognitive development*

It is well-established that maternal postnatal depression carries with it a number of detrimental consequences for the child, including disturbances in social, behavioural, cognitive, physical and emotional development (O'Hara & McCabe, 2013).

One potential mechanism suggested for these outcomes is that women with postnatal depression talk and play with their children differently, resulting in cognitive and emotional development issues later in the infant (Cooper & Murray, 1998; Field, 2010; Murray, Fiori-Cowley, Hooper, & Cooper, 1996). In one study, women with and without depression were compared in how they interacted with their infant at two months postpartum and showed a difference in the level of sensitivity when interacting, exhibiting less affirmations and more

[1] These are not dissimilar to common risk factors of depression outside of the perinatal period (repeatedly found are depressive history, stressful life events, relationship difficulties, low socioeconomic status, chronic physical illness and little or no social support) (Fried, Nesse, Zivin, Guille, & Sen, 2014; Martin, 2013).

negations of the infants' behaviour resulting in more infant interruptions and negative expressions (Murray et al., 1996). This early interaction was also found to be associated with infant development at 18 month follow-up.

One review outlined evidence of an increase in precarious parental interactions and handling issues, including problems with feeding the infant (especially breastfeeding[2]), putting the child to sleep and setting up a routine for sleep, adjusting care seats properly, using safety latches and getting water temperature correct for the infant as well as reduced healthcare visits and vaccinations, although these same unsafe practices were not found in one English study (Field, 2010). One study examining the effects of postnatal depression on parenting found that mothers who were suffering were 1.5 times more likely to have problems with sleep and healthy eating habits with their infant, for instance putting the child to sleep with a bottle or putting them to bed on their front or side (where best practice is to place the infant on their back). Mothers were also likely to play less positively, i.e. reading to, singing and telling stories, when either themselves or their partners were depressed (Paulson, Dauber, & Leiferman, 2006).

It is not known what mechanisms are at work with relation to parenting issues and postnatal depression, although Stein and colleagues (Stein, Lehtonen, Harvey, Nicol-Harper, & Craske, 2009) suggested that it may be a woman's self-preoccupation which impedes her ability to notice and act appropriately to infant cues. Research is lacking and needs to be addressed to understand these processes for the development or implementation of useful interventions at this time (O'Hara & McCabe, 2013).

[2] Breastfeeding effects are unclear, as is the mediator for postnatal depression having an effect on breastfeeding so more research is needed. However, studies have found an association between higher rates of postnatal depression and a lesser likelihood for breastfeeding, and for a shorter length of time. (O'Hara & McCabe, 2013).

Literature finding an association between postnatal depression and problems surrounding language and IQ development in the infant is well established (O'Hara & McCabe, 2013). In a study of 1201 children, 999 of which were followed-up for a language assessment at 36 months, postnatal depression at 3 and 10 months postpartum and lower scores for maternal responsiveness were associated with lower language development in the child at 36 months, as was poorer socioeconomic status (Stein, Malmberg, Sylva, Barnes, & Leach, 2008). Postnatal depression predicts lower language and IQ development in children and likewise up to adolescence e.g. (Brand & Brennan, 2009). The duration of depression in the mother has been found to be important, being more predictive of cognitive issues than the timing of episodes, perhaps due to the mother's prolonged likely problems with sensitive parenting at this time (Sohr-Preston & Scaramella, 2006).

### *1.4.2 Behavioural problems in the infant*

Maternal depression during the postnatal period is associated with a more difficult infant temperament (Beck, 2001) with one study finding prenatal depression, prenatal stressful life events, postnatal anxiety and previous miscarriage as predictors of a more difficult child temperament at three months (Della Vedova, 2014). Unexpectedly, a high level of partner support, a high level of education and breastfeeding were also related to higher infant difficulty. This is particularly surprising when a low level of partner support has been associated with the onset of postnatal depression (Beck, 2001). Conversely, mothers who were married, mothers who had planned the pregnancy and mothers who had delivered via caesarean also rated their infants as less difficult (more joyful, less intense and less agitated) (Della Vedova, 2014).

There have been many replicated findings showing that depression during the perinatal period has an impact on the child's behavioural outcomes. In a brief review of prospective studies examining the effects of postnatal depression on child development, behavioural

problems were found including internalising (e.g. withdrawal and suppression of problems) and externalising (e.g. conduct problems, attention deficit disorder) problems in children up to 8 years of age and particularly in sons (Brand & Brennan, 2009). These findings were later confirmed when, in a review of 193 studies, researchers (Goodman et al., 2011) found associations between postnatal depression and a range of problems, including internalising and externalising psychopathology and positive (reward seeking behaviours) and negative (anger, irritability, negative mood reactivity) emotionality, with larger effect sizes for younger children and for internalising effects on daughters.

The timing and length of the episode has also been found to be an important factor with behavioural difficulties. One study of 4953 children followed up until 5 years of age found that the timing, severity and whether episodes had been chronic predicted future behavioural problems and vocabulary deficits in the infant. Increasing episode severity was associated with increasing negative developmental outcomes, more chronic depression was associated with worse behavioural problems and later episodes associated with behaviour problems, with little relationship to prenatal or early postnatal depression (Brennan et al., 2000). A community sample study found that children aged 15 years had double the risk of depression when their mothers had been depressed when compared to children whose mothers had not been (Hammen & Brennan, 2003). Further, it was found that a brief exposure of 1-2 months to a more severe depressive episode in the mother, or a longer exposure, of more than a year, to a milder episode, both increased the risk that the child would show depressive symptoms at 15 years with episode severity being the biggest contributor to adolescent depression, even if the mother had only one episode of depression during the child's first ten years[3]. Research is warranted to explore the issue of timing

[3] Maternal postnatal stress and depression, resulting in less sensitive parenting, has also been linked to more activation in the hypothalamic-pituitary-adrenal (HPA) axis to everyday worries in the child (having potentially long-lasting effects on brain regulation) (Lupien, McEwen, Gunnar, & Heim, 2009) and in turn, to the child's development of depression during adolescence (Pearson et al., 2013).

further, again to elucidate the best timing for the most useful potential intervention (O'Hara & McCabe, 2013).

### *1.4.3 Physical development issues*

While mothers with postnatal depression have a tendency to adverse caretaking behaviours (Field, 2010) which may contribute to physical health problems, other studies have also found associations between postnatal depression and physical health problems in the child including lower cardiovascular functioning, higher rates of gastrointestinal and respiratory tract infections and lower child growth, see O'Hara & McCabe for a review (O'Hara & McCabe, 2013).

### *1.4.4 Further implications of maternal perinatal negative mood*

Suicide is one of the leading causes of death among mothers with one British study finding that 45% of mothers who died by suicide were suffering with depression, comorbid anxiety with depression or adjustment reaction (Lewis & Drife, 2004; Mallikarjun & Oyebode, 2005) and a recent review finding that severe depression, substance abuse and intimate partner issues are associated with an increased risk of postnatal suicide attempts (Paschetta et al., 2014).

The onset of postnatal depression increases the risk of future depressive episodes (e.g. (Cox et al., 1993).) Similar to non-postnatal depression with relapse rates of 50-80% (American Psychiatric Association, 1994), in one study, postnatal depression had a recurrence rate of 25% after one episode, whether or not women had previously suffered with depressive episodes outside of the postnatal period (Wisner et al., 2001).

The cost to the family and health services is vast. One study estimates that a single case of perinatal depression costs approximately £74,000 with the majority of cost relating to

healthcare costs resulting from the impact on the child. Prenatal anxiety alone is estimated to cost approximately £35,000 per case (Bauer et al., 2014).

### *1.4.5 The impact of maternal prenatal negative mood*

Depression, anxiety and stress during pregnancy are often comorbid and so their independent effects may be difficult to differentiate (Glover, 2014), however, research suggests that they do effect child outcomes differently (Brand & Brennan, 2009). A review of studies examining stress and anxiety during pregnancy found numerous associations between high levels of stress and impeded development in children, including lower cognitive development and language development in toddlers, especially when the stressor was experienced during the first or second trimester and impaired ability at school at six years of age and high levels of prenatal anxiety associated with more impulsivity and potentially, lower IQs at 15 years of age (Brand & Brennan, 2009). While research addressing prenatal stress and anxiety are beginning to show an association with behavioural and emotional problems in the infant, the mechanisms are only recently being explored (Paschetta et al., 2014).

In one research study investigating potential pathways of prenatal depression on negative child outcome, mothers were assessed for depression during pregnancy and postpartum and 475 children were followed-up at age five, 20 and again at age 22-25 (Raposa, Hammen, Brennan, & Najman, 2014). It was found that maternal prenatal depression predicted early childhood health problems in the child (though this was somewhat explained by maternal postnatal depression at that time), which in turn increased health related stress and lower social functioning at age 20, resulting in higher scores for depressive symptomology at age 22-25. Although the sample was selected because of the higher depressive scores during pregnancy, it shows a potential pathway by which prenatal depression affects the child in later life.

Although a certain amount of stress in healthy mothers-to-be is to be expected and may actually be helpful for infant development (DiPietro, Novak, Costigan, Atella, & Reusing, 2006), prenatal stress has been found to increase negative outcomes for the mother such as a more negative view of self, partner and child (Milgrom & McCloud, 1996; Murray et al., 1996) and is associated with behavioural and cognitive development issues in the child (Ramchandani et al., 2005; Talge et al., 2007). Higher levels of prenatal stress associated with more daily hassles have been found to be associated with lower mental and motor development in the infant up to 8 months of age (Huizink, Robles de Medina, Mulder, Visser, & Buitelaar, 2003) and with low birth weight and premature delivery (Mulder et al., 2002). Adverse effects of stress are evident from birth with one recent review citing an increase in difficult infant temperament, sleep problems, cognitive impairment and higher fearfulness in babies and toddlers (Glover, 2014). Stressors during pregnancy ranging from mild (hassles) to severe (bereavement, natural disasters) have been examined in research studies but, as yet, it is unclear about how these different stressors may affect the infant differently (Glover, 2014).

'Foetal programming', meaning that the uterus environment affects the growing infant and the impact of which can also be seen in later life, is well established but mechanisms for change are unclear. It has been suggested that perhaps an increase in cortisol exposure via an expectant mothers increase in stress, may be the cause for the differences in brain development (Paschetta et al., 2014) and several studies have now found pregnancy stress is related to altered HPA axis function, but thus far specific biological causes remain uncertain (Glover, 2014). If the mother is stressed, it may be that susceptibility to stress and low mood is passed on to the infant genetically resulting in emotional problems. A study examining prenatal depression at 26 weeks gestation and infant brain structure at 2 weeks using MRI scans showed a change in the structure of the infant's right amygdala, which is

linked to susceptibility to stress and anxiety disorders. Again the mechanism is unclear, particularly as the authors state that if the cause was purely genetic, studies which control for postnatal low mood in the mother would not have found the same association with prenatal low mood and infant difficulties (Rifkin-Graboi et al., 2013). More research is needed for the timing of the stressor as the problems associated with prenatal stress could be linked to adverse health behaviours (i.e. smoking and alcohol consumption leading to lower birth weight and behavioural problems) although many studies controlling for these factors still find a prenatal association (Glover, 2014).

### *1.4.6 The ALSPAC studies exploring mothers-to-be*

In one of the largest studies examining perinatal mood and child development with 14,062 participants in England (the Avon Longitudinal Study of Parents and Children; ALSPAC; Golding, Pembrey, Jones, & The Alspac Study, 2001), depression during pregnancy, when controlling for maternal smoking, age and life events, was associated with a 50% increase in developmental delays in the child at 18 months and a 34% increase if postnatal depression was present (Deave, Heron, Evans, & Emond, 2008). The finding suggests that depression during pregnancy may be at least as important in child development as postnatal depression and the authors suggest that previous research examining *postnatal* depression may be finding developmental issues which are actually accounted for by prenatal depression.

There have been numerous studies showing behavioural disturbances in animal offspring when the mother was stressed during pregnancy and the ALSPAC team have investigated this in humans (O'Connor, Heron, Golding, Beveridge, & Glover, 2002). Mothers-to-be (7448 participants) were assessed for anxiety and depression during pregnancy and after childbirth. Thereafter, maternal self-report data on any behavioural problems in the infant was gathered at age four. Results indicated that women who had

been most anxious (the highest scoring 15%) during pregnancy were 2-3 times more likely to report their child having more than 2 standard deviations above the mean for behavioural and emotional problems. Mothers-to-be with high levels of anxiety at 32 weeks pregnant were twice as likely to report behavioural difficulties in their children at 4 years for either sons or daughters, even when controlling for prenatal or postnatal depression or postnatal anxiety. This suggests that prenatal anxiety has a direct impact on child development and is not mediated by postnatal anxiety or perinatal depression and the authors suggest that reducing maternal anxiety during pregnancy could, therefore, have protective effects for the child. In a follow-up study, 6493 of these participants were asked once more to provide self-report data about their children at 81 months (6.75 years of age). Findings were that the relationship between prenatal anxiety and behavioural problems was sustained, even when controlling for postnatal mood and prenatal and psychosocial risk (risk based upon sociodemographics, e.g. low education, teenage pregnancy) (O'Connor, Heron, Golding, & Glover, 2003).

A recent ALSPAC study examining 7959 mothers also found evidence of a gender difference for prenatal maternal depression and later child depression. Females seemed to have increased vulnerability to depression at age 18 when their mothers had been depressed during pregnancy (Quarini et al., 2015).

## 1.5 The Impact of Paternal Depression

Findings for paternal postnatal depression are beginning to find a similar role in influencing child development as maternal depression (Schumacher, Zubaran, & White, 2008; Solantaus & Salo, 2005). For example, paternal postnatal depression and stress have been related to emotional, cognitive and behavioural problems in children (Schumacher et al., 2008).

In a review examining 28 published and unpublished studies, paternal postnatal depression was found associated with less positive parenting overall, especially when those studies were observational and observations were made for a longer duration (Wilson & Durbin, 2010). More negative parenting was also found, particularly when the ratings used were via self-report. When investigating potential moderators, more negative parenting was associated with younger child age and younger father age. Notably, the effects found were comparable to those found with parenting and maternal postnatal depression. In another study of 5089 families, fathers suffering from postnatal depression were again noted to interact less positively with their children (Paulson et al., 2006). When fathers were depressed, it was less likely that the father would play with their child outside or sing songs to their child, particularly if both parents were suffering.

One ALSPAC study (Golding et al., 2001) examined 12,884 fathers at eight weeks and 21 months post-birth and followed-up 10,024 children to 42 months. Disturbances in emotional and behavioural development were found up to the age of three when the fathers had been depressed (Ramchandani et al., 2005), especially conduct issues in boys. Conduct problem effects remained even when controlling for maternal depression and later depression in the father, at 21 months.

In a later study of a similar nature, 54 men with postnatal paternal depression at 7 weeks post-birth were compared to 99 without (Ramchandani et al., 2011). Paternal postnatal depression was examined in relation to the first three months of the infant's life, examining potential differences in the marital relationship and in child temperament. The fathers who had been suffering reported less relationship satisfaction, less affection, higher levels of criticism from and for their partner and less confidence in the outcome of their relationship,

than their healthy counterparts[4]. Their partners also rated the relationships as less affectionate.

When examining the potential outcomes at later follow-up for children, the ALSPAC team conducted one study which assessed fathers for depression during gestation and after the birth, up to 21 months, and assessed the child through maternal and teacher reports when they were aged six and seven (Ramchandani et al., 2008). At seven years, with 5,924 fathers and children included in the sample, children were twice as likely to have developed a psychiatric disorder (6.3 % for non-depressed and 11.9% for those whose fathers had been depressed). After controlling for maternal postnatal depression and the educational level of the father, an association was still found with conduct and oppositional defiant disorders with a likelihood almost doubled and a 66% increased risk of developing any disorder. When controlling for maternal depression and education once more, peer problems and pro-social problems were found to be associated with paternal postnatal depression in the sample of 6,092 children at age six. The children who developed problems by ages six or seven were more likely to have had behavioural problems at three years of age. The authors state that at-risk fathers could be identified, particularly because the predictors for postnatal depression (depressive history and depressive symptoms during pregnancy) are present during gestation and suggest using the EPDS to screen fathers at this time to prevent low mood and improve familial health.

As with maternal postnatal depression, there is also a higher cost to the health service when the father is depressed postpartum. In one study comparing the monetary cost of health visits for the child and the father in the subsequent 12 months after birth, fathers who had been depressed at 7 weeks after the birth had accumulated £1103.51 in cost; £28.45

[4] When the analysis was repeated (less robust due to small sample size) examining the impact of current depression with 19 participants, relationship adjustment scores were lower still, as was their level of confidence in the success of their spousal relationship and infant distress was rated as higher, with lower rates of infant smiling and laughter reported by the mothers, particularly for girls.

more than those at risk for depression and £158.48 more than healthy controls (Edoka et al., 2011).

## 1.6 Interventions for the Perinatal Period

### *1.6.1 What interventions are available*

Expectant mothers are able to take very limited pain medication (Duncan & Bardacke, 2010) and although National Institute for Health and Care Excellence (NICE) guidelines advise taking antidepressants for perinatal depression (National Institute for Health and Care Excellence, 2014), many women do not want to take antidepressants during pregnancy or while breastfeeding (Austin & Priest, 2005; Dennis & Dowswell, 2013; O'Hara & McCabe, 2013). There is little evidence for the effectiveness of antidepressants in preventing postnatal depression in those showing depressive symptoms during pregnancy (Dimidjian & Goodman, 2009; Hughes et al., 2009) and it is not yet clear as to whether medication for mood disorders or mood disorders themselves during pregnancy contribute to detrimental infant outcomes (Paschetta et al., 2014).

Psychological interventions for the perinatal period, such as antenatal and parenthood support classes do exist, but are currently scarce and expensive and only available for a small percentage of those currently suffering or deemed to be at risk. Indeed, while NICE guidelines (National Institute for Health and Care Excellence, 2014) suggest that once a psychological history is established during a prenatal appointment, women at risk of a perinatal mood disorder should be referred on to specialist healthcare for intervention and continued monitoring, it is estimated that only half of women in the UK have access to specialist perinatal mental health services (Bauer et al., 2014). For those at risk, one Cochrane review found that psychological interventions, such as CBT, do reduce depression and anxiety in the short term but they have no effect at 9 months postpartum;

when comparing psychosocial and psychological treatments with usual care, they did not reduce the risk of postnatal depression (Dennis & Creedy, 2004). More recently, the Cochrane review authors have called for more research into the effectiveness of CBT for perinatal depression (Dennis & Dowswell, 2013).

One systematic review showed that only intensive, professional, postnatal support was a promising intervention for postnatal depression (Lewis & Drife, 2004) and a later Cochrane review supported this (Dennis, 2005). Another review showed a lack of efficacy when using prenatal treatment for perinatal depression, with overall poor study quality (Gaynes et al., 2005). More recently, another review found that Cognitive Behavioural Therapy (CBT) and interpersonal therapy (given that lack of social support and relationship problems are risk factors for perinatal depression), either in group or individual format, do fair better overall for prenatal depression than treatment as usual (Stuart & Koleva, 2014) and again, that professional psychotherapy and community based interventions achieved a greater reduction in postnatal depression than the control comparison (30% reduction in symptoms). However, the authors cite limitations of many of the studies conducted as small sample sizes, differing cut-offs for depression, a lack of follow-up data and many did not require the participants to be diagnosed with depression. Additionally, the authors reiterate that the mechanisms of change are unknown, and it is unclear who benefits from which types of therapy. The most recent Cochrane review also found that 'individualised' professional postnatal care (including screening during pregnancy) was helpful for postnatal depression (Dennis & Dowswell, 2013). Building upon intervention literature, the authors suggests that while lay interventions also seem helpful for postnatal depression, more studies targeting prenatal maternal mood are needed. Several studies have been conducted examining prenatal interventions designed to reduce rates of postnatal depression but with mixed results, particularly because screening for at risk populations is

difficult and attrition rates for an asymptomatic samples are high resulting in small samples (Austin, 2004).

Researchers suggest that more research is warranted particularly with other modalities of treatment to improve accessibility, i.e. phone and internet based (Stuart & Koleva, 2014). The recent Cochrane review supports this view, suggesting that other modes of treatment are needed for pregnant women because of particular difficulties with therapeutic access and stigma (Dennis & Dowswell, 2013). More promising owing to a reduction in cost and increased accessibility, the review showed that phone-based support for new mothers with depressive symptoms showed promise, though further trials are needed.

In terms of the child's cognitive developmental issues resulting from problems with parenting, one review found that therapies targeting the mother-child relationship did show improvement in their relationship but only one showed cognitive improvement in the child and this was a prolonged and intensive therapy (Poobalan et al., 2007).

While no study has yet examined the child's long-term outcomes of a prenatal intervention for low mood (Glover, 2014), one study followed-up 315 children, which implemented a prenatal, and continuing postnatal, intervention for single mothers with poor socioeconomic status. The intervention consisted of nurse home visits giving information about diet and parenting education. The study found less incidents of running away from home, arrests and convictions, sex partners, and lower levels of smoking and alcohol consumption at 15 years of age, when compared to a control group (Olds et al., 1998).

Interventions for expectant fathers are especially few (Edoka et al., 2011; Schumacher et al., 2008). Early screening, understanding and support from healthcare workers may be most helpful especially because of the stigma surrounding paternal postnatal depression (Edward et al., 2015).

Not only does prenatal negative mood have a potential negative impact on the family, but if postnatal depression is more likely in both parents when the mother-to-be has been depressed, stressed or anxious during pregnancy, then it seems logical to offer intervention or support at this time. Questions remain as to what is available and helpful and how to provide these interventions to people who need them, when they would most benefit from them. Interventions for paternal depression are largely overlooked even though this is not a rare phenomenon, thus increased health awareness and research is required (Edoka et al., 2011; Schumacher et al., 2008), particularly because low social support and marital conflict are also risk factors for postnatal depression in mothers and fathers (Dennis & Dowswell, 2013).

### *1.6.2 Screening to recognise who needs help*

Prediction of those likely to suffer can be problematic (Austin, Hadzi-Pavlovic, Saint, & Parker, 2005) and approximately half of all perinatal depression and anxiety cases go undetected (Bauer et al., 2014). However, many risk factors can be practically identified as many are evident during pregnancy (O'Hara & McCabe, 2013), thus a reliable screening tool or intervention at this time would be appropriate (Mallikarjun & Oyebode, 2005).

Identification of those who need help early in pregnancy is warranted for positive outcomes for the family (Milgrom & Gemmill, 2014), with consideration given to depression and comorbid conditions. Screening for risk is limited, only applies to those in regular routine care and only those detected to be at-risk are invited to interventions which are lacking in findings for preventative effects (Lewis & Drife, 2004; Mallikarjun & Oyebode, 2005). While screening tools, such as the Edinburgh Postnatal Depression Scale (EPDS Cox et al., 1987) are routinely used by healthcare professionals to detect postnatal depression (O'Hara & Wisner, 2014), one study examining their effectiveness suggests that, used alone, the measure did not detect 16.9% of the anxiety and depressive disorders

present using the Composite International Diagnostic Interview (CIDI, Robins et al., 1988) in the first 8 months after childbirth (Austin et al., 2010). Furthermore, one meta-analysis showed that sensitivity of the EPDS was poor for major and minor depression during pregnancy, relying on a limited number of studies because previous researchers had used different cut-offs and failed to report screening accuracy in a population (Gaynes et al., 2005). NICE guidelines (National Institute for Health and Care Excellence, 2014) suggest using two questions to screen for prenatal depression (Whooley, Avins, Miranda, & Browner, 1997) asking about 'being down, depressed, hopeless and bothered by having little interest or pleasure in doing things, over the previous month'. Similarly, NICE suggests using the GAD-2 (Kroenke, Spitzer, Williams, Monahan, & Löwe, 2007) for anxiety, which consists of two questions about 'feeling nervous, anxious or on edge and unable to stop worrying, over the previous month'. Many psychologists agree that risk factors should be evaluated during prenatal screening, including taking a psychological and familial history and asking about any current difficulties (Deave et al., 2008; Paschetta et al., 2014). This is potentially problematic as previous research has shown that few mothers-to-be will admit difficulties such as anxiety or depression due to stigma (Vieten & Astin, 2008) and fear of being referred to child services (Dennis & Dowswell, 2013). This means that only those people willing to discuss mental health issues with their GP or midwife may be offered help which may result in many expectant mothers not receiving needed support.

There is limited detection of risk of depression for fathers-to-be because there is relatively little knowledge of depression in fathers and less contact between expectant fathers and care practitioners. However, the EPDS (Cox et al., 1987) has begun to receive validation for use with fathers (Matthey, Barnett, Kavanagh, & Howie, 2001) with a score of 10 or more (as with mothers) for possible depression (Edmondson, Psychogiou, Vlachos,

Netsi, & Ramchandani, 2010). Increased health awareness may be most needed at this time (Schumacher et al., 2008).

### *1.6.3 Timing for intervention*

As outlined above, screening and intervention should be implemented prenatally to attempt prevention of mood disorders and to lessen potential negative impact on mother, child, family and healthcare services (e.g. Paschetta et al., 2014; Rifkin-Graboi et al., 2013), so it seems wise to posit a time which may be most suitable.

Previous research indicates that anxiety during pregnancy fluctuates and is highest during the first and third trimesters suggesting that a preventative measure may be most beneficial during the second trimester (Newham, Westwood, Aplin, & Wittkowski, 2012). However, one study examining the prevalence of disorders during the second trimester found that of 220 (out of 1795 women attending an antenatal clinic) screened for mood disorders, 14.1% of women had some sort of disorder, of which 3.3% fit criteria for major depression, 6.9% for minor depression and 6.6% for anxiety disorders; 29.5% of those were comorbid. Among the patients diagnosed, only 5.5% had received any treatment (Andersson et al., 2003). Not only does this study suggest a lack of diagnosis, perhaps stemming from a reluctance to seek help at this time, but the lack of treatment at this time is a cause for concern, especially considering what we now know of prenatal mood and the potential outcomes for the family. Perhaps an intervention delivered at this time, which targets low mood without a need to be medically diagnosed, would be beneficial.

The first trimester is not without risk. One study of 239 women found that 18.4% of these women met the criteria for current suicide risk, higher than rates reported previously; 15.1% of the sample was experiencing major depressive disorder and 10.5%, generalised anxiety disorder. They found that there was a higher rate of current suicide risk when

women had major depressive disorder, generalised anxiety disorder and had previous children (Farias et al., 2013). However, the criteria for current suicide risk in this study was a positive response to one question about current suicide attempt, plan, ideation or *previous* suicide attempt, which one could argue does not necessarily indicate current risk. Stress experienced during the first trimester of pregnancy has been associated with onset of schizophrenia in the child later in life and in inherited malformations at birth (Glover, 2014) suggesting that an early intervention is necessary. The author suggests however, that later interventions are also likely to be beneficial.

Researchers investigating perinatal issues repeatedly recommend early identification of those at high-risk for low mood, with a view to offer an intervention early to prevent negative mood and outcomes during pregnancy and thereafter (Stein et al., 2014). It would appear that while prevention is key, especially at an early time during pregnancy, there are few interventions which target the prevention of low mood and depressive relapse. Although the difficulties of healthcare and screening are still issues to explore, the evidence for interventions which may be helpful at this time is limited. Not only that, but there are issues surrounding accessibility and cost, particularly if parents-to-be seek out help themselves without going via their healthcare provider because of concerns about stigma at this time (Dennis & Dowswell, 2013).

## 1.7 Mindfulness Therapy

While there are many treatment options available for those currently suffering from depression, there are few interventions which focus on preventing relapse. Mindfulness Based Cognitive Therapy (MBCT) (Segal, Williams, & Teasdale, 2002) is recommended for people who have recurrent depression by NICE (National Institute for Health and Clinical Excellence, 2009) as mindfulness-based therapies have been shown to help in preventing episodes in those most vulnerable to depressive relapse (Williams, 2007). There

is increasing research showing that mindfulness based courses, particularly Mindfulness-Based Stress Reduction (MBSR) (Kabat-Zinn, 1982, 1990) and MBCT (Segal et al., 2002) are effective interventions for a broad range of health problems (Grossman, Niemann, Schmidt, & Walach, 2004; Piet, Wurtzen, & Zachariae, 2012; Shapiro, Oman, Thoresen, Plante, & Flinders, 2008). Mindfulness interventions have been shown as effective for recurrent depression, reducing relapse rates, especially in those who have suffered with three of more episodes of depression (Barnhofer et al., 2009; Ma & Teasdale, 2004; Segal et al., 2002; Teasdale et al., 2000) and for reducing anxiety (Hofmann, Sawyer, Witt, & Oh, 2010; Piet et al., 2012). Research also shows that perceived stress decreases following participation in a Mindfulness intervention, with the decrease maintained at follow-up (between one and three months) (Carmody & Baer, 2008; Carmody, Baer, L. B. Lykins, & Olendzki, 2009; Chiesa & Serretti, 2009; Epel, Daubenmier, Moskowitz, Folkman, & Blackburn, 2009).

Although the mechanisms of change at work in mindfulness interventions are unclear, many researchers agree that the meditation practices taught during mindfulness courses cultivate awareness and acceptance which lowers levels of anxiety, depression and stress (Greeson, 2009). This seems logical when a greater level of dispositional mindfulness equates to lower levels of stress (Quintana & Rivera, 2012) and when larger amounts of meditation practice increase dispositional mindfulness and decrease low mood (Carmody & Baer, 2008) and depression relapse rates (Crane et al., 2014) . A larger amount of meditation practice during a face-to-face course (Baer, Carmody, & Hunsinger, 2012; Carmody & Baer, 2008) and during an online course (Morledge et al., 2013) has been found to decrease stress. However, there are mixed results when investigating the amount of mindfulness practice as a mediator of change (Fjorback, Arendt, Ørnbøl, Fink, & Walach, 2011). A recent review found evidence to suggest that a change in mindfulness

does mediate mood improvement and that changes in rumination, worry or self-compassion also appear to mediate the change in mood, see van der Velden (van der Velden et al., 2015).

### *1.7.1 Mindfulness therapy for the perinatal period*

There is a growing body of evidence suggesting that offering a mindfulness-based intervention during pregnancy may be beneficial for low mood. Upon beginning this literature review in 2012, no studies had been conducted examining dispositional mindfulness and how it relates to mood during pregnancy and there were three studies examining the potential of mindfulness courses delivered to expectant mothers. During the last three years, the number of studies conducted investigating mindfulness interventions for perinatal mood has grown to fifteen (see Table 1-1, Beddoe, Paul Yang, Kennedy, Weiss, & Lee, 2009; Byrne, Hauck, Fisher, Bayes, & Schutze, 2013; Chan, 2014; Dimidjian et al., 2014; Duncan & Bardacke, 2010; Dunn, Hanieh, Roberts, & Powrie, 2012; Fisher, Hauck, Bayes, & Byrne, 2012; Gambrel & Piercy, 2014; Goodman et al., 2014; Guardino, Dunkel Schetter, Bower, Lu, & Smalley, 2013; Miklowitz et al., 2015; Muzik, Hamilton, Rosenblum, Waxler, & Hadi, 2012; Vieten & Astin, 2008; Woolhouse, Mercuri, Judd, & Brown, 2014; Zhang & Emory, 2015), owing to promising preliminary results and the reasons to suggest that mindfulness courses may be suitable, acceptable and useful to this population. The reasons from recent literature which inform the rationale of a mindfulness course for use during pregnancy are presented in Figure 1-1 and described below.

**Table 1-1 Mindfulness for Pregnancy Studies**

| Authors | Year | Paper | Journal | Study | Intervention | Type |
|---|---|---|---|---|---|---|
| Vieten & Astin | 2008 | Effects of a mindfulness-based intervention during pregnancy on prenatal stress and mood: results of a pilot study | Archives of Women's Mental Health | RCT | 8-wk Mindful Motherhood | Pregnancy-specific |
| Beddoe, Yang, Kennedy, Weiss, Lee | 2009 | The Effects of Mindfulness-Based Yoga During Pregnancy on Maternal Psychological and Physical Distress | Journal of Obstetric, Gynecologic, & Neonatal Nursing | Pre-post | 7-wk Mindful yoga (inc. MBSR) | Pregnancy-specific |
| Duncan & Bardacke | 2010 | Mindfulness-Based Childbirth and Parenting Education: Promoting Family Mindfulness During the Perinatal Period | J Child Fam Stud | Pre-post | 9-wk MBCP | Pregnancy-specific |
| Dunn, Hanieh, Roberts & Powrie | 2012 | Mindful pregnancy and childbirth: effects of a mindfulness-based intervention on women's psychological distress and well-being in the perinatal period | Archives of women's mental health | RCT | 8-wk MBCT | Generic |
| Muzik, Hamilton, Rosenblum, Waxler & Hadi | 2012 | Mindfulness yoga during pregnancy for psychiatrically at-risk women: Preliminary results from a pilot feasibility study | Complementary Therapies in Clinical Practice | Pre-post | 10-wk mindful prenatal yoga | Pregnancy-specific |
| Fisher, Hauck, Bayes & Byrne | 2012 | Participant experiences of mindfulness-based childbirth education: a qualitative study | *BMC Pregnancy and Childbirth* | Pre-post | 8-wk MBCE (childbirth Education, inc MBSR) | Pregnancy-specific |
| Byrne, Hauck, Fisher, Bayes & Schutze | 2013 | Effectiveness of a Mindfulness-Based Childbirth Education Pilot Study on Maternal Self-Efficacy and Fear of Childbirth | Journal of Midwifery & Women's Health | Pre-post | 8-wk MBCE (childbirth Education, inc MBSR) | Pregnancy-specific |
| Guardino, Dunkel Schetter, Bower, Lu & Smalley | 2013 | Randomised controlled pilot trial of mindfulness training for stress reduction during pregnancy | Psychology & health | RCT | 6-wk MAPS (Mindful Awareness) | Generic |
| Gambrel & Piercy | 2014 | Mindfulness-Based Relationship Education For Couples Expecting Their First Child—Part 1: A Randomized Mixed-Methods Program Evaluation | Journal of marital and family therapy | RCT | 4-wk Transition to Parenthood | Pregnancy-specific |
| Woolhouse, Mercuri, Judd & Brown | 2014 | Antenatal mindfulness intervention to reduce depression, anxiety and stress: a pilot randomised controlled trial of the MindBabyBody program in an Australian tertiary maternity hospital | BMC pregnancy and childbirth | RCT & Pre-post | 6-wk Mind-Baby-Body | Pregnancy-specific |
| Goodman, et al | 2014 | CALM Pregnancy: results of a pilot study of mindfulness-based cognitive therapy for perinatal anxiety | Archives of Women's Mental Health | Pre-post | 8-wk MBCT tailored to pregnancy & anxiety | Pregnancy-specific |
| Miklowitz, Semple, Hauser, Elkun, Weintraub & Dimidjian | 2015 | Mindfulness-Based Cognitive Therapy for Perinatal Women with Depression or Bipolar Spectrum Disorder | Cognitive Therapy and Research | Pre-post | 8-wk MBCT | Generic |
| Zhang & Emory | 2015 | A Mindfulness-Based Intervention for Pregnant African-American Women | Mindfulness | RCT | 8 session, 4-wk Mindful Motherhood | Pregnancy-specific |
| Dimidjian et al | 2015 | An open trial of mindfulness-based cognitive therapy for the prevention of perinatal depressive relapse/recurrence | Archives of women's mental health | Pre-post | 8-wk MBCT (pregnancy & depression tailored) | Pregnancy-specific |
| Chan | 2015 | Effects of perinatal meditation on pregnant Chinese women in Hong Kong: A randomized controlled trial | Journal of Nursing Education and Practice | RCT | 6 session Meditative Intervention inc MBCT | Pregnancy-specific |

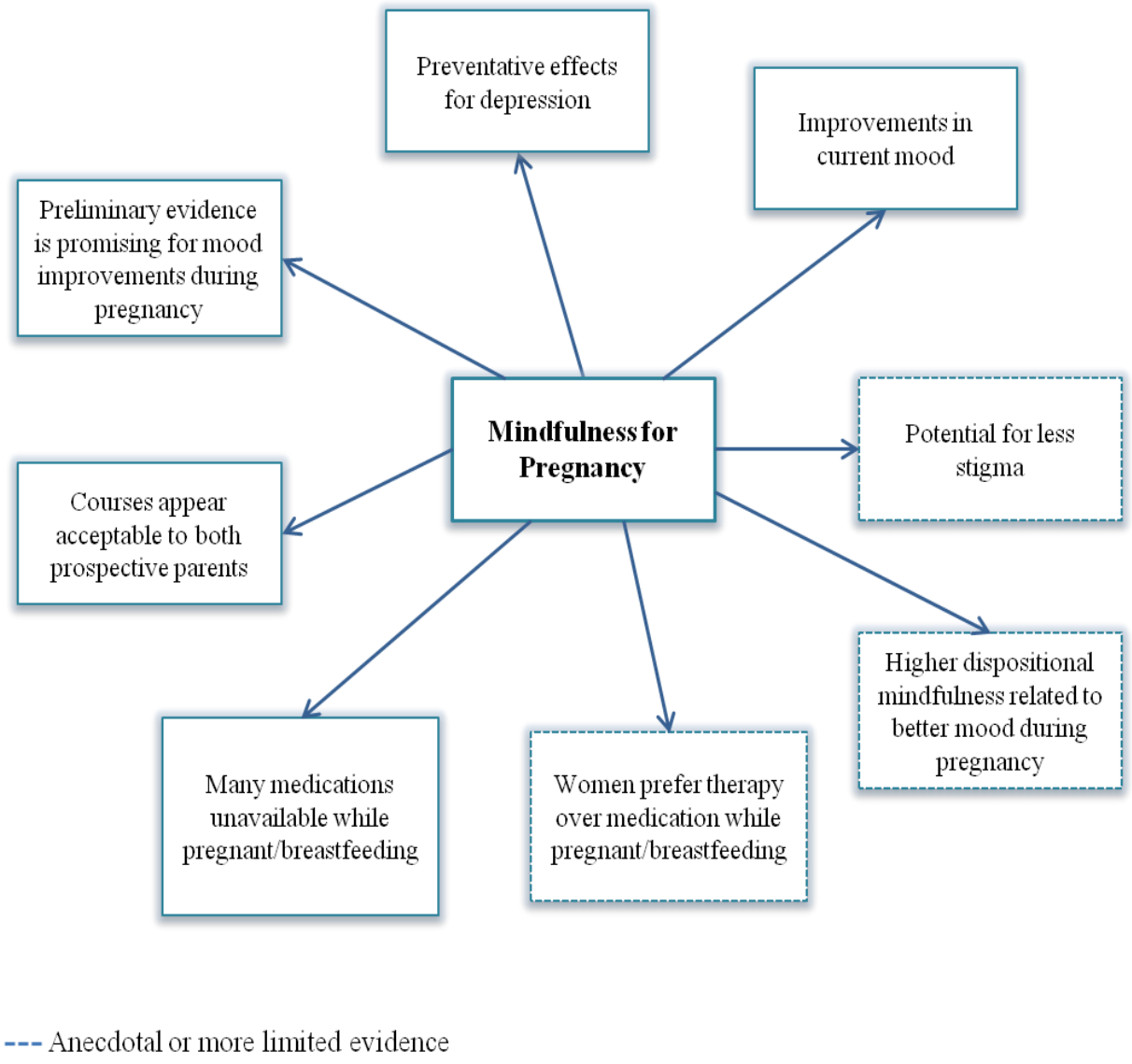


**Figure 1-1 Reasons for the Use of Mindfulness Interventions from Recent Literature**

Mindfulness-based courses have been previously found to prevent depressive relapse in currently well populations with histories of depression (Teasdale et al., 2000; Williams, 2007) suggesting that it may have a preventative effect on perinatal depression, especially if the participant is at high risk having suffered from previous depressive episodes, either perinatal or otherwise (Paschetta et al., 2014; Stuart & Koleva, 2014).

Research findings indicate that mindfulness courses can have a beneficial effect for stress (Carmody et al., 2009), anxiety and depression (Hofmann et al., 2010) in currently well populations.

Preliminary investigations and anecdotal evidence suggest that mindfulness courses are acceptable to pregnant women and expectant fathers (Fisher, Hauck, Bayes, & Byrne, 2012; Gambrel & Piercy, 2014b), with various studies reporting good adherence and satisfaction rates (Beddoe, Paul Yang, Kennedy, Weiss, & Lee, 2009; Byrne, Hauck, Fisher, Bayes, & Schutze, 2013; Gambrel & Piercy, 2014a; Miklowitz et al., 2015).

Preliminary quantitative and qualitative evidence suggests that delivering these courses during pregnancy can improve mood, help pain management and have a positive effect on relationships, and that some of these benefits are maintained at postnatal follow-up. Thus far, research has been conducted examining the potential of generic mindfulness courses and pregnancy-tailored courses offered to prospective mothers with promising results and these will be outlined in detail below.

Studies have begun to examine the relationship between dispositional mindfulness, low mood and child outcomes. One study found that higher mindfulness during the second trimester is related to lower levels of anxiety and that levels of anxiety mediate the relationship between mindfulness and infant self-regulation problems and negative affect at 10 month postpartum (van den Heuvel, Johannes, Henrichs, & Van den Bergh, 2015). Higher rates of mindfulness during the second and third trimesters have been associated with lower levels of depression and anxiety at six months postpartum (Zoeterman, 2014). Interestingly, rates of mindfulness decreasing from pregnancy to postnatal follow-up predicted an increase in depression and anxiety, suggesting that a high level of dispositional mindfulness might only be beneficial for low mood if it is sustained after childbirth. Validation of a short-form FFMQ scale for mindfulness during pregnancy also showed that

higher rates of mindfulness were related to lower scores of distress and depression (Truijens, Nyklíček, van Son, & Pop, 2015). The researchers have even suggested that screening for low levels of mindfulness early in pregnancy would be prudent to offer a mindfulness intervention, increasing dispositional mindfulness, because levels of mindfulness during pregnancy now seem so important in the maintenance of psychological well-being (Truijens et al., 2015). Delivering a course during pregnancy which potentially increases dispositional mindfulness could be beneficial to low mood during and after pregnancy.

Women describe their preference for therapeutic interventions during pregnancy over medication and in some cases, are unable to take certain medication at this time (Dennis & Dowswell, 2013). In a recent study of 200 women asked about their treatment preferences during pregnancy, mindfulness-based cognitive therapy and interpersonal therapy were more frequently endorsed than medication, with 90% disagreeing with a statement that read they would not be interested in psychotherapy and 85% indicating that they would be interested in an approach to help pregnant women to "improve well-being, manage stress and prepare for parenting", whether or not they had an history of depression (Dimidjian & Goodman, 2014).

There may be less stigma attached to mindfulness-based courses (often advertised primarily as a stress reduction course as opposed to a therapy) meaning that people may be more willing to take the course when they might otherwise fear stigma related to suffering from low mood, stress or mental health problems. This fear seems especially elevated during pregnancy with the potential connotation of being unable to cope with a new infant, or being a bad mother (Vieten & Astin, 2008), especially coupled with fears of being referred to child services (Dennis & Dowswell, 2013).

A review of the literature investigating mindfulness courses for pregnancy is presented below including generic and pregnancy-tailored courses for pregnant samples. Literature searches were conducted between October 2012 and October 2015 using Oxford-based online research sites and Google Scholar and the search terms were: mindful*, meditat*, pregn*, mother*, father*, perinat*, prenat* and postnat*. No studies were excluded; abstracts were read to determine suitability (i.e. that the studies conducted used mindfulness-based or similar courses for expectant mothers or fathers).

### *1.7.2 Generic mindfulness courses for pregnancy*

Research has indicated that a generic mindfulness training (i.e. mindfulness training not aimed at preparation for parenthood) nevertheless has beneficial effects on mood during and after pregnancy (Dunn, Hanieh, Roberts, & Powrie, 2012; Guardino, Dunkel Schetter, Bower, Lu, & Smalley, 2013; Miklowitz et al., 2015). For a detailed table outlining the studies examining generic courses for pregnancy, see Table 1-2.

A pilot evaluation of Mindfulness-Based Cognitive Therapy (MBCT) delivered at 12-28 weeks of pregnancy to a mixed sample of expectant mothers with and without histories of anxiety or depression showed clinically reliable declines in depression, stress and anxiety and this decline remained at 6 weeks postpartum (Dunn et al., 2012). The authors surmised that expectant mothers were likely to use the mindfulness skills they had learned to manage stressful aspects of pregnancy, parenting and childbirth resulting in less distress and improved well-being. The results seem promising, however, the sample size was small with ten expectant mothers in the treatment group compared with nine in the control Also, nine of the ten participants in the treatment group reported a history of anxiety and/or depression while none of the control participants reported a similar history meaning comparison between the groups is difficult.

**Table 1-2 Studies examining generic mindfulness courses for use during pregnancy**

| Authors | Year | Study type | Intervention | Sample | *N* | Measures | Outcomes | Post-assessment time | Follow-up | Limitations |
|---|---|---|---|---|---|---|---|---|---|---|
| Dunn, Hanieh, Roberts & Powrie | 2012 | RCT | 8-wk MBCT | Expectant mothers. 1st & 2nd trimester Non-clinical | 10 vs 9 | DASS-21 depression, anxiety, stress, EPDS depression SCS self-compassion MAAS mindfulness | Clinically reliable declines in depression, stress & anxiety | Post-course & 6 week postnatal | Maintained & change in compassion | Small sample 9/10 ppts in active group reported histories of anxiety or depression All participants were receiving outpatient care but there is no description |
| Guardino, Dunkel Schetter, Bower, Lu & Smalley | 2013 | RCT (reading control) | 6-wk MAPS (Mindful Awareness Practice classes) | Expectant mothers, 1st & 2nd trimester. Highly stressed or anxious Non-clinical | 24 vs 23 | PSA pregnancy stress PRA pregnancy anxiety PSS perceived stress STAI anxiety FFMQ mindfulness | Pregnancy-related stress & anxiety declined. General stress, anxiety declined & mindfulness increased for both groups | Post-course & 6 week (prenatal) | Decrease (difference) not maintained at follow-up | No control group-reading control group given pregnancy book Small sample 30% reading control group did yoga |
| Miklowitz, Semple, Hauser, Elkun, Weintraub & Dimidjian | 2015 | Pre-post | 8-wk MBCT | Expectant mothers, trying to conceive or =< 1 yr postpartum, with MDD or bipolar history (sub threshold at baseline) | 31 post-course & 6m fu, 32 1m fu | Client satisfaction questionnaire BDI depression Hamilton depression STAI anxiety LIFE for relapses FFMQ mindfulness | BDI depression decreased (no diff with perinatal status) Hamilton depression decreased No change in anxiety Mindfulness increased High treatment satisfaction | Post-course, 1 month, 6 month | Hamilton & BDI depression decrease maintained at 6m An increase in mindfulness resulted in BDI decrease at all time points 21.9% relapsed by 6m (30% norm) | No control group Sample size meant previous number of depressive episodes could not be analysed Half of the sample were taking medication but no analysis |

A randomised controlled pilot trial of mindfulness for stress during pregnancy showed a decrease in pregnancy-related stress and anxiety following a generic 6-week mindful awareness programme (Guardino et al., 2013). Expectant mothers who were highly stressed and/or anxious were recruited at 10-25 weeks gestation to participate in the 6-week mindfulness course or an active control group where they were given a book to read about stress management and pregnancy. The treatment group consisted of 24 participants and the active control, 23. Dispositional mindfulness increased and general stress and anxiety and pregnancy-specific stress and anxiety all decreased for the two samples. No difference was found between the groups when examining the change in general stress, anxiety or mindfulness scores and while there was a difference in pregnancy-related stress and anxiety scores post-course, there was none found at follow-up (6 weeks later). The lack of difference found may be due to the active control group finding the pregnancy book useful and it is unfortunate that there is no usual care control comparison. Of those in the active control group, 30% reported later that they practiced prenatal yoga, which may have included similar practices and information to that given in the treatment group but this is unknown so the comparison between groups may not reflect what was intended. The change in mood whereby general stress and anxiety decreased may be due to the natural changes in mood over pregnancy (Beddoe et al., 2009) but this is unclear because evaluation by trimester was not performed, or, as the author notes, due to the sample being highly stressed and/or anxious at baseline, the participants in the control group may have attempted, and been successful in, managing their stress individually. Mindfulness scores increased for all participants which may, again, be due to natural changes at this time or the experience of pregnancy, or may be an indication that the active control group gained some increase in mindfulness from their pregnancy book or through completion of the FFMQ measure of mindfulness(bringing attention to their thoughts, feelings and behaviours

without a formal class). Further research is required to address these limitations, particularly, comparison to a usual care control group may be useful.

One study examining the potential benefits of MBCT for currently well women with major depressive disorder or bipolar disorder who were either pregnant (up to 32 weeks), trying to conceive, or had recently had a baby (up to one year postpartum) found reduced rates of depression which were maintained at follow-up (Miklowitz et al., 2015). Participants with major depressive disorder were found to decrease more in their rates of depression than their counterparts with bipolar depression. At six month follow-up, 21.9% of the sample had a depressive relapse, compared with 30% relapse rate in naturalistic studies. The status of women in the study, i.e. whether they were trying to conceive, pregnant or postnatal, showed no differences in outcomes. Mindfulness increased for the total sample, but more so for those with recurrent depression than with bipolar disorder, and the increase was associated with the decrease in depression scores. Participants were also asked to rate their satisfaction with the intervention and showed high levels of satisfaction. However, only course completers completed these ratings (25/27 completed with depressive disorder, 5/12 with bipolar disorder). One limitation of this study is a small sample size meaning that comparison of outcomes looking at the number of previous depressive episodes could not be conducted, especially because previous literature suggests that this may have a bearing on outcome where MBCT seems most useful for those who have suffered from three or more episodes previously. Otherwise, there is no control comparison which may be particularly problematic in this study because approximately half of the sample were taking medication meaning any improvement must be evaluated with caution. Further, the amount of mindfulness meditation practiced outside of the course was not recorded so no analysis could be conducted examining amount of practice as a potential mediator. However, these results indicate that MBCT may be helpful for women during the

perinatal phase who have suffered from previous depressive episodes and that they find the treatment acceptable, with a large number of participants completing the course. That anxiety did not decrease and those suffering with bipolar depression did not experience the same improvements is interesting and warrants further investigation. It is interesting to note that adherence was low for those with bipolar disorder, indicating that MBCT may need to be altered further to suit specific disorders/samples.

### *1.7.3 Pregnancy-tailored courses*

Mindfulness courses specifically tailored to pregnancy have started to be developed and evaluated for clinical and non-clinical samples. For details about studies which have been conducted examining pregnancy-tailored courses for use during pregnancy, see Table 1-3 and Table 1-4.

While qualitative studies are comparatively few and usually as part of a quantitative study design, they are being published examining potential benefits of mindfulness courses for pregnancy and give insight to the opinions of both prospective parents. These findings are discussed, for the most part, in conjunction with their quantitative investigations. For an overview of qualitative evidence to date, see Table 1-5.

**Table 1-3 Pre-post studies examining pregnancy-tailored mindfulness courses for use during pregnancy**

| Authors | Year | Intervention | Sample | *N* | Measures | Outcomes | Post-assessment time | Follow-up | Limitations |
|---|---|---|---|---|---|---|---|---|---|
| Beddoe, Yang, Kennedy, Weiss, Lee | 2009 | 7-wk Mindful yoga (inc. MBSR) | Expectant mothers, nulliparous, any trimester Non-clinical | 16 (8 2nd tri, 8 3rd tri) | PSS stress<br>PPP pregnancy stress<br>STAI anxiety<br>Brief pain inventory<br>Cortisol<br>Acceptability questionnaire | PSS stress & trait anxiety declined for 3rd trimester women & trend for PPP stress<br>2nd trimester women had lower pain scores post-course compared to 3rd trimester (2nd tri pain hrs decreased, 3rd tri increased)<br>Cortisol increased for all ppts<br>Classes acceptable, 15/16 satisfied & would recommend | Post-course | NA | Small sample, especially comparing trimesters<br>No control group<br>Mindfulness practice wasn't recorded<br>Women were paid $100-approx £65-to participate<br>No measure of mindfulness |
| Duncan & Bardacke | 2010 | 9-wk MBCP | Expectant mothers in 3rd trimester-non-clinical but 70% reported stressful life event during pregnancy Non-clinical | 27 | PSS stress<br>PAS pregnancy anxiety<br>PANAS pos & neg affect<br>DES pos & neg affect frequency<br>WOC coping<br>CES-D depression<br>Awareness, non-judge, non-react subscales of FFMQ | Mindfulness & positive affect increase. Pregnancy anxiety, depression & negative affect decrease | Post-course | NA | Small sample<br>No control group (self selected sample)<br>Fathers took part but this data is not reported<br>Only qualitative at follow-up |
| Byrne, Hauck, Fisher, Bayes & Schutze | 2013 | 8-wk MBCE (childbirth Education, inc MBSR) | Expectant mothers, nulliparous, 18-28 weeks gestation Non-clinical | 12, 16 at pn fu | DASS-21 depression, anxiety, stress<br>EPDS depression<br>Childbirth self-efficacy inventory<br>Wijma delivery expectations<br>Qs re fear of labour before & after birth<br>MAAS mindfulness | Self-efficacy & positive expectations increased. Fear of birth decreased.<br>Trends for mindfulness & DASS depression<br>No change in DASS stress or anxiety, or EPDS depression<br>Low homework rates reported (av practice per week 3.6, av mins over course 102.8 mins) | Post-course, 3-12 week postnatal follow-up | Pre-follow-up increase in mindfulness.<br>Birth fear, anxiety & stress decreased<br>Large Ess for self-efficacy, fear of birth<br>Medium Ess for labour expectations, mindfulness, anxiety and depression but underpowered | No control group<br>Small sample<br>Fear of birth decreased at follow-up might be assumed<br>EPDS not taken at follow-up<br>Birth partners took part but no data |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Dimidjian et al | 2015 | 8-wk MBCT-PD (pregnancy & depression tailored) | Expectant mothers, up to 32 weeks gestation, previous MDD, well for at least 2m. Current psych or meds not excluded Clinical-past MDD | 42 | SCID at baseline<br>Client satisfaction questionnaire<br>EPDS depression weekly, post-course, monthly up to 6m pp<br>LIFE semi-structured interview at post, 1m & 6m follow-up | 88% practiced more informal than formal, av home practice 33/42 days<br>Sig decrease in EPDS depression over & post-course | Post-course, 6m follow-up (postnatal) | 18.37% relapse rate from first class to 6m pp follow-up (30% norm)<br>Decrease in depression maintained | No control group<br>No analysis by previous episodes or medication/psych<br>Good adherence rates but monetary compensation, paid for childcare and travel & asked to practice at least 6 days a week |
| Goodman , et al | 2014 | 8-wk CALM Pregnancy MBCT tailored to pregnancy & anxiety | Expectant mothers in 1st & 2nd trimester with GAD scoring highly for anxiety with no greater than moderate depression Clinical-GAD | 23 | Penn state worry<br>GAD-7 anxiety<br>PHQ-9 depression<br>MINI<br>Beck Anxiety Inventory<br>SCS Self-compassion<br>BDI depression<br>MAAS mindfulness | All significant improvements<br>21 ppts attended =>6 sessions, 2 attended 5 sessions<br>4.12/6 days home practice average, 12.3 breathing spaces per week average<br>Great adherence rates | Post-course | NA | No control group<br>small sample<br>No follow-up |
| Muzik, Hamilton, Rosenblum, Waxler & Hadi | 2012 | 10-wk mindful prenatal yoga | Expectant mothers up to 26 weeks gestation, current depression>8 EPDS, nulliparous<br>SCID 18% PTSD, 46% anxiety (GAD, phobias, panic), 9% MDD, 50% no diag<br>9 women in current therapy Clinical-current depression | 18 | SCID<br>EPDS depression<br>BDI depression<br>Maternal foetal attachment scale<br>Acceptability questionnaire<br>FFMQ mindfulness | Depression decreased, mindfulness increased, maternal attachment increased<br>Current other psychotherapy did not affect outcomes<br>7.83 session completed on average-good adherence | Post-course | NA | Current yoga or medical problems were not exclusions<br>Many different past and present diagnoses<br>No control group<br>Small sample |
| Woolhouse, Mercuri, Judd & Brown | 2014 | 6-wk Mind-Baby-Body | Expectant mothers, any trimester, 'at risk' of stress, anxiety or depression by midwife At-risk | 11 | DASS-21 depression, anxiety, stress<br>CES-D depression<br>STAI anxiety<br>PSS stress<br>FFMQ mindfulness | DASS depression, CES-D depression, state anx declined. 'Act aware' & 'describe' & total mindfulness increase. PSS & DASS stress decline trend. | Post-course | NA | Small sample<br>No control |

**Table 1-4 Randomised controlled studies examining pregnancy-tailored mindfulness courses for use during pregnancy (all non-clinical samples)**

| Authors | Year | Course | Sample | *N* | Measures | Outcomes | Post-time | Follow-up | Limitations |
|---|---|---|---|---|---|---|---|---|---|
| Vieten & Astin | 2008 | 8-wk Mindful Motherhood | Expectant mothers in 2nd/3rd trimester. 'History of mood concerns' | 13 vs 18 | STAI anxiety<br>PANAS-X pos, neg affect<br>PSS stress<br>CES-D depression<br>MAAS mindfulness | Anxiety & negative affect declined. Trends for general stress, mindfulness & depression | Post-course & 3m postnatal | No between group difference at 3m. Depression increased for controls at post-intervention | Small sample<br>Control group lower mood at baseline |
| Gambrel & Piercy | 2014 | 4-wk Transition to Parenthood | Expecting couples, non-clinical, primiparous, 1st & 2nd trimester | 32 (16) vs 34 (17) | CSI rel. satisfaction<br>IRI general empathy<br>SDPTS self-partner empathy<br>ODPTS partner-empathy<br>DASS-21 stress, anxiety, depression<br>PANAS pos & neg affect<br>FFMQ mindfulness | No sig diffs for women. Men improved in relationship satisfaction, mindfulness & negative affect vs control | Post-course | NA | Couples report high baseline relationship satisfaction so cannot be generalised<br>Men in control group had higher mindfulness at baseline (more scope to increase in active group?)<br>Qualitative interviews conducted with couples |
| Woolhouse, Mercuri, Judd & Brown | 2014 | 6-wk Mind-Baby-Body | Expectant mothers, any trimester, non-clinical (1/3 fell in clinical range for depression, anxiety or stress, means below clin cut-offs) | 13 vs 10 | DASS-21 depression, anxiety, stress<br>CES-D depression<br>STAI anxiety<br>PSS stress<br>FFMQ mindfulness | No between group differences, but improvements in DASS anxiety for active group, with 'observe' and 'describe' & total mindfulness increase. Usual care no change. | Post-course | NA | Small sample<br>Control group reported yoga (50%) and meditation (10%)<br>Active group younger & more usually primiparous |
| Zhang & Emory | 2015 | 8 session, 4-wk Mindful Motherhood | Expectant mothers, any trimester, low income African-American women. 51.4% married or cohab, 84.6% unemployed<br>Highly stressed at baseline | 34 vs 31 | PSS stress<br>Pregnancy Experience Scale (positive & negative)<br>BDI depression<br>Toronto Mindfulness Scale | Mindfulness increased post-course<br>Reactive cortisol reduced at T2 with more sessions completed<br>Hassles decreased post-course with more sessions | Post-course, 1 m follow-up | With more sessions: Depression reduced at follow-up, but not at T2<br>PES positive intensity increased at follow-up, not at T2<br>Trend for PES hassles | Analysis unavailable between groups because of attrition -only 3 ppts completed. A dose-effect analysis was conducted which may be confounded by ppt characteristics. Attrition meant cortisol at follow-up was unavailable |
| Chan | 2015 | 6 session EBMI (Eastern-based Meditative inc MBCT) | Expectant mothers, Chinese women, 12-28 gestation | 64 vs 56 | PDQ distress<br>PCI prenatal coping<br>EPDS depression<br>Body-Mind spirit well-being Inventory<br>Morning & evening cortisol | Between-group:<br>Social support, self-care (body-mind)<br>When comparing frequent practisers (36) vs control: positive appraisal also present<br>frequent vs control: resilience | 36th week gestation (post-course), 5 week pp, 5m pp | Frequent practisers vs control: physical distress difference<br>Frequent practisers vs control: evening cortisol levels sig different | 94% of mulitparous intervention group had previous vaginal deliveries vs 80% in control (sig at .05)<br>Recruited at different time points in pregnancy but not taken into account (nor described) |

**Table 1-5 Qualitative findings for mindfulness during pregnancy**

| Authors | Year | Intervention | Sample | *N* | Qualitative |
|---|---|---|---|---|---|
| Woolhouse, Mercuri, Judd & Brown | 2014 | 6-wk Mind-Baby-Body | Expectant mothers, any trimester, 'at risk' of stress, anxiety or depression by midwife<br>Non-clinical but at-risk | 11 | Post-course 4 interviews. 3/4 had psych problems.<br>Four themes: reigning in unhelpful patterns, improvements in sleep, relationships & qual of life.<br>Different meditation prefs. Group initially hadn't 'gelled' but then enjoyable |
| Duncan & Bardacke | 2010 | 9-wk MBCP | Expectant mothers, 3rd trimester-70% reported stressful life event<br>Non-clinical | 27 | Postnatal interviews<br>Improvements in partner relationship, benefits with pain & parenting |
| Fisher, Hauck, Bayes & Byrne | 2012 | 8-wk MBCE (childbirth Education, inc MBSR) | Expectant mothers, nulliparous, 18-28 weeks gestation<br>Non-clinical | 12 mothers, 7 birth partners | 2 focus groups of 12 mothers & 7 birth partners 4m post-course (6-wk postnatal)<br>Themes of empowerment & community<br>Use of mindfulness during labour helped with feelings of control & calm<br>Mothers drove attendance 'dragged partners along'. They could later see the value in attending<br>Provided space for the men to engage with the birth process, not passive spectators. Felt more of a team<br>Mindfulness & ability to be flexible important.<br>Sharing worries & concerns as a group helpful-many stayed in touch, shared tips for new-borns<br>Some continued to practice mindfulness after the course |
| Dimidjian et al | 2015 | 8-wk MBCT-PD (pregnancy & depression tailored) | Expectant mothers, up to 32 weeks gestation, previous MDD, well for at least 2m. Current psych or meds not excluded<br>Clinical-past MDD | 42 | Qual at 6m postpartum<br>78% said course was helpful, high satisfaction<br>83% said helped with intense emotions<br>78% with times they started feeling depressed again<br>67% beneficial learning to relate differently to depressive phenomena<br>72% recognising warnings & triggers<br>89% taking action with warning signs<br>94% using activities (such as breathing space) to disengage from negative mood |
| Goodman, et al | 2014 | 8-wk MBCT tailored to pregnancy & anxiety (CALM-P) | Expectant mothers in 1st & 2nd trimester with GAD scoring highly for anxiety with no greater than moderate depression<br>Clinical-GAD | 23 | Questions answered post-course.<br>7 main themes: skill building, connection, universality, acceptance & self-kindness, decreased reactivity, cognitive changes, insight<br>Suggestions included having partners attend at least one session & ongoing support. Many not keen on amount of required practice |
| Muzik, Hamilton, Rosenblum, Waxler & Hadi | 2012 | 10-wk mindful prenatal yoga | Expectant mothers up to 26 weeks gestation, nulliparous.<br>Clinical- current depression | 18 | Acceptability questionnaire post-course:<br>Helpful coping strategies, social support via group, content perceived positively<br>Many comorbid disorders (PTSD, GAD, phobias, panic disorder) |
| Gambrel & Piercy | 2014 | 4-wk Transition to Parenthood | Expecting couples, non-clinical, primiparous, 1st & 2nd trimester<br>Non-clinical | 32 (16 couples) | Post-course interviews with couples<br>May be particularly helpful for men because of differences in social support needs |

An investigation of a mindfulness course named Mindful Motherhood (incorporating elements of MBSR and MBCT with some practices altered to encompass pregnancy and parenting information) found a significant decline in anxiety and negative affect post-treatment compared to a control group (Vieten & Astin, 2008). Women were recruited during the second and third trimesters of pregnancy who had 'a history of mood concerns'. Baseline scores for the sample indicate moderate levels of stress, anxiety and depression. The treatment group contained 13 women and the control group contained 18. A trend for active participants improving more than controls was found for stress and depression at 8-10-week follow-up (up to 2 weeks after the 8-week course) during the third trimester but this trend was not apparent at 3 month postnatal follow-up. The control group showed significant increases in depression at post-intervention, but it is unclear whether this is due to their being recruited during the second trimester and therefore whether this is because of the expected decline in mood during this third trimester (Beddoe et al., 2009). As this is a pilot investigation, the sample size is small and there is no evaluation concerning previous children, relationship status or trimester differences. The feasibility phase of this study showed that recruitment was difficult with many women citing preference for treatment group over control and scheduling and location of classes as obstacles to participation. It was also found that many women were likely not to come forward for the study when advertising for people with a history of anxiety or depression due to stigma.

One pilot study suggests that a 7-week prenatal mindfulness-yoga training, incorporating MBSR with pregnancy yoga, can have different beneficial effects depending on the trimester of pregnancy in which the course is taken (Beddoe et al., 2009). Sixteen non-clinical nulliparous expectant mothers were recruited and paid US$100 (á £65) to take part in the study at 12-32 weeks gestation, of which 8 were in their second trimester and 8 in their third. The researchers measured rates of perceived stress, pregnancy related stress, anxiety, pain, including length, intensity and interference and morning cortisol levels. They

found no baseline differences by trimester. Interestingly, while the total sample scores of stress and anxiety decreased, the decrease was most prominent for the women in their third trimester. Conversely, the women in their second trimester decreased in their ratings of pain, with a particular difference in length of pain; third trimester participants pain time increased post-course. The levels of cortisol increased over time for all participants. All participants were asked about how acceptable they found the intervention and 15/16 stated that they were satisfied and would recommend it to a friend. This study, being intended to gather data for power and sample calculations for a larger study, has a number of limitations, primarily the small sample size. Further, there was no control group so the differences found between those in the second and third trimesters cannot be compared to natural changes over pregnancy. The authors posit the natural changes over pregnancy to be one of the possible reasons for the results that show pain increasing for those later in pregnancy and they suggest that perhaps the intervention can have a preventative effect on pain for women in their second trimester while limiting the potential increase in stress and anxiety usually occurring later in pregnancy. Further limitations include a lack of recorded mindfulness practice amounts so any cumulative benefits with increased practice cannot be examined and a measure of dispositional mindfulness was not included in the study so mediation analysis is unavailable. Payment to participate may skew the results, perhaps resulting in participants unintentionally rating the intervention more favourably. While there are a number of limitations, this study shows some potential for the use of a mindfulness intervention during pregnancy, particularly for improvements in pain for those in their second trimester and improvements in mood for those later in pregnancy. This may be particularly important during this time of life because limited pain medication is available and as there is the potential to use previously learned coping strategies for labour pain, teaching these skills prenatally should be helpful (Hughes et al., 2009).

Mindfulness-Based Childbirth and Parenting (MBCP; Duncan & Bardacke, 2010) incorporates elements of MBSR with tailored mindfulness practices and information for pregnancy. A pilot evaluation of MBCP for 27 non-clinical expectant mothers in the third trimester showed an increase in mindfulness (using the awareness, non-judging and non-reactivity subscales of the Five Facet Mindfulness Questionnaire; FFMQ Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006) and in positive affect following the 9-week course. There was a decrease in pregnancy related anxiety, depression and negative affect. Being a pilot study means there are limitations. While expectant fathers took part, their quantitative data are not reported. Post-partum follow-up was conducted but only qualitative data was collected so although participants state that they found the course helpful, whether the improvement in mood was maintained is unclear. The results do show promise for the use of MBCP during this time, particularly as it is delivered to couples rather than being aimed at the mother alone, indicating that expectant fathers are also willing to engage in mindfulness practice as a preparation for parenthood and that both parents see a need for support at this time. Qualitative data showed that participants used mindfulness skills during labour and postpartum and that they also found these skills helpful for paying attention to their mood, reactions and relationships during this time. The same authors conducted a proceeding study examining the effectiveness of a weekend mindfulness course specifically for pain management during labour, compared to a childbirth and parenting education class without a mind-body focus (Duncan et al., 2014). Compared to the control participants, participants in the mindfulness group showed an increase in childbirth self-efficacy and there was a trend for lower pain catastrophising and furthermore, had lower scores for post-course and postnatal depression. Again, this study adds to the developing literature suggesting a number of potential benefits for the use of mindfulness courses delivered during pregnancy.

A further study evaluated the potential of a 10-week mindfulness prenatal yoga course for expectant mothers who exhibited depressive symptoms (Muzik, Hamilton, Rosenblum, Waxler, & Hadi, 2012). The sample was primiparous and at 26 weeks gestation or less. Eighteen of 20 course completers submitted the post-course assessments. Pre to post-course, mindfulness significantly increased, as did maternal foetal attachment; depression decreased. Correlations revealed that pre-course depression was correlated negatively with post-course mindfulness and pre-course mindfulness was negatively correlated with post-course depression suggesting a relationship, however no causality can be analysed due to the small sample size. Although the results indicate that a mindfulness-yoga course can be beneficial for a group with depressive symptomology and adherence rates were good with 7.83 sessions completed on average, there are study limitations. First, a lack of follow-up; second, demographically, the sample is again similar to those previously found to complete this type of research, with a mean age of 32.4 years, a high level of education and all participants either married or cohabiting and thus, the results cannot be generalised; third, the diagnoses of the sample vary with half of the sample meeting no diagnosis during the baseline assessment and half meeting diagnoses for a range of problems, such as anxiety disorders and depression and sample history also varied. A large number reported anxiety or previous substance issues, but this is not taken into account in the analysis, nor is there a measure of anxiety included in the study. The small sample means that it would perhaps be difficult to analyse the sample based on their current or previous diagnoses so perhaps a follow-up study with a larger sample examining these issues individually would be helpful. Women in the study were also asked to provide feedback via questionnaire about acceptability and findings were that many participants found the course helpful for coping with low mood, appreciated the social support of the group and that course content was perceived positively. The study is one of the first to address the needs of currently depressed expectant mothers and shows promise for benefitting low mood during

pregnancy, indicating that this is an acceptable intervention to pregnant women whether they be a clinical or non-clinical population. The study is also the first to measure maternal foetal attachment in relation to participation in a mindfulness course and this too shows promise and a need for further investigation.

In a recent pilot, women were recruited at 10-34 weeks gestation and were allocated to one of two studies (Woolhouse, Mercuri, Judd, & Brown, 2014). The two studies were a pre-post evaluation for women deemed at risk for perinatal stress, anxiety or depression by their midwives (11 women took part) and a randomised controlled trial for a non-clinical sample (13 active and 10 control). The intervention was a 6-week mindfulness-based 'Mind-Baby-Body' programme, incorporating mindfulness meditation and cognitive exercises. For the pre-post study, there were significant improvements in depression and state anxiety. There was also a trend for a decline in stress and a significant increase in mindfulness. For the RCT, no between group differences were found, however, the active group had significant improvements in anxiety and the 'observe' and 'describe' facets of the FFMQ significantly increased pre- to post-course. There are a number of limitations for this pilot investigation. First, the sample sizes are small, primarily due to deliveries before course completion. Second, due to a lack of stratification, the active group was younger and more likely to be expecting their first child, than those in the control comparison group and it was noted that 50% of the control group had practiced prenatal yoga and 10% had practiced formal meditation between the pre and post data collection points. These differences may have attributed to the lack of a significant between groups for the RCT outcomes. The authors note that a third of the non-clinical pre-post sample fell into the clinical range for stress, anxiety or depression, but that baseline means did not fall within clinical cut-offs. This, they state, is usual in studies such as these, where those who feel they need support opt in. Indeed, their qualitative data taken from four participants supports this in that three stated their participation was due to their wish to manage an existing

psychological difficulty. Similarly, their sample consisted of relatively older expectant mothers and educated to a higher level than average, owing to the tendency of 'highly-resourced' and motivated participants usually taking part in these programmes. This means that the results cannot be generalised to other populations, particularly those more vulnerable and/or with less resources.

Qualitative data presented four main themes about changes owing to the course, these were: 'reigning in unhelpful patterns'; relationship improvements; improvements in quality of life; improvements in quality of sleep. While the women described different meditation preferences and routines, they appreciated the variety of formal and informal meditations on offer and all said that they intended to continue their practice, finding the course helpful. Interestingly, they all reported doubts over the group situation initially saying that it was uncomfortable because the group had not 'gelled' but growing to ultimately enjoy the group format of the classes. The results of this investigation provide support for the need for future investigations and look promising for the potential to help clinical and non-clinical groups manage prenatal stress, anxiety and depression.

Another study evaluating these courses for depression examined women with depressive histories. The impact of an 8-week mindfulness-based cognitive therapy course, adapted for pregnancy, with currently well women who had previous major depression (Dimidjian et al., 2014) was examined. Forty-nine women were recruited up to 32 weeks gestation and their depressive symptoms were assessed at baseline, over the course and at 6-month postnatal follow-up. Forty-two women completed the course (4 sessions or more; 6.10 sessions completed on average and a course completion rate of 88%) and their depressive symptoms declined over the course, with a significant decrease post-course which was sustained at 6-month post-natal follow-up. Up to the 6-month postnatal follow-up, a relapse rate of 18.37% was reported, lower than previously reported norms of approximately 30%. Participants were requested to complete home practice at least 6 days

per week and the study showed good adherence with an average of 33/42 days practice (with more informal than formal reported).

Exit interviews were conducted to gather qualitative data about course satisfaction and experience. Participants showed high satisfaction with the course with many reporting that they felt the course had been helpful, particularly for coping with intense emotions and times they had started to feel unwell. Thematic coding revealed four main themes about the ways the course had helped specifically, these were: learning to relate differently to depressive symptoms, recognising triggers and warning signs, taking positive action with warning signs and using practices such as the breathing space to disengage from negative moods. The study shows that the course is an acceptable and useful way to help prevent depressive relapse over the perinatal period, although there are limitations. First, although there was a significant decrease in depressive symptoms and a low relapse rate, without a control group it is unclear that the course was wholly responsible, but the finding that the decrease was maintained at 6-month postpartum is promising. Second, although participants were recruited into this study based on the previous depressive history, no analysis was conducted examining postnatal differences with the number of previous depressive episodes. Mindfulness-based courses have been particularly successful in preventing depressive relapse in people who have had three or more previous depressive episodes. In this study, depressive histories did vary, however this was not included in the analysis; the sample size in this instance means that any meaningful analysis splitting by history would be difficult. Adherence to the course and to the research was high, however, there was a monetary incentive to participate. Participants were paid $115 (£74) to take part in assessments, travel and childcare costs were covered and a nominal gift was given to participants when the baby was born. Although the findings suggest that the course is acceptable, with good satisfaction, in routine practice participants may find it more difficult or less appealing to attend if they are not recompensed for their time, must pay for travel

and/or childcare cover and on many occasions, have to pay to attend the course. Although high homework practice rates also support the implication of good course acceptability, further work is required to evaluate the acceptance of these courses in other populations and with more ecologically valid settings. The finding that one third of participants excluded from this study was because of a lack of previous depression certainly suggests an interest in other populations for these types of courses during the perinatal period. In addition, many participants self-excluded on the basis of time or travel constraints, suggesting a high level of interest and the need for more accessible courses. The authors suggest a need for novel mediums, such as phone or web-based courses, to meet the growing demand, citing one recent study with 85% of pregnant women with depressive symptoms reporting an interest in web-based interventions to cope with depressive symptoms (Maloni, Przeworski, & Damato, 2013). Future work replicating this study with a control group and examining the benefits with other samples, perhaps distinguishing depressive histories, may be pragmatic.

Expanding the literature examining clinical populations, one study has examined a pregnancy-related mindfulness course for Generalized Anxiety Disorder (GAD) sufferers (Goodman et al., 2014). The intervention was an 8-week mindfulness course: Coping with Anxiety through Living Mindfully (CALM-Pregnancy) and was an adapted MBCT course tailored to pregnancy and anxiety, developed by the authors. Eligibility criteria consisted of scoring a high level of anxiety and/or meeting the criteria for GAD in a diagnostic interview, showing rates of moderate depression or lower, with no suicidal ideation and the ability and willingness to attend at least seven of the eight classes. The 23 women who completed the course also completed the post-course assessment. Attendance at the classes was also high with the average number of sessions at 6.96 and home practice rates of 4.15 days out of the six requested for formal practice and an average of 12.3 breathing spaces per week over the course. At post-course, there were significant improvements in worry,

anxiety, self-compassion, and depression with a significant increase in mindfulness. Measures of depression, anxiety and mindfulness were also taken at weeks 3, 5 and 7 of the intervention and correlations showed that mindfulness and depression were correlated at weeks 5, 7 and post-course where anxiety and mindfulness were only correlated at post-course. Fifteen of the 16 participants meeting criteria for GAD no longer did so at post-course with two participants meeting criteria for major depressive disorder no longer meeting criteria at post-course; other co-morbidities at baseline (PTSD, social phobia, specific phobia, dysthymia) remained unchanged. One participant met the criteria for social anxiety disorder at post-course but had not done so at baseline.

Qualitative data was gathered at post-course through questionnaires asking what they had learned from the course, if anything, what aspects were most and least helpful and any suggestions for improvements. Seven categories were found during analysis, these were: skill building (to help with anxiety), connection (with others in the group), universality (learning that they were not alone), acceptance and self-kindness (more accepting of thoughts and feelings, particularly with anxiety), decreased reactivity, cognitive changes (learning to think differently) and insight (into how they cope with anxiety). Six participants suggested the inclusion of their partners in at least one session so that they too could learn and be supportive going forward. Several participants said that they disliked the amount of home practice required with one person stating that this increased her anxiety. The sample was (as previously seen in this type of research) highly educated, older than average (33.5 years) and the majority were married so the results cannot be generalised to other groups. This study is the first to examine the potential of mindfulness courses for those suffering with high rates of anxiety during pregnancy and the results indicate that this type of course is acceptable and helpful. That attrition rates were low may in part be due to the screening procedure, including people able and willing to participate in most of the course and a commitment to home practice of at least 30-40 minutes per day. However, this

commitment requirement perhaps eludes to the participants' acceptance and need for a therapeutic intervention at this time, given that recruitment and attrition were successful. That the majority of participants no longer met their previous disorder diagnoses is intriguing and requires follow-up study to explore the possible maintenance of the benefits found here. The majority of participants said that they found the course useful and for a number of reasons elucidating their acceptance of the intervention. That participants suggested including their partners in the course is support for the inclusion of partners in future interventions during pregnancy.

Although these mindfulness courses are aimed at expectant parents and show improvements for the expectant mother, there is a lack of data about how helpful these courses are for prospective fathers, other than their adherence and willingness to participate. Lower relationship satisfaction and a lack of father involvement have been shown to predict postnatal depression (Matthey, Barnett, Ungerer, & Waters, 2000; Pop et al., 2011; Shapiro & Gottman, 2005) indicating that offering an intervention suitable for both expectant parents, such as mindfulness classes, may be beneficial.

One randomised controlled trial of a 4-week mindfulness 'Transition to Parenthood' course delivered to 32 participants (16 couples), compared with 34 waitlist control participants (17 couples), examined the effect on relationship satisfaction, mindfulness and negative affect (Gambrel & Piercy, 2014a). The sample recruited were non-clinical primiparous couples at 12-34 weeks gestation at the start of the course; those with a current daily meditation regime or attending couples therapy were excluded. Men showed significant improvements in relationship satisfaction and mindfulness and a decline in negative affect compared to the control group. There was no difference in empathy, positive affect or negative emotional states, nor were there any significant differences between the data of the female treatment and control groups. Adherence to classes was above 90% with

mindfulness practice homework at 177/360 minutes for men and 202.65/360 minutes of practice for women (requested to complete 15 minutes of daily practice).

Qualitative data were gathered via interviews with 13 couples (interviewed together) upon course completion and analysed using phenomenological analysis (Gambrel & Piercy, 2014b). The women in the study felt they received ample support from other pregnant women and mothers, especially given the visible status of pregnancy. Men found the support of other fathers-to-be in the group helpful as they were less likely to receive this support elsewhere. Usually, the expectant mother enrolled in the course and requested their partner also take part which gave the women a sense of relationship stability and support from their partner. Women in the classes stated that they felt more connected to their unborn babies and better prepared, where they had already been feeling so to a degree throughout the pregnancy. Conversely, men learned more about pregnancy through the course which made them feel more connected to their partners and unborn children, leading to a better understating of what their partner was experiencing and they felt more supportive as a result.

There are study limitations. First, couples recruited reported high levels of relationship satisfaction so the results cannot be generalised to those with less positive relationship status. Second, men in the control group had significantly higher mindfulness scores at baseline, likely due to the coin toss randomisation; participants were not randomised using stratification. This may account for the significant increase in mindfulness for men in the treatment group compared to the control group but is not discussed. Finally, although the qualitative data is beneficial, it is perhaps unfortunate that couples were interviewed together as this may have impacted on their revelations and if the interviews were conducted separately, participants may have felt more at ease if their opinions differed. The study suggests that a mindfulness course delivered at this time to prospective couples is

potentially beneficial for both parents-to-be and illustrates a need for future research, especially with expectant fathers.

One qualitative study found similar advantages in focus groups which were conducted separately, with one group of expectant mothers (12 took part) and another group of birth partners (six partners and one mother of the pregnant women) (Fisher et al., 2012) following an 8-week Mindfulness-Based Childbirth Education (MBCE) class. MBCE is similar to MBCP, incorporating elements of MBSR and childbirth education. Mothers-to-be are invited with their birth partners. Focus groups were conducted four months after the course finished to allow for at least six weeks to have past after the birth. A generic thematic analysis was used on the transcriptions and two main themes were found: empowerment and community. Birth partners especially stated that they had a new sense of empowerment through the education, allowing them to engage in the birth instead of being passive spectators. Many couples said that they used mindfulness techniques during the birth to help them to remain calm and focussed or flexible, allowing for a sense of control. That there was class-based discussion throughout the course seemed to help birth partners to be included in the upcoming birth in particular, and allowed the couples attending to feel more of a team with their shared knowledge. Participants also said that they found mindfulness techniques helpful for remaining calm and in control with their newborns, with some participants continuing their mindfulness practice after the course. The authors note that further exploration of these ideas is needed in a more diverse population, as this sample was once more of a high socioeconomic status. Even so, the initial findings show that this type of course is acceptable and valuable to mothers-to-be and importantly, has started to examine the potential benefits for partners as well.

Quantitative pilot analysis (Byrne et al., 2013) was also conducted on the data of the 12 women completing the MBCE courses in the qualitative study (Fisher et al., 2012) outlined above. Measures of mindfulness, general stress, anxiety, depression and prenatal

depression, childbirth self-efficacy, positive expectations for labour and fear of childbirth were taken before the course, after the course and at 3-12 weeks postnatal follow-up (omitting self-efficacy and perinatal depression at the final stage). Post-course, childbirth self-efficacy and positive expectations increased, fear of birth decreased and there were trends for mindfulness increasing and depression decreasing. From pre-course to follow-up, mindfulness significantly increased and fear of birth, anxiety and stress decreased. Not only does this study show that a mindfulness course might be helpful during pregnancy for low mood and childbirth fear, but it is promising that anxiety and stress were also lower at postnatal follow-up, suggesting a preventative effect. Fear of birth was measured at follow-up and decreased but it could be assumed that fear of childbirth would be alleviated after the birth. Most striking is the lack of measures taken for birth partners. The qualitative study included both expectant mothers and their birth partners and yet quantitative data for the attending birth partners was not analysed. Unfortunately, this omission means that while the course shows promise for expectant mothers, we do not have potential outcomes for birth partners. One main strength is that measures of childbirth fear and efficacy were analysed, showing mindfulness course potential for perinatal stressors that, so far, had not been examined. That mindfulness showed a trend at post-course and an increase at follow-up is support for an increase in mindfulness mediating the benefit on low mood and it might be prudent to examine this further in a larger sample.

One of the main limitations of the research examining the potential of mindfulness courses for the perinatal period is that they appeal to participants who are older than average for expectant mothers, who are highly educated and motivated and well-resourced (Fisher et al., 2012; Woolhouse et al., 2014). This means that much of the research thus far has failed to address the potential benefits for those who may be more vulnerable. In an attempt to address this, one recent study (Zhang & Emory, 2015) has piloted Mindful Motherhood, an 8-week mindfulness-based course similar to MBCP with pregnancy

information and elements of MBSR and MBCT (Vieten & Astin, 2008) to low income African-American women during pregnancy. Women at 12-31 weeks gestation were recruited via healthcare services for low-income families and randomised to either take part in Mindful Motherhood, which in this case, was administered with two sessions per week over four weeks, or to receive usual care. The intention was to compare treatment outcomes with the control group and initially, 34 participants were randomly allocated to the active group and 31 to the control. Attrition rates were high for both assessments so the analysis was changed to a dose effect analysis examining the potential benefits to outcome with number of sessions completed. With more sessions, mindfulness was found to increase at post-course but this increase was not maintained at one month follow-up. Stress showed no change with sessions. Pregnancy-related positive experiences increased with more sessions at one-month follow-up, but not post-course, and pregnancy-related negative experiences decreased at post-course with a trend at follow-up. Depression decreased with more sessions at follow-up but not a post-course. This is the first study to explore the usefulness of a mindfulness-based course for expectant mothers in another setting. The demographics of this sample differ to much of the current research, with lower average age at 25.3 years, with a higher percentage single with 51.4% cohabiting or married and 19.1% living apart from their partners and with low incomes across the sample and 84.6% unemployed. It is unfortunate that levels of attrition were so high and this may indicate that these types of courses may not be acceptable to this sample. That the number of course sessions was associated with positive outcomes warrants further investigation, particularly, as the authors note, with course completers versus non-completers as was initially intended. The authors suggest that the mindfulness course may need additional tailoring to this group of people so that it may be more relevant and acceptable. The dose-effect analysis means that the findings could be confounded by participant characteristics (i.e. there may be a relationship with demographics, mood or personality and the number of courses attended). That stress

did not decrease with session numbers is interesting and the authors posit that perhaps using a general measure of stress may not be appropriate during pregnancy, or that perhaps the measure was not so relevant to this sample. This study warrants replication accounting for attrition difficulties and indicates that there may be benefits with stress reaction, depression and pregnancy hassles and uplifts in this population. It is a first step examining the potential of these courses with more diverse populations.

Expanding upon the literature for mindfulness during the perinatal period with other populations, one study has also found potential benefits with a population of non-clinical pregnant Chinese women (Chan, 2015). A six-session course named Eastern-Based Meditation Intervention (EBMI), incorporating elements of mindfulness, education about stress and how to cope with stressors and pregnancy and motherhood experience was created. Women between 12-28 weeks gestation attending antenatal clinics were recruited and randomly allocated to complete the course or to be in the control group. Participants were analysed comparing people who reported high amounts of practice with low. At 36 weeks gestation positive appraisal was significantly higher for frequent practice participants vs. control and for frequent practice participants vs. non-frequent participants; social support and self-care were also higher for active vs. control, but this difference was also present at baseline. There were no significant differences between any groups for distress or depression at any of the time points, though this may be due to the mild levels at baseline allowing for less scope for improvement. The findings show the potential of mindfulness meditation training for positive appraisal and stress levels in healthy pregnant women, however, there are limitations. First, women were recruited during pregnancy, given the six-session course and followed up initially at 36 weeks gestation, but it is not clear as to how pregnant the women were when they attended the course, nor how long the course was (though it may be assumed that six sessions were given over the course of six weeks, it is not clear that this was the case). Also, it is unclear how much time had lapsed between the

end of the course and the first assessment, or if this was different for different participants. Second, participants were randomly allocated to active or control but not stratified and there were significant differences between the groups at baseline, including social support, self care, resilience and how participants had given birth previously. This study is an indication that a meditation course, including elements of mindfulness, given to healthy women during pregnancy, may be beneficial for stress and expands on current literature by exploring this potential in another geographic sample. That there were very few differences found post-course between the active and control participants warrants further investigation and may indicate that a course such as this would benefit from being altered for healthy samples, or that these types of courses can elicit improvements not measured in the current study.

As described above, many of the studies examining the utility of a mindfulness course for prospective parents share the same limitations. Many studies are preliminary investigations and as such the sample sizes tend to be small. Few studies include a postnatal follow-up to examine potential maintenance of benefits and few include control comparisons. This is an area of study which is currently being expanded upon and these limitations are in large part due to the novelty of this research. Although the preliminary evidence for the use of mindfulness interventions at this time look promising, acceptable to both prospective parents and there is a growing body of evidence for their usefulness to improve mood, there is still an issue with accessibility. Currently, accessibility to a mindfulness course varies depending on location and there are usually two routes for access. One option is for those deemed at risk to be referred by their healthcare professional and the other option is to pay privately for a course, but this can be expensive.

## 1.8 Internet Interventions

There are numerous reasons why people may be unable to attend a face-to-face course such as disability, childcare and travel issues and the times that the courses are available (Beattie, Shaw, Kaur, & Kessler, 2009; Finucane & Mercer, 2006). Online interventions are being created and studied to provide helpful mental health resources which may be inaccessible otherwise. By offering treatment via the internet, providers are delivering interventions with reduced cost to the health services and patients (Bolier et al., 2014; Clarke et al., 2009; Powell et al., 2013) and allowing the provision for patients to complete courses in their own comfortable familiar surroundings (Beattie et al., 2009; Finucane & Mercer, 2006).

There is a substantial cost decrease for courses which do not include therapist support, but the lack of support is a topic of debate among researchers (Palmqvist, Carlbring, & Andersson, 2007). Studies are beginning to examine whether a therapist is needed to gain the benefits. Recent research suggests that support when taking an online course is important; when examining an internet intervention for anxiety and/or depression, participants given weekly support improved significantly compared to their counterparts receiving either no support or support on request (Kleiboer et al., 2015). However, courses without guidance have also found improvements in mood (e.g. (Cavanagh et al., 2013; Krusche, Cyhlarova, King, & Williams, 2012; Zetterqvist, Maanmies, Ström, & Andersson, 2003) and it has been suggested that even without an actual therapist, people do still feel a similar kind of support simply by interacting with the course itself (Barazzone, Cavanagh, & Richards, 2012) and so the research needs expanding (Palmqvist et al., 2007).

Several trials of online Cognitive Behavioural Therapy (CBT) and stress management look promising for a range of disorders, including stress (Eisen, Allen, Bollash, & Pescatello, 2008; Zetterqvist et al., 2003), anxiety (Powell et al., 2013; Spek et al., 2007) and depression (Bockting et al., 2011; Christensen, Griffiths, & Jorm, 2004; Christensen, Griffiths, Mackinnon, & Brittliffe, 2006; Holländare et al., 2011; Powell et al., 2013; Spek

et al., 2007), reducing relapse rates, recurrence and antidepressant usage. Indeed, a recent review found that internet-based interventions can be effective as face-to-face therapy and are becoming a viable cost-effective alternative (Cuijpers, Riper, & Andersson, 2014). Online courses seem to be particularly helpful for users who engage more with the programmes (Christensen et al., 2006; Clarke et al., 2009), who are more familiar with computers, more comfortable in their surroundings and prefer therapy to be anonymous (Beattie et al., 2009; Christensen et al., 2006).

Online therapy research seems to have particular difficulties with retention, especially with self-guided interventions (Karyotaki et al., 2015) with one meta-analysis finding that 84.7% of people receiving face-to-face CBT complete the course compared with 65.1% completing an online CBT course (van Ballegooijen et al., 2014). Further, the percentage of those completing 80% or more of the courses was significantly lower for online CBT with 85.2% for face-to-face courses and 67.5% for online courses. One meta-analysis of internet interventions for depression examined ten randomised controlled trials to examine the causes of dropout finding that male gender, lower level of education, anxiety symptoms and younger age predicted a significantly higher likelihood of dropout (Karyotaki et al., 2015).

### *1.8.1 Online interventions for perinatal mood*

*"Pregnant women and women in the postpartum period face unique health service barriers. Innovative and creative ways to deliver preventative interventions to these women are required including those that incorporate technology."* Cochrane review, 2013 (Dennis & Dowswell, 2013)

The research field evaluating online interventions for low mood during the perinatal period is currently developing. Online interventions targeting postnatal depression are now being researched, in large part due to accessibility issues in this population and because recent findings suggest that many pregnant women search the internet for health information (Drozd, Haga, Brendryen, & Slinning, 2015). Preliminary randomised controlled studies have shown promise for the treatment of postnatal depression online

using courses which incorporate CBT and health education, with reduced scores for depression post-course compared to controls (Danaher et al., 2013; Sheeber et al., 2012). Another study examining an online course using Behavioural Activation for postnatal depression also found reduced depressive symptoms post-course, compared with controls (O'Mahen et al., 2013). However, one study examining the change in depression following an online intervention with information and support from peers and experts showed no difference in depression when comparing active participants to controls, up to 12 months postpartum (Salonen, Pridham, Brown, & Kaunonen, 2014). A randomised controlled trial for an online intervention (which includes cognitive behavioural education, pregnancy exercises and elements of mindfulness and begins during pregnancy until 6 months postpartum) for perinatal depression is currently under development (Drozd et al., 2015), having found good rates of engagement and acceptability in the feasibility study (Haga, Drozd, Brendryen, & Slinning, 2013). This early evidence suggests that while more work needs to be conducted to examine the usefulness of these interventions for perinatal depression, delivering an online intervention for low mood during pregnancy seems feasible with large sample sizes recruited and good rates of adherence thus far.

### *1.8.2 Online mindfulness interventions*

While mindfulness courses can be helpful interventions for stress, anxiety and depression, it has been observed that the National Health Service (NHS) cannot handle the demand for mental health resources in the UK (Kuyken, 2011). The availability of mindfulness courses across the UK is variable, with lengthy NHS waiting lists only serving certain health problems, such as recurrent depression or chronic fatigue syndrome. Private courses can be expensive, ranging between £200 and £350.

Although there have been doubts about the efficacy of online mindfulness courses because of the lack of group and therapist interaction, there is growing evidence for online

mindfulness courses being as effective as other face-to-face interventions and other online courses for stress, anxiety and depression, even without a therapeutic alliance (Cavanagh et al., 2013; Gluck & Maercker, 2011; Monshat, 2012; Morledge et al., 2013; Wolever et al., 2012). Indeed, it has been found that when comparing cognitive-behavioural therapy and mindfulness-based cognitive therapy for depression, a therapeutic alliance in mindfulness therapy did not improve outcome as it did with Cognitive Behavioural Therapy (CBT) (Snippe et al., 2015). Therefore, although therapeutic alliance is likely not the only benefit of being led by a mindfulness teacher, an online mindfulness course without direct therapist communication may still be beneficial (Snippe et al., 2015).

Previously found Perceived Stress (PSS; Cohen et al., 1983) effect sizes are comparable to those found with face-to-face mindfulness and CBT interventions (Allexandre, Neuman, Hunter, Morledge, & Roizen, 2012; Krusche et al., 2012; Wolever et al., 2012). One Randomised Controlled Trial found that an automated internet-based therapy including CBT and mindfulness actually had better outcomes for Irritable Bowel Syndrome than the comparative online therapist-led intervention, suggesting that the effects of mindfulness-based internet interventions cannot be attributed to, and do not rely on, therapist interaction (Ljótsson et al., 2011). Studies are also now finding that online mindfulness courses can be beneficial for depressive and anxiety symptoms (Monshat, 2012) but research investigating effectiveness is limited. Research is also lacking in terms of the benefits to the actual users of online courses in real world settings, as opposed to study samples.

Online mindfulness research involves the same difficulties surrounding attrition rates, with one study finding that 43% of those allocated to the active group and given an online mindfulness course and 70% of those allocated to control group completing the post-course questionnaires (Cavanagh et al., 2013).

There are mixed results when investigating the amount of mindfulness practice as a mediator of change. A larger amount of meditation practice during a face-to-face course (Baer et al., 2012; Carmody & Baer, 2008) and during an online course (Morledge et al., 2013) has be found to decrease stress but not in one preliminary investigation evaluating the online course being evaluated as part of this doctorate (Krusche et al., 2012). Research investigating online mindfulness courses has started to explore the benefits and barriers of participants completing the courses in this mode of delivery. One randomised controlled trial of an online mindfulness course evaluated three groups consisting of 183 participants using the course, 184 participants using the course with access to an online forum and 184 control participants (Morledge et al., 2013). The study examined the effects of an 8-week mindfulness stress reduction programme for the self-selected, highly stressed, non-clinical sample of course completers and found significant improvements in stress and dispositional mindfulness when compared to a usual care control group, which were sustained at 12-week follow-up. Feedback was given about the course. Participants stated that the reasons for 'lack of benefit' were that they found the online mindfulness course too demanding, the practice too time consuming and the mode of delivery inconvenient. A majority of participants were Caucasian, female, had college or degree level education and had previous experience with meditation a few times or less per year so the results are not generalisable to other populations. Prior experience with meditation was not evaluated. There was no difference in the outcomes of the two intervention groups, probably as a result of the participants in the stress course group with forum access posting very little and the majority of them stating that they found the forum of little help and lacking in activity. Although many participants who dropped out of the study did give their reasons for doing so; problems with instructions or web access, too busy, measures too demanding or that they did not like the programme, many participants who were in the treatment groups and dropped out (90 participants) did not specify a reason so this data are unavailable.

The first qualitative investigation of an online 8-week MBCT course, Mindful Mood Balance (MMB) drawing on grounded theory, examined the usefulness of this mode of delivery for a mindfulness course (Boggs et al., 2014). Currently well participants who suffered from recurrent depression were recruited and given access to the online course which used text, audio and video materials to instruct participants in MBCT. There was no therapist interaction except for the option to ask a question online, to which a therapist would respond within a week. Participants were requested to contact a researcher if they had any troubleshooting problems and received a reminder email if they had not logged into the site for that week. The interviews were conducted via telephone and averaged at 35 minutes; 38 participants took part, of which 37 completed the online course. The findings were that online delivery was an acceptable mode; that participants had similar experiences with the positive impact of mindfulness tools as experienced with mindfulness courses delivered in person, such as increased awareness of signs of low mood and information about how to manage low mood; that the main benefits of the online delivery were flexibility of the course schedule, being able to pause and return to the course at will, a lack of required travel or childcare and feeling less self-conscious completing the programme at home as opposed to being with a group. Similar to face-to-face mindfulness course feedback, the time requirement of the meditation practices, particularly the lengthier ones, was a cause for concern for some participants with many people preferring the shorter practices because of allowing time for them, impatience and difficulty sustaining attention for longer periods. Some participants compared this course to a mindfulness course they had attended in person and stated that they found the lack of the class or therapist as disadvantageous, particularly the omission of group learning. Many conveyed a desire for interaction with a therapist or group or said that they would have liked more support. However, participants did find the group videos on the course supportive, in a similar way to a group environment, for example, video discussion around finding mindfulness practice

difficult. The videos were not a compulsory part of the course and some participants commented that they found them too abundant, or that they did not wish to learn mindfulness with the group experience. This varied experience of group preference, to learn individually or have group interaction, perhaps serves as a indication of web-based courses being more acceptable to certain people, i.e. those who prefer anonymity. The role of the support researcher was highly valued, as were emails sent to remind participants to complete the online course.

This study does have limitations. First, only one non-completer of the course agreed to be interviewed meaning that the results are likely positively skewed and the reasons that participants dropped out are unknown. Also, the sample included people with previous mindfulness experience or interest which may have contributed to more positively biased opinion of the course. Second, interviews were conducted upon course completion and there was no follow-up meaning that insight into how the course may or may not be useful over time is unavailable. Third, the authors have acknowledged possible biases with regard to the primary coder being involved in recruitment and project management and the interviewer being associated with the MMB programme, which may have evoked more positive responses from participants. Even so, this study is a first step in evaluating online mindfulness courses in more depth with particular investigation into how people found participation with this mode of delivery.

## 1.9 Mindfulness Courses Online for the Perinatal Period

Online interventions are being developed to provide accessible and helpful mental health resources with reduced cost to the health services and patients (Clarke et al., 2009; Powell et al., 2013) and allowing the provision for patients to complete courses in their own comfortable, familiar surroundings (Beattie et al., 2009; Finucane & Mercer, 2006). The potential utility of mindfulness interventions in supporting parents and parents-to-be looks

promising, but there are low levels of provision. The accessibility of courses during pregnancy seems a particular issue not only because of the lack of provision and cost but also because expectant mothers seem to find course attendance particularly difficult during this time. Barriers to participation and adherence often cited by participants include class schedule, location and time, issues with travel, a need for childcare, discomfort and lack of feeling sociable during the third trimester and these are barriers to research studies offering potentially helpful mindfulness courses for free, as part of research trials (Beddoe et al., 2009; Dimidjian et al., 2014; Guardino et al., 2013; Vieten & Astin, 2008).

Following a pilot study investigating the effects of a mindfulness programme on prenatal stress and anxiety (Vieten & Astin, 2008), an online intervention was made available to parents following the same course structure as the face-to-face mindfulness intervention examined in the research. However, this online course is still in its infancy and while the course specifically follows the 'mindful-motherhood' intervention structure, no research has been conducted on the efficacy of the online version of the course.

It would appear that offering courses online could be a viable alternative for many unable to attend a course face-to-face. Research investigating the utility of online mindfulness courses for expectant parents is required to determine the acceptability and potential benefits to this population.

## 1.10 Aims

The aim of this doctorate was to add to emerging literature examining mindfulness in relation to mood during pregnancy. How dispositional mindfulness relates to mood during pregnancy and how mindfulness courses delivered in different modalities (in person or online) might be beneficial to the perinatal period were explored.

# 2 CHAPTER 2. MINDFULNESS ONLINE FOR THE GENERAL POPULATION

## 2.1 Introduction

As discussed in Chapter 1, research suggests that people are more likely to develop depression during the perinatal period when they have been depressed previously, or are stressed or anxious and, as such, preventative measures before or during the prenatal period are necessary to lower rates of post-natal depression (Beck, 2001; Jomeen, 2004). Not only is prevention of prenatal and postnatal depression important, but improving mood and lowering distress during pregnancy is important in itself to prevent behavioural and cognitive development issues in the child (Ramchandani et al., 2005; Talge et al., 2007). A mindfulness course may be beneficial during the prenatal period because mindfulness courses have been found to prevent depressive relapse previously, decrease the intensity of future depressive episodes and improve current low mood.

A first step in determining whether online mindfulness courses might have benefit for mothers-to-be during the perinatal period was to establish whether an online mindfulness course improved mood in a general population, non-clinical, sample. In order to replicate previous findings for stress improvement and gather preliminary evidence concerning the utility of online mindfulness training for anxiety and depression, the current study took advantage of routinely collected data from one of the first online mindfulness courses to be established (bemindfulonline.com). The effects of this course on stress, depression and anxiety pre to post-course and at 1-month follow-up were explored, in an unselected sample of course completers who signed up to the online mindfulness course (run by the Mental Health Foundation). The study aimed to examine whether the decrease in perceived stress found in a preliminary study (Krusche et al., 2012) was duplicated in a larger sample and to explore potential benefits for depression and anxiety. The amount of mindfulness practice completed by participants was investigated as a predictor of mood improvement to clarify

the potential benefit of larger amounts of meditation practice and add to existing, limited, literature. The amount of practice was also examined to evaluate how much practice course users were doing because it has implications for deciding whether asking expectant mothers to take the course would be realistic. The findings were expected to inform later studies in which participants were recruited for research during pregnancy. The results were intended to determine whether a mindfulness course delivered online holds potential as an intervention for pregnant women to reduce levels of stress, anxiety and depression. An online mindfulness course such as the one under investigation, available to the general public, had not yet been evaluated for its effectiveness for depression and anxiety in the general population, let alone pregnancy.

The study examined:

(1) Changes in anxiety, depression and perceived stress from pre to post treatment and at one month follow-up for those completing the course,

(2) The association between degree of self-reported mindfulness practice and change in mood,

(3) The similarity between the effects of the Be Mindful course and other previous interventions,

(4) The change in mood and relationship with practice amount in a subsample of women of childbearing age.

## 2.2 Methods

### *2.2.1 Participants*

Study participants (*n* = 273) were self-referrals to an online mindfulness course, each paying £60 to participate. Self-report data were collected prior to the start of the course, on completion of the course and at one-month follow-up.

A subset of women aged 18-45 (*n* = 89), most similar to a sample of pregnant women, was analysed to inform future studies investigating the potential of the course for the prenatal period.

### *2.2.2 Procedure*

Data was collected before the course, upon course completion and requested once more via an automated email with a link to the website at one-month follow-up. All measures were completed on the course website and data was securely downloaded for analysis. Anonymous research opt-in was used upon course registration (see appendix, 229). Research governance was contacted to confirm that specific ethical approval was not necessary owing to the study being an audit.

### *2.2.3 Intervention*

The 'Be Mindful Online' mindfulness course, run by the Mental Health Foundation and Wellmind Media is a modified mindfulness course comprising elements of Mindfulness Based Stress Reduction (MBSR) and Mindfulness based Cognitive Therapy (MBCT). The online course costs £60 (~$90US), and follows the same class sequence as the eight week mindfulness course and was developed in conjunction with leading UK mindfulness instructors. The course lasts for a minimum of four weeks, depending on when participants are able to complete each course week. Participants are able to have a break from the course and receive email reminders to continue from the point at which they last participated. Self-report practice questions are issued upon completion of each week.

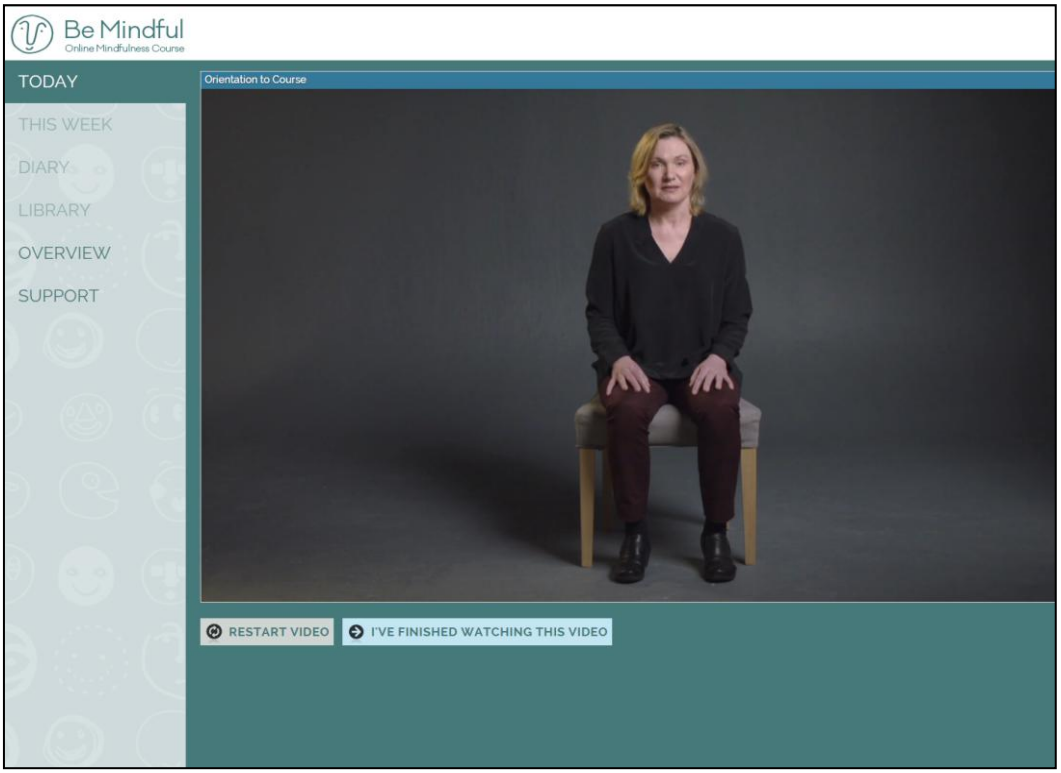


**Figure 2-1 Screenshot of the Online Mindfulness Course**

The online course consists of ten interactive sessions (see Figure 2-1) accessed on the website (www.bemindfulonline.co.uk), led by two mindfulness instructors, one male and one female. Participants learn to use formal meditation skills (body scan, mindful movement, sitting meditation, three minute breathing space) and informal mindfulness techniques (incorporating mindfulness into daily activities, such as mindful eating) through assignments and emails, see Table 2-1.

**Table 2-1 Content of Be Mindful Online Course**

| Week number | Focus of week |
|---|---|
| 0 | **Introduction**<br>Course preparation and orientation<br>Stress, anxiety and depression assessment |
| 1 | **Stepping out of Automatic Pilot**<br>Online sessions include: Dealing with Barriers<br>Assignments: Routine Activity, Mindful Eating, Body Scan<br>Emails: Practising at Home, Mindful Meal Anecdote |
| 2 | **Reconnecting with Body & Breath**<br>Online sessions include: The Physical Barometer |

| | |
|---|---|
| | Assignments: Mindful Movement, Event Awareness, Mindful Breathing<br>Emails: Breathing Tips, Remember your Intentions |
| 3 | **Working with Difficulties**<br>Online sessions include: On Negative Thoughts<br>Assignments: Breathing Space, Stress Awareness, Sitting Meditation<br>Emails: The Guest House Poem, 3 minute Breathing Space |
| 4 | **Mindfulness in Daily Life**<br>Online sessions include: Mindful Walking<br>Assignments: Activity Awareness, Breathing Space and Action Step, Stress Strategies<br>Emails: Preparing for Stress, Fear and Fearless Quote |
| 5 | **Going Forward**<br>Online session includes: Completion Certificate and Additional Resources<br>Post course stress, anxiety and depression assessment |
| 8 | **One-month follow-up**<br>Follow-up stress, anxiety and depression assessment |

Participants are asked to practice one formal meditation exercise using the audio and video clips supplied (audio can be downloaded) and one informal practice every week, plus one extra practice or task. For example, during week one, participants are guided in the use of the body scan and asked to practice this during the following week as well as eating a meal 'mindfully' and bringing awareness to a chosen activity, such as brushing teeth.

The course has been shown to significantly reduce perceived stress in a non-clinical, highly stressed sample (Krusche et al., 2012), as measured by the Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983).

### *2.2.4 Measures*

Perceived stress using the Perceived Stress Scale (PSS; Cohen et al., 1983), anxiety using the Generalised Anxiety Disorder Assessment (GAD-7; Spitzer, Kroenke, Williams, & Lowe, 2006) and depression using the Patient Health Questionnaire (PHQ-9; Kroenke, Spitzer, & Williams, 2001) were measured before the course, immediately upon completion and at one month follow-up. The amount of weekly mindfulness practice was determined

by self-report and coded as a scale variable. The online course website included the measures taken automatically at the appropriate times.

#### *2.2.4.1 The Perceived Stress Scale*

The Perceived Stress Scale (PSS; Cohen et al., 1983; Cohen & Williamson,1988) is a widely used and validated scale which measures how much the individual perceives events as uncontrollable and overwhelming during the previous month. The PSS consists of ten items answered using five-point scales, each ranging from 0-4, with total scores ranging from 0-40 with 40 indicating most stress. The PSS has been used in previous research of mindfulness courses and has repeatedly shown to reduce following the intervention (Carmody & Baer, 2008; Carmody et al., 2009; Chiesa & Serretti, 2009; Dobkin, 2008) (see (Krusche et al., 2012) for a compilation of mindfulness studies and their effects on perceived stress). Online mindfulness courses also show a significant reduction in PSS scores (Allexandre et al., 2012; Krusche et al., 2012; Morledge et al., 2013; Wolever et al., 2012). Cronbach's α for the PSS was 0.79.

#### *2.2.4.2 The General Anxiety Disorder Scale*

The General Anxiety Disorder 7-item Scale (GAD-7; Spitzer et al., 2006) is widely used to assess anxiety during the preceding two weeks and has been shown to have good reliability and validity (Kroenke, Spitzer, Williams, & Löwe, 2010; Löwe et al., 2008a). The GAD-7 consists of seven items answered using a four point scale, ranging from 0-3 with total scores ranging from 0-21. Higher scores indicate increasing functional impairment with cut-offs at 5, 10 and 15 for mild, moderate and severe anxiety respectively (Kroenke et al., 2007; Spitzer et al., 2006). The GAD-7 has been used in previous mindfulness intervention research showing a reduction after a face-to-face course (Piet et al., 2012). Cronbach's α for the GAD-7 was 0.71.

#### *2.2.4.3 The Patient Health Questionnaire for depression*

The Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001) is a widely used and validated scale used to assess depression severity during the preceding two weeks (Bian, Li, Duan, & Wu, 2011; Gilbody, Richards, Brealey, & Hewitt, 2007; Kroenke et al., 2010). The PHQ-9 consists of 9 items answered using a four point scale, ranging from 0-3 and a further item asking about the level of difficulty associated with any endorsed items. Scores range from 0-27 with cut-off points for depression at 5, 10, 15 and 20 for mild, moderate, moderately severe and severe depression respectively (Kroenke et al., 2001). The PHQ-9 has been used in previous research investigating mindfulness interventions and has been shown to reduce following treatment (Hartmann et al., 2012; Kearney, McDermott, Malte, Martinez, & Simpson, 2012; Piet et al., 2012). Cronbach's α for the PHQ-9 was 0.73.

#### *2.2.4.4 Mindfulness practice*

Participants were asked to complete three self-report practice questions at the completion of each course week (12 in total). The first question concerned frequency of formal practice (Every Day, Most Days, Once or Twice and Never), the second, informal practice (Yes/Always, Sometimes, No) and the third, another practice for that week, for example bringing attention to a chosen activity (Every Time, Most Times, Once or a Few Times or Never). For analysis, practice scores were averaged across weeks 1 to 4, producing a mean score ranging 1-4 with 1 equating to the participant practicing as much as possible and 4 equating to no practice. Formal and informal practice scores were also individually calculated on a scale from 1 (Every day or Always) to 4 (No or Never). Participants who did not report their practice were assumed not to have completed the task/s.

## 2.3 Results

### *2.3.1 Data checks: Outliers, normality and homogeneity*

The sample was checked for outliers. There were no outliers for male (*n* = 59) or female (*n* = 214) participants. The sample was normally distributed.

### *2.3.2 Sample characteristics*

Data from two hundred and seventy three participants, who completed the course including the one month follow-up, were analysed. The mean age of participants was 47.7 years (*SD* 11.92, range 20-80) and 78% (*n* = 214) of the sample was female.

### *2.3.3 Stress, anxiety and depression at baseline*

**Table 2-2 Baseline Stress, Anxiety & Depression**

| | |
|---|---|
| Mean Baseline Stress | 23.04 (*SD* 6.85, highly stressed[5]) |
| Mean Baseline Anxiety | 10.98 (*SD* 5.17, moderately anxious[6]) |
| Mean Baseline Depression | 10.06 (*SD* 6.40, moderately depressed[7]) |

The mean baseline PSS score for the sample was higher than the published population norms (between 11.9 and 14.7) (Cohen & Williamson, 1988) and comparable to previous samples of either "highly stressed" individuals (Shapiro et al., 2006) or individuals with a wide range of illness, personal or employment related stress (Carmody & Baer, 2008). The mean baseline GAD-7 score for the sample was higher than published normative population scores (between 2.7 and 3.8) (Löwe et al., 2008a; Löwe et al., 2008b) and in the published range for moderate anxiety (Kroenke et al., 2007; Spitzer et al., 2006). The mean baseline PHQ-9 score for the sample was higher than the population norms (3.3 (Kroenke et al., 2001) and in the published range for moderate depression (Kroenke et al., 2001).

[5] (Cohen & Williamson, 1988) (Shapiro, Carlson, Astin, & Freedman, 2006) (Carmody & Baer, 2008)
[6] (Löwe et al., 2008a; Löwe et al., 2008b) (Kroenke et al., 2007; Spitzer et al., 2006)
[7] (Kroenke et al., 2001)

### *2.3.4 Changes in perceived stress*

The changes in mean PSS score are shown in Figure 2-2.

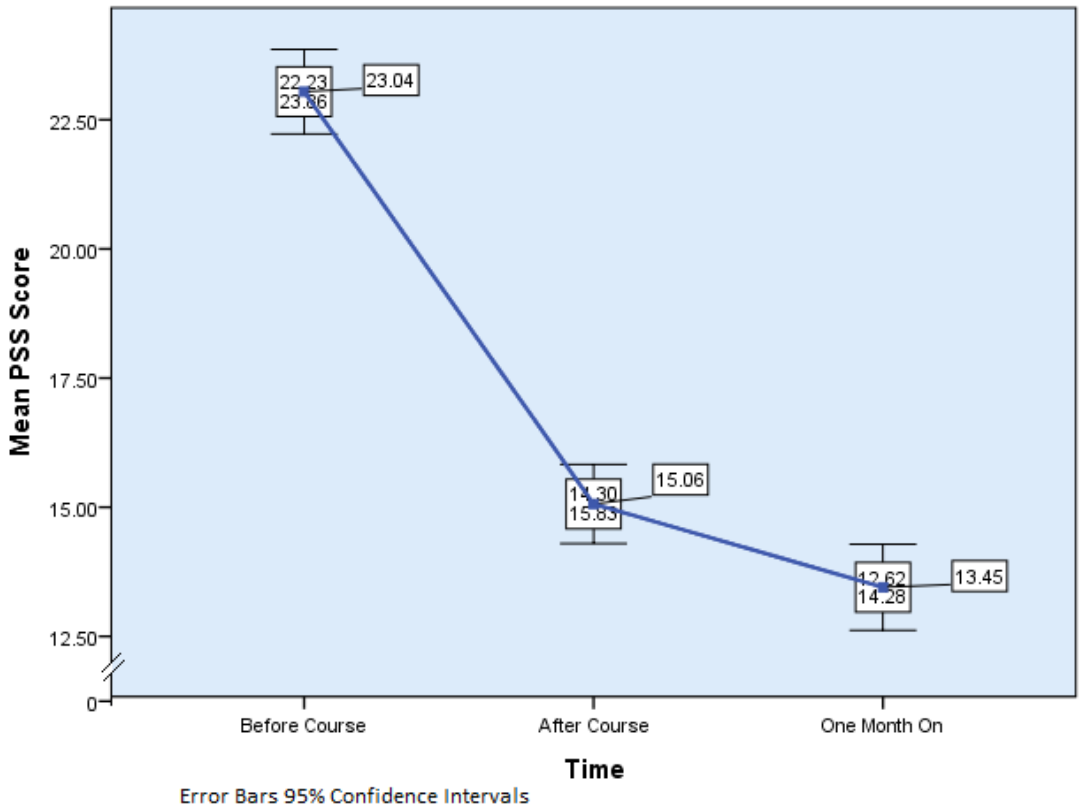


**Figure 2-2 Change in PSS following the online mindfulness course**

The mean PSS score after the online mindfulness course was 15.06 (*SD* 6.42), and at one month follow-up, 13.45 (*SD* 6.99), a repeated measures ANOVA showing a significant decrease from pre to post-course ($F$ (1.86, 506.97)= 357.89, $p$<.001)[8]. Post-hoc tests using the Bonferroni correction revealed that that PSS score significantly decreased from post-course to one month follow-up, mean difference from post to follow-up 1.61, $p$<.001.The pre-post effect size ($d$) was 1.20, and pre to follow-up was 1.39, comparable to other published studies of mindfulness courses delivered in person (Carmody & Baer, 2008; Carmody et al., 2009; Chiesa & Serretti, 2009; Dobkin, 2008) and online (Allexandre et al., 2012; Krusche et al., 2012; Morledge et al., 2013; Wolever et al., 2012) and only slightly

[8] Maulchy's test indicated that the assumption of sphericity had been violated $\chi^2$ (2)= 20.56, $p$<.001, therefore multivariate tests are reported (ε = 0.93). The results showed that PSS significantly decreased, $V$ = 0.69, $F$ (2, 271)= 295.3, $p$<.001, $\omega^2$ = 0.38.

less effective than an internet-based stress management for a more severely stressed sample (Zetterqvist et al., 2003)[9]. Post to follow-up effect size was 0.24.

### *2.3.5 Changes in anxiety*

The changes in mean GAD-7 are shown in Figure 2-3.

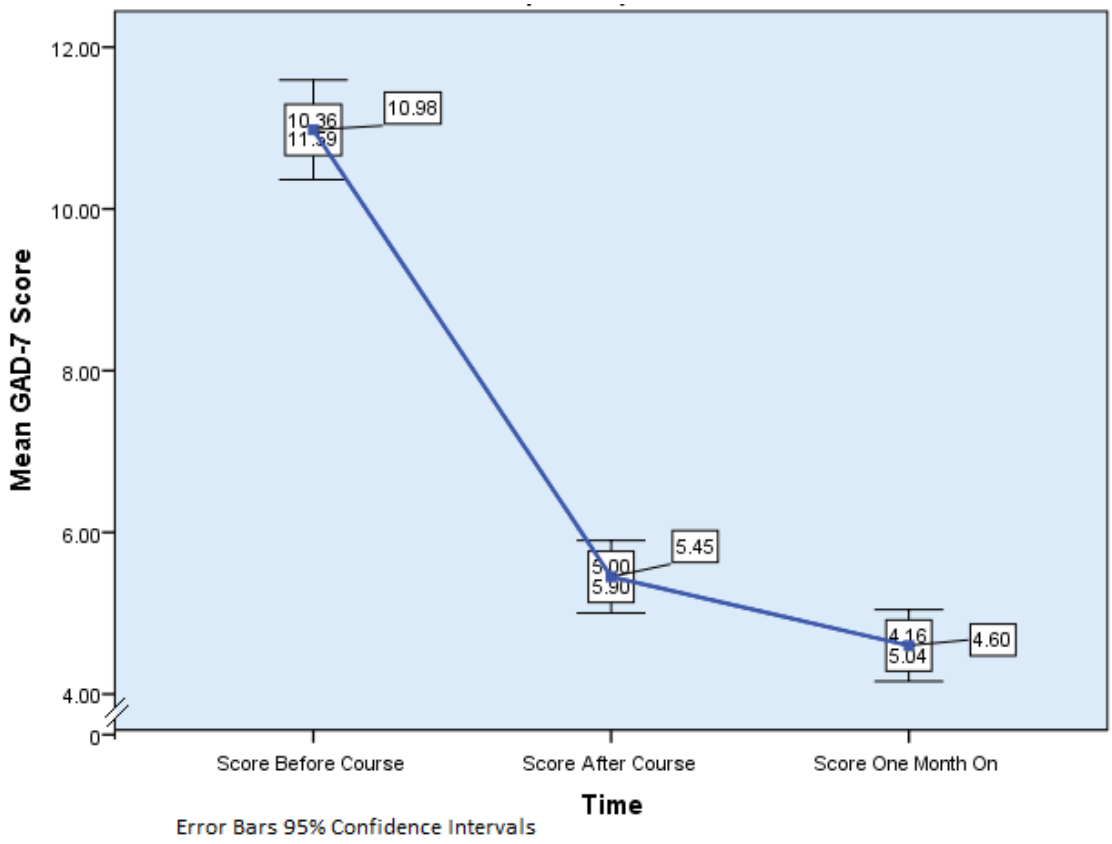


**Figure 2-3 Change in GAD-7 following the online mindfulness course**

The mean GAD-7 score after the online mindfulness course was 5.45 (*SD* 3.77), and at one month follow-up, 4.60 (*SD* 3.72). A repeated measures ANOVA indicated that GAD-7 scores changed significantly ($F(1.71, 465.4)= 325.53$, $p<.001$)[10]. Post-hoc tests using the Bonferroni correction revealed that GAD-7 score significantly decreased at one month follow-up, mean difference post to follow-up .85, $p<.001$. The pre-post effect size ($d$) was 1.23, and pre-course to follow-up was 1.42, comparable to other published studies of online

[9] Compared to effect sizes for samples of completers.

[10] The assumption of sphericity was violated $\chi^2$ (2)= 50.17, $p<.001$, so multivariate tests are reported ($\varepsilon$ = 0.85). GAD-7 scores significantly decreased, $V = 0.63$, $F$ (2, 271)= 230.02, $p<.001$, $\omega^2 = 0.44$.

CBT to improve well-being in the general population (Powell et al., 2013), and mindfulness courses delivered in person (Piet et al., 2012). Post to follow-up effect size was 0.23, similar to other online cognitive therapy outcomes (Powell et al., 2013)[11].

### *2.3.6 Changes in depression*

Changes in PHQ-9 are shown in Figure 2-4.

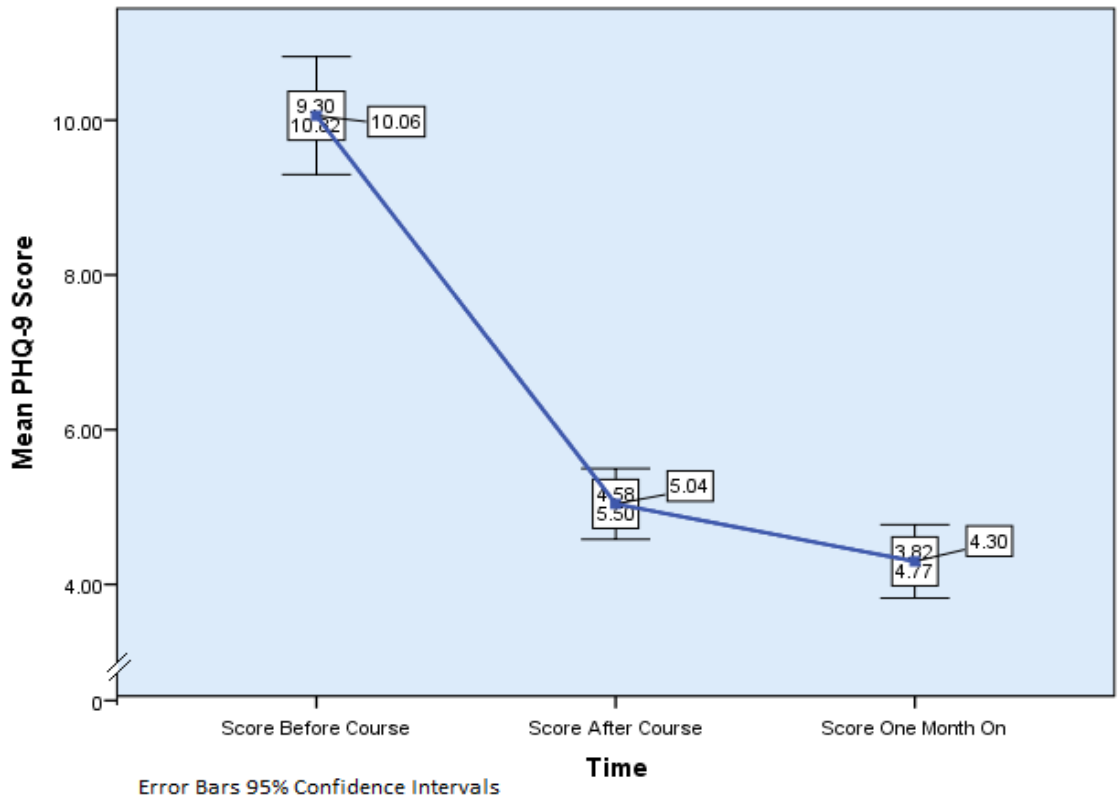


**Figure 2-4 Change in PHQ-9 following the online mindfulness course**

The mean PHQ-9 score after the online mindfulness course was 5.04 (*SD* 3.84) and a repeated measures ANOVA indicated that the change was significant ($F(1.51, 409.9)= 215.35$, $p<.001$)[12]. At one month follow-up, the PHQ-9 score was 4.30 (*SD* 3.97). Post-hoc tests using the Bonferroni correction indicated that PHQ-9 score also significantly decreased at one month follow-up, mean difference post to follow-up .74, $p<.005$. The pre-

[11] Completer samples compared.

[12] Maulchy's test indicated that the assumption of sphericity had been violated $\chi^2$ (2)= 107.41, $p<.001$, therefore multivariate tests are reported ($\varepsilon = 0.75$). The results showed that PHQ-9 scores significantly decreased, $V = 0.50$, $F$ (2, 271)= 136.52, $p<.001$, $\omega^2 = 0.27$.

post effect size (*d*) was 0.95, and pre to follow-up was 1.08, comparable to effect sizes published investigating face-to-face mindfulness interventions for depressive symptoms in those with diabetes, PTSD and cancer (Hartmann et al., 2012; Kearney et al., 2012; Piet et al., 2012) and online cognitive therapy interventions for depressive symptoms in a moderately depressed sample (Clarke et al., 2009)[13]. Post to follow-up effect size was 0.19.

### *2.3.7 Mindfulness practice*

The majority of the sample (86.08%, *n* = 235) completed all twelve of the self-report practice questions, 11.36% (*n* = 31) participants completed 8 or more practice questions and 2.56 % (*n* = 7) completed 6 or less practice questions, of which 2 completed 0. There were no significant differences in age, time taken to complete the course, PSS, GAD-7 or PHQ-9 scores at any time between those who did and did not complete practice questions.

The amount of total average practice was correlated with PSS, GAD-7 and PHQ-9 outcome at follow-up, $r$ =.16, $p$ <.001, $r$ =.14, $p$ <.05 and $r$ =.13, $p$ <.05, but not to improvement (change in mood over time). When practice was divided into 'formal' (e.g. body-scan and sitting meditations) and 'informal' (e.g. mindful meal and stress awareness) practice, correlations were found with informal practice and PSS, $r$ = 0.16, $p$ <.001, GAD-7, $r$ = 0.13, $p$ <.05, and PHQ-9, $r$ =.17, $p$ <.001, but not with formal practice, $r$ = 0.06, $p$ > .05, $r$ = 0.04, $p$ > .05 and $r$ = -0.06, $p$ > .05 respectively. In all cases, however, the absolute magnitude of these associations was small.

Participants were grouped according to average level of practice into those who practiced 'every day or most days' (0 to 2, *n* = 112), 'sometimes' (2.01 to 3, *n* = 141) and 'rarely or never' (3.01 and 4, *n* = 20). A repeated measures ANOVA showed no significant difference between the practice groups in their PSS, GAD-7 or PHQ-9 decrease. It was found, however, that the low practice group had higher PSS ($F$(2, 270)= 255.89, $p$ <.001)

[13] Samples of completers compared once more.

GAD-7 ($F(2, 270)= 205.9$, $p <.001$) and PHQ-9 ($F(2, 270)= 122.6$, $p<.001$) scores at baseline. Average practice as a continuous variable was correlated with change in PSS ($r_{(PSS)}= -.122$, $p <.05$, GAD-7, $r_{(GAD-7)}= -.128$, $p <.05$, and PHQ-9, $r_{(PHQ-9)}= -.138$, $p <.05$).

Multiple regression analysis was used to test if mindfulness practice amount significantly predicted the change in PSS, GAD-7 and PHQ-9 when controlling for baseline severity, see regression tables below.

**Table 2-3 Regression examining pre-post stress change with practice as predictor**

| *Step 1* | *B* | Standard Error | β | *p* |
|---|---|---|---|---|
| PSS Baseline | 0.45 (0.36, 0.54) | 0.05 | .51 | *p*<.001 |
| *Step 2* | | | | |
| PSS Baseline | 0.46 (0.37, 0.55) | 0.05 | .52 | *p*<.001 |
| Amount of Practice | -1.15 (-2.28, -0.02) | 0.57 | -.10 | *p*<.05 |

Note: Dependent variable: Change in PSS stress pre-post course.$R^2$=.26 (*p*<.001) for step 1; $\Delta R^2$=.011 for step 2 (*p*<.05).

**Table 2-4 Regression examining pre-post anxiety change with practice as predictor**

| *Step 1* | *B* | Standard Error | β | *p* |
|---|---|---|---|---|
| GAD-7 Baseline | 0.65 (0.57, 0.72) | 0.04 | .71 | *p*<.001 |
| *Step 2* | | | | |
| GAD-7 Baseline | 0.64 (0.57, 0.72) | 0.04 | .71 | *p*<.001 |
| Amount of Practice | -0.89 (-1.56, -0.14) | 0.36 | -.10 | *p*<.05 |

Note: Dependent variable: Change in GAD-7 anxiety pre-post course.$R^2$=.51 (*p*<.001) for step 1; $\Delta R^2$=.010 for step 2 (*p*<.05).

**Table 2-5 Regression for pre-post depression change with practice as predictor**

| *Step 1* | *B* | Standard Error | β | *p* |
|---|---|---|---|---|
| PHQ-9 Baseline | 0.67 (0.61, 0.73) | 0.03 | .80 | *p*<.001 |
| *Step 2* | | | | |
| PHQ-9 Baseline | 0.67 (0.61, 0.73) | 0.03 | .80 | *p*<.001 |
| Amount of Practice | -0.86 (-1.55, -0.17) | 0.35 | -.09 | *p*<.05 |

Note: Dependent variable: Change in PHQ-9 depression pre-post course.$R^2$=.64 (*p*<.001) for step 1; $\Delta R^2$=.008 for step 2 (*p*<.05).

Controlling for baseline severity, when more practice was reported there was a larger mood improvement for each of the measures.

### *2.3.8 Course completion time*

The mean time to finish the course was 7.06 weeks (mode 4.14 weeks). Regression analysis revealed that longer course time predicted less improvement in PSS (β = -0.165, $p$<.05, $R^2$=.12, $f$(1,271)= 4.23, $p$ <.05), less GAD-7 improvement (β = -0.191, $p$<.005, $R^2$=.18, $f$(1,271)= 9.57, $p$ <.005) and less PHQ-9 improvement (β = -0.173, $p$<.05, $R^2$=.14, $f$(1,271)= 5.98, $p$ <.05).

### *2.3.9 Gender differences*

There were no significant gender differences in the total sample for baseline or change in mood, course time or practice.

#### *2.3.9.1 Subsample baseline characteristics and changes in mood*

A subsample of women aged 20-45 ($n$ = 89) was analysed to evaluate whether the findings were consistent with the full sample. There was no difference in baseline mood compared to the full sample. The mean age of the subsample was 36.02 years (*SD* 6.72). See Table 2-6 for mood scores.

**Table 2-6 Subsample mood**

| | Baseline | Post-course | 1 Month Follow-up |
|---|---|---|---|
| Mean Stress | 23.57 (*SD* 6.81) | 15.42 (*SD* 6.13) | 13.61 (*SD* 7.20) |
| Mean Anxiety | 10.92 (*SD* 5.22) | 5.48 (*SD* 4.10) | 4.81 (*SD* 3.95) |
| Mean Depression | 10.12 (*SD* 6.42) | 5.03 (*SD* 3.89) | 4.52 (*SD* 4.33) |

Repeated measures ANOVAs indicated that PSS score ($F$(1.84, 161.61)= 91.17, $p$<.001)[14] , GAD-7 score ($F$(1.84, 161.94)= 77.66, $p$<.001)[15] and PHQ-9 score ($F$(1.56,

[14] Maulchy's test indicated that the assumption of sphericity had been violated $\chi^2$ (2)= 8.11, $p$<.05, therefore multivariate tests are reported (ε = 0.92). The results showed that PSS significantly decreased, $V$ = 0.65, $F$ (2, 87)= 81.24, $p$ <.001, $\omega^2$ = 0.41.

137.00)= 56.61, $p<.001$)[16] changed significantly from before to after the course. Pairwise Comparisons indicated that the decrease was maintained at one month follow-up for PSS (mean difference = 1.81, $p=.054$), GAD-7 (mean difference = 0.67, $p=.470$) and PHQ-9 (mean difference = 0.52, $p=.642$).

The pre-post effect size (*d*) for PSS was 1.26, and pre to follow-up was 1.42; post to follow-up effect size was 0.27. The pre-post effect size (*d*) for GAD-7 was 1.16, and pre to follow-up was 1.32; post to follow-up was 0.17. The pre-post effect size (*d*) for PHQ-9 was 0.96 and pre to follow-up was 1.02; post to follow-up was 0.12.

#### *2.3.9.2 Subsample mindfulness practice & course time*

The mean course time was 7.42 weeks and the mode was 5.23 weeks indicating that this subset took slightly (but not significantly) longer to complete the course than the whole sample or men of the same age (course time mean 6.81, mode 4.14).

Correlations exploring the relationship between practice (total, formal and informal), course time and the change in PSS, GAD-7 and PHQ-9 from pre to post revealed that less total formal practice, $r = -.223$, $p<.05$ and a longer course time, $r =-.236$, $p<.05$ were associated with less improvement in PHQ-9 score. Otherwise, practice and course time were not significantly correlated with the change in mood scores from pre to post.

Partial correlations were run controlling for baseline scores of PSS, GAD-7 and PHQ-9. A greater amount of practice resulted in a larger improvement in stress, $r_{(PSS)}=-.264$, $p<.05$, anxiety, $r_{(GAD-7)=}$ -.216, $p<.05$ and depression, $r_{(PHQ-9)}= -.221$, $p<.05$. More formal practice resulted in a larger improvement in stress, $r_{(PSS)=}-.250$, $p<.05$, anxiety, $r_{(GAD-7)=}-.239$, $p<.05$,

[15] Maulchy's test indicated that the assumption of sphericity had been violated $\chi^2$ (2)= 7.90, $p<.05$, therefore multivariate tests are reported ($\varepsilon$ = 0.92). The results showed that PSS significantly decreased, $V$ = 0.59, $F$ (2, 87)= 62.01, $p$ <.001, $\omega^2$ = 0.37.

[16] Maulchy's test indicated that the assumption of sphericity had been violated $\chi^2$ (2)= 29.14, $p<.001$, therefore multivariate tests are reported ($\varepsilon$ = 0.78). The results showed that PSS significantly decreased, $V$ = 0.46, $F$ (2, 87)= 37.37, $p$ <.001, $\omega^2$ = 0.25.

and depression, $r_{(PHQ\text{-}9)=}$-.239, $p$<.05, and more informal practice was associated with a larger improvement in stress, $r_{(PSS)=}$-.226, $p$<.05. Course time did not affect outcome.

To investigate whether more total practice predicted mood improvement, multiple regressions were conducted controlling for baseline mood, see below tables.

**Table 2-7 Regression examining pre-post stress change in women subset with course practice as predictor**

| *Step 1* | *B* | Standard Error | β | *p* |
|---|---|---|---|---|
| PSS Baseline | 0.57 (0.40, 0.74) | 0.09 | .58 | $p$<.001 |
| *Step 2* | | | | |
| PSS Baseline | 0.59 (0.42, 0.75) | 0.08 | .61 | $p$<.001 |
| Amount of Practice | -2.41 (-4.29, -0.53) | 0.95 | -.22 | $p$<.05 |

Note: Dependent variable: Change in PSS stress pre-post course.$R^2$=.34 ($p$<.001) for step 1; $\Delta R^2$=.046 for step 2 ($p$<.05).

**Table 2-8 Regression examining pre-post anxiety change in women subset with course practice as predictor**

| *Step 1* | *B* | Standard Error | β | *p* |
|---|---|---|---|---|
| GAD-7 Baseline | 0.64 (0.49, 0.79) | 0.08 | .68 | $p$<.001 |
| *Step 2* | | | | |
| GAD-7 Baseline | 0.65 (0.50, 0.80) | 0.07 | .69 | $p$<.001 |
| Amount of Practice | -1.37 (-2.66, -0.09) | 0.65 | -.16 | $p$<.05 |

Note: Dependent variable: Change in GAD-7 anxiety pre-post course.$R^2$=.46 ($p$<.001) for step 1; $\Delta R^2$=.027 for step 2 ($p$<.05).

**Table 2-9 Regression examining pre-post depression change in women subset with course practice as predictor**

| *Step 1* | *B* | Standard Error | β | *p* |
|---|---|---|---|---|
| PHQ-9 Baseline | 0.71 (0.60, 0.83) | 0.06 | .80 | $p$<.001 |
| *Step 2* | | | | |
| PHQ-9 Baseline | 0.72 (0.60, 0.83) | 0.06 | .80 | $p$<.001 |
| Amount of Practice | -1.31 (-2.51, -0.11) | 0.61 | -.14 | $p$<.05 |

Note: Dependent variable: Change in PHQ-9 depression pre-post course.$R^2$=.64 ($p$<.001) for step 1; $\Delta R^2$=.019 for step 2 ($p$<.05).

Controlling for baseline severity, when more practice was reported there was a larger improvement in stress, anxiety and depression.

## 2.4 Discussion

The aim of this investigation was to evaluate the usefulness of an online mindfulness course for perceived stress, anxiety and depression. The findings suggest that the course has a beneficial effect on these factors. Earlier studies had shown promise, but had not examined the change in anxiety and depression in a non-clinical sample using an online mindfulness course based directly on MBSR and MBCT courses. This study was also the first, to our knowledge, to evaluate the amount of practice as a predictor of change in anxiety and depression with an online mindfulness course.

That levels of negative mood reduced significantly upon completion of the online mindfulness course and further decreased at one month follow-up is suggestive of significant improvements. People with higher levels of stress, anxiety and depression self-reported less practice and took longer to complete the course. A longer course time predicted less of a change in stress, anxiety and depression. More mindfulness practice significantly predicted greater improvements in stress, anxiety and depression when controlling for baseline severity.

The changes in perceived stress, anxiety and depression are comparable to mindfulness courses delivered in person to non-clinical samples. This result is surprising as having group and therapist interaction during a course is expected to be an important factor in recovery. One benefit of this type of research is that each participant receives exactly the same intervention such that there are no therapist or group effects. The comparative large effect sizes may be due, not only to the highly selective sample of non-clinical course completers, but also to the mode of delivery, whereby participants complete the mindfulness exercises in their homes or other familiar surroundings, enabling them to use

the learned skills in situations where they might be more readily recalled and more effectively used.

The differences in intervention type and samples should be scrutinised when considering the effect sizes. There are few studies which investigate the change in a similar sample using the same measures as the current study and none of them examine the change in a non-clinical paying sample. The current changes in mood cannot be generalised to other populations. That there was a further significant decrease in negative mood at the one month follow up is surprising. Participants may have continued to use the skills learned in the course but this data is unavailable.

The current study has a range of limitations. First, there is no control comparison so although negative mood decreases significantly we cannot be sure that the course was responsible. There may be other reasons why stress, anxiety and depression decreased over this time; it may due to reversion to the mean or to natural recovery.

Second, only 29% of people starting the course have completed it and the one month follow-up (1497 people had completed the course and follow-up, out of 5094 people who signed up to the course from November 2010 to August 2013). No data was available for those who did not complete the follow-up measures; any participants who started the course but did not complete the follow-up questionnaires were omitted, regardless of whether they completed the course or not. It is plausible that more participants did complete the course but ignored the follow-up email requesting their responses to the questionnaires, but the data are not available. However, evaluating the efficacy of the course for people choosing to take the course of their own accord and completing the follow-up as opposed to recruiting a sample to participate in a study is advantageous in that the results are ecologically valid and demonstrative of future course completers. The high non-completion rate is a concern and further studies of adherence to the course are required.

Third, clinical status was not assessed. One of the benefits of this online course is anonymity, so the only data requested were date of birth, gender, mood measures and self-report practice. Clearly this has a number of limitations, most notably, that potential sociodemographic influences and clinical status were not taken into account when examining change in outcome. Although the sample may have contained participants with clinical disorders, because the data are unavailable, potential benefits of the course for those currently unwell are unknown. The reasons that participants who were more stressed, depressed and anxious at baseline tended to practice less and take more time to complete the course are speculative. These participants may have been less motivated and less able to complete the exercises in the weekly timeframes because of their low mood or because they were clinically unwell. Since diagnostic status was not determined, we cannot be sure whether the course would be more or less suitable for those participants with disorders.

Fourth, the mechanism of change in outcome resulting from the course remains unclear. The reduction in stress, anxiety and depression could be due to reversion to the mean, or, if the course is responsible for the decrease, we do not know which elements of the course produced the improvement. While one may speculate that the combination of the CBT elements of the course and the mindfulness meditation practice combine to affect mood (particularly because a larger amount of mindfulness practice results in a larger improvement in mood) it is not possible to surmise that the combination produces an increase in dispositional mindfulness and that it is this increase which is the mediator of change, without a measure of mindfulness.

Finally, self-reported practice may not be accurate. That the course can be taken at a preferred pace is potentially beneficial, but means that the weekly reported practice levels may not reflect how much actual practice is being completed. The self-report practice questions are limited and constructed so that responses are requested once each week of the

course is complete, so if a participant completes the 'structured week' of the course over a longer period of time, the question does not reflect this.

The current research suggests that a non-clinical sample who are, on average, ‘highly stressed’, ‘moderately depressed’ and ‘moderately anxious’ do benefit from completing the course. Effect sizes for the subsample are similar to those found with the total sample indicating that women aged between 20 and 45 years experienced a similar decrease in stress, anxiety and depression so the course seems a promising intervention for a non-clinical sample during pregnancy. The next study explored the relationship between dispositional mindfulness and mood during pregnancy to determine whether a course which conceivably increases mindfulness might be useful for expectant mothers.

# 3 CHAPTER 3. DISPOSITIONAL MINDFULNESS AND MOOD DURING PREGNANCY

## 3.1 Introduction

Existing research evaluating mindfulness and pregnancy has explored the utility of mindfulness courses during pregnancy but very few studies have examined the relationship between dispositional mindfulness and mood without examining an intervention.

One study examining dispositional mindfulness and general anxiety during pregnancy and infant mood at 10 months postpartum found that higher dispositional mindfulness was associated with lower anxiety during pregnancy and less self-regulation problems and negative affect in the 10 month old infant (van den Heuvel et al., 2015). Interestingly, the authors found that anxiety during pregnancy mediated the relationship between mindfulness and infant self-regulation problems and negative affectivity. A further study investigated the 'act aware' subscale of the five-facet mindfulness questionnaire (FFMQ; Baer et al., 2006), general anxiety and depression during pregnancy and birth experience and followed-up participants up at 3-6 month postpartum (Zoeterman, 2014). Higher dispositional mindfulness (act aware) during pregnancy was related to lower postnatal depression and anxiety scores. Further exploration found that as prenatal mindfulness decreased over time, postnatal depression and anxiety scores increased suggesting that higher dispositional mindfulness would be helpful for mood during and after pregnancy if a higher level was maintained. A recent study also found a similar relationship with dispositional mindfulness during pregnancy whereby higher levels of mindfulness were related to lower levels of depression and distress during pregnancy (Truijens et al., 2015).

Previous research indicates that anxiety during pregnancy fluctuates and is highest during the first and third trimesters, suggesting that an intervention during the second

trimester may help to prevent the increase in anxiety generally purported to ensue during the third trimester (Newham et al., 2012). This change over trimester was investigated cross-sectionally in the current study. Higher dispositional mindfulness may be most beneficial for mothers in their second or third trimester because they may have increased anxiety or distress nearing the due-date, which higher levels of mindfulness may serve to alleviate (potentially, by acknowledging and being non-judgemental of bodily processes and thoughts at this time (Vieten & Astin, 2008)). Existent mothers as opposed to first-time mothers, have scored higher on well-being during their third trimester, probably because pregnancy and labour are more familiar to them (Gedde-Dahl & Fors, 2012).

It has been suggested that pregnancy-specific and general anxiety and stress reflect different emotional constructs (Lobel et al., 2008; Redshaw, Martin, Rowe, & Hockley, 2009; Roesch, Schetter, Woo, & Hobel, 2004; Yali & Lobel, 1999). General measures for stress and anxiety were included in the current study to allow for an exploration using the same measures previously found to improve following an online mindfulness course. Further, including general measures allows for comparisons in future studies with postnatal follow-ups. Pregnancy-specific measures were included to allow an exploration of pregnancy-related constructs.

This study explored whether dispositional mindfulness was related to mood during the first and second trimesters of pregnancy in a cross-sectional analysis. Changes from the second to the third trimester were examined in a subsample of women, controlling for baseline mood. The results were examined to evaluate whether increasing dispositional mindfulness during pregnancy may be beneficial, something which a mindfulness course is purported to do. The findings expand the evidence base examining dispositional mindfulness and general mood during pregnancy and included measures of pregnancy-related mood which had not been explored previously.

The hypotheses were that:

(1) the measures for perceived stress and anxiety previously found to reduce following an online mindfulness course would be correlated with pregnancy measures of depression and distress,

(2) higher dispositional mindfulness scores would be associated with lower general scores of stress and anxiety,

(3) participants with higher dispositional mindfulness would score lower on the pregnancy measures for depression, distress, discomfort and labour worry,

(4) higher levels of mindfulness would be associated with higher levels of positive pregnancy experience and lower levels of negative pregnancy experience.

And for the follow-up part of the study, in a subsample of women with data collected during the second trimester and followed-up during the third:

(5) dispositional mindfulness and general and pregnancy-related outcomes would decline from the second to the third trimester,

(6) higher dispositional mindfulness would be associated with lower scores for general and pregnancy-specific measures at follow-up during the third trimester, controlling for baseline symptom levels,

(7) higher dispositional mindfulness during the second trimester would predict healthier levels of mood at follow-up; during the third trimester, controlling for baseline symptom levels,

(8) as dispositional mindfulness decreased, mood would decline.

Parity and gestational age were explored to examine mood in relation to these variables.

## 3.2 Methods

### *3.2.1 Participants*

The aim was to recruit 150 expectant mothers, at 3-5 months pregnant and follow-up as many as willing at 6-9 months pregnant (the follow-up survey was made optional to keep the first survey anonymous to aid in recruitment). The sample was non-clinical; responses to the questionnaires were expected to vary within the normal range. The minimum age for participants was 18 years. Three hundred and sixty six participants took part in the survey, of which 43% ($n$ = 157) completed all required questionnaires. Thirty-nine participants entered their contact details for the follow-up survey and 20% ($n$ = 31) of the total sample completed the follow-up during the third trimester.

### *3.2.2 Procedure*

The methods used to recruit were online advertising, including Facebook, Twitter, Google Adwords and online motherhood forums; emails to colleges and departments around Oxford; and posters sent to Oxford shops and baby-groups.

Initially the survey was launched and advertised for four weeks. One hundred and forty-four participants started the survey, of which 33 completed equating to a 77% non-completion rate. An incentive was introduced (prize draw for a gift voucher for initial survey completion and gift voucher for completion of the follow-up survey) to reduce the level of attrition. The front and final pages were edited so that the information was clearer. These changes alleviated drop-out. The non-completion rate overall was 57%; 157 of 366 completed the survey.

The questionnaires were completed using the Bristol Online Survey website (http://www.survey.bris.ac.uk/). The survey web address was advertised alongside study information and contact details. Once on the survey website, participants were shown a front-page which presented the study poster and a small amount of information about the study which led to the Participant Information and Consent pages. Participants were

required to tick to consent and proceed to the measures. No personal details were requested; the data taken in the first survey was anonymous.

After completing the online questionnaires, participants were shown a thank you page with information about where to go for emotional support if desired. They were invited to complete the same questionnaires in 2-4 months to allow an exploration of any potential mood change. If participants decided that they would like to contribute further, they were asked to enter the last five digits of their mobile (or home) number and to complete either a separate secure questionnaire (the link of which was shown on the thank you page) or to get in touch with the research team to record their contact information so that they could be emailed at a later date with a link to complete the questionnaires once more. Initial questionnaire data was linked to follow-up data through the use of the final five digits of their mobile number being entered once more during the follow-up survey. There were no missing values because the online questionnaire site would not allow it.

Oxford University CUREC Ethics was obtained for the study (reference MSD-IDREC-C1-2013-016).

### *3.2.3 Measures*

Data was collected during the first or second trimester of pregnancy and then during the third trimester if the participant took part in the follow-up. A demographic questionnaire comprised of general questions about age, familial and occupational status and questions about the birth and current baby group attendance was presented, followed by the measures outlined below.

#### *3.2.3.1 The Perceived Stress Scale*

The Perceived Stress Scale (PSS; Cohen et al., 1983; Cohen & Williamson, 1988) measures how uncontrollable and overwhelming events are perceived to have been during

the past month and ranges from 0-40. The PSS was included in this study to measure general stress, as opposed to pregnancy related stress and has been used in a pregnant sample previously, showing a reduction following relaxation training (Bastani, Hidarnia, Kazemnejad, Vafaei, & Kashanian, 2005). Studies show mixed results when examining the change in perceived stress, measured using the Perceived Stress Scale, during pregnancy following a mindfulness course. One study found that stress reduced for both active and control groups over pregnancy (Guardino et al., 2013), pre-post studies examining pregnancy-tailored mindfulness courses have shown reduction for participants in their third trimester of pregnancy (Beddoe et al., 2009) or a trend post-course (Woolhouse et al., 2014). Randomised controlled studies have found a negative trend at post-course (Vieten & Astin, 2008), or no change at all (Woolhouse et al., 2014; Zhang & Emory, 2015).

#### *3.2.3.2 The General Anxiety Disorder Scale*

The General Anxiety Disorder Scale (GAD-7; Spitzer, Kroenke, Williams & Löwe 2006) measures general anxiety over the previous two weeks. Scores range from 0-21. Cut-offs are 5, 10 and 15 for mild, moderate and severe anxiety respectively. Anxiety measured using the Generalised Anxiety Disorder scale has been shown to reduce following a mindfulness course in a pregnant clinical sample (with high levels of anxiety or a diagnosis of Generalised Anxiety Disorder) (Goodman et al., 2014).

#### *3.2.3.3 The Edinburgh Postnatal Depression Scale*

The Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden, & Sagovsky, 1987) measures levels of depression over the previous week and ranges from 0-30. It can be completed in little time, approximately 5 minutes, and cut-offs of 9/10 indicate possible depression, 12/13 likely depression. It has been used during the prenatal and postnatal phases (Edmondson et al., 2010; Pearson et al., 2013).

Studies examining the change in depression measured using the Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987) have shown reductions following generic mindfulness courses (Dunn et al., 2012) and pregnancy-tailored courses (Muzik et al., 2012), some of which are maintained at postnatal follow-up when the sample reports high rates of mindfulness practice (Dimidjian & Goodman, 2014). Other studies have found no change in EPDS depression following pregnancy-tailored courses (Chan, 2014), particularly when samples have reported very little practice (Byrne et al., 2013). Higher rates of EPDS depression have been shown to be associated with lower levels of dispositional mindfulness during pregnancy (Truijens et al., 2015).

#### *3.2.3.4 Tilburg Pregnancy Distress Scale*

The Tilburg Pregnancy Distress Scale (TPDS, Pop, Pommer, Pop-Purceleanu, Wijnen, Bergink & Pouwer, 2011) measures pregnancy-related distress for the previous 7 days and ranges from 0-48. It was created using focus groups and includes a perceived partner involvement subscale (range 0-12). Previous evaluation of the scale showed that partner involvement is important since low scores were associated with increased stress. The TPDS was correlated with the GAD-7 for anxiety and EPDS for depression, resulting in the creators defining a score of more than 17 as 'distressed', using the 90th percentile where scores over this were correlated with high anxiety (>9) and depression (>11). Previous TPDS score for a sample of non-clinical pregnant women was 10.67 (*SD* 5.81). It has not been evaluated for changes in trimester. High TPDS distress has been associated with lower levels of dispositional mindfulness in previous pregnant samples (Truijens et al, 2015.). Change in pregnancy-related distress measured by the Tilburg Prenatal Distress Scale (TPDS; Pop et al., 2011) has not been evaluated for a pregnant sample taking a mindfulness course.

#### *3.2.3.5 Revised Prenatal Distress Questionnaire*

The Revised Prenatal Distress Questionnaire (PDQ; Yali & Lobel, 1999; PDQ-R; Lobel, Cannella, Graham, DeVincent, Schneider & Meyer, 2008) measures pregnancy-related distress, with specific questions added at the second and third trimesters and ranges from 0-34. For the purposes of this study, all measure items were presented. Pregnancy specific distress has been associated with prenatal smoking resulting in preterm delivery and low birth weight (Lobel et al., 2008). Because of the difference in item number by trimester, scores can be calculated by taking the sum and dividing by the number of items; normative non-clinical scores reported are 0.77 (*SD* 0.44) (Coussons-Read et al., 2012) and 0.72 (*SD* 0.35), 0.59 (*SD* 0.32) and 0.55 (0.30) for the three trimesters (Lobel et al., 2008). Pregnancy-related distress using the Prenatal Distress Questionnaire (revised; PDQr; Lobel et al., 2008; Yali & Lobel, 1999) has shown no difference following a pregnancy-tailored mindfulness course in a non-clinical sample, compared to a control group (Chan, 2014).

#### *3.2.3.6 Oxford Worries about Labour Scale*

The Oxford Worries about Labour scale (OWLS; Redshaw, Martin, Rowe & Hockley, 2009) is a 10-item scale that measures worry about labour. Labour worry is said to differ from anxiety because it lacks the clinical label that accompanies anxiety and, at a certain level, is a normal part of pregnancy. The scale has a range of 10-40 with 10 being the highest level of worry. It encompasses three subscales: labour pain and distress, pre-labour uncertainty, and interventions. The scale was created as a retrospective measure of labour worry using common worries from qualitative data and therefore needs validating in a sample of prospective parents. 'Worry about interventions' and 'pain and distress' were found to be predictors of baby blues at 10 days postpartum and 'pain and distress' a predictor of self-reported postnatal depression at 3 months. The mean labour worry score in a non-clinical sample of new mothers was 25.15 (*SD* 6.72) (Redshaw et al., 2009). Thus far,

labour worry measured with the Oxford Worries about Labour Scale has not been evaluated for a pregnant sample taking a mindfulness course.

#### *3.2.3.7 Scale for Pregnancy-Related Discomforts*

The scale for Pregnancy-Related Discomforts (PRD; Shinkawa, H., Shimada, M., Hirokane, K., Hayase, M. and Inui, T.,2012) measures pregnancy-related discomfort for the previous week and is smaller than many previous scales measuring discomfort. It was created by Japanese respondents answering 95 items about pregnancy discomfort which were then divided into the three trimesters, the ranges are 0-75, 0-65 and 0-65 respectively. Normative scores for the three trimesters are 36.9, 26.0 and 29.2 (Shinkawa, Shimada, Hirokane, Hayase, & Inui, 2012).

#### *3.2.3.8 The Pregnancy Experience Scale*

The Pregnancy Experience Scale (PES-Brief version; DiPietro, Christensen & Costigan, 2008) measures positive, or uplifting, experiences and negative experiences, or hassles, of pregnancy affecting the individual currently and has 10 questions for each, rated from 0-3. The two parts of the measure range from 0-30. Frequency scores are calculated by counting the number of endorsed questions for positive and negative frequency scores; previous mean scores are 6.5-7.5 for hassles and 9.5 for uplifts. Intensity scores are calculated by summing the scores for hassles or uplifts and dividing them by the frequency score; previous mean scores are 1.4 for hassles and 2.4 for uplifts (DiPietro, Christensen, & Costigan, 2008; DiPietro JA, 2004). Positive pregnancy experiences were shown to increase following one pregnancy-tailored mindfulness course, and negative experiences to decrease at 1-month follow-up, compared to a control group, using the Pregnancy Experiences Scale (Chan, 2014).

#### *3.2.3.9 The Fifteen-item Five Facet Mindfulness Questionnaire*

The Five Facet Mindfulness Questionnaire-15 item (FFMQ; Baer et al, 2006, FFMQ-MS; Baer et al., 2012) measures dispositional mindfulness over the current week and ranges from 15-75. The scale incorporates subscales for facets of mindfulness: observe, describe, non-judgement, non-reactivity and awareness. As the scale consists of 15 items, each subscale is made up of only three items, although previous research reports alphas of .60 to .94 for these subscales and of .80-.85 for the scale. Mindfulness measured by the scale has shown to increase following mindfulness courses with participants beginning with a mean of 48.10 (*SD* 7.01) (Baer et al., 2012).

## 3.3 Results

### *3.3.1 Data checks: Outliers, normality and homogeneity*

Data was checked for non-normal distribution and outliers. One dataset was discovered where the first answer was given for each measure so their data was removed, leaving 156 completers. The subscale for negative pregnancy experiences showed positive kurtosis (4.609) and the Shapiro Wilk's test was significant for the positive and negative subscales with first trimester and third trimester subsamples[17], indicating that any analysis conducted using this measure for a trimester split should be non-parametric or bootstrapped.

### *3.3.2 Sample characteristics*

There are no missing values for the measures of mood because the online questionnaire site will not allow incomplete pages to be submitted. There were no differences in the sociodemographics of those who completed ($n$ = 156) and did not complete ($n$ = 148) the questionnaires.

[17] Sample split into trimesters for analysis (first $n$ = 27, second $n$ = 116, third $n$ = 13).

Approximately half of the sample (52%, *n* = 81) had children and of those, the majority had just one child (*n* = 55). Eight percent of participants had completed the survey (incorrectly) during their third (*n* = 13) but were included in the study.

Fifteen percent of the sample indicated that they had physical ailments unrelated to the pregnancy (*n* = 23) including asthma, fibromyalgia, diabetes and various problems with muscles and joints; 12% of the sample had mental health problems (*n* = 20) with most indicating depression (*n* = 6), or anxiety (*n* = 6) or comorbid depression and anxiety (*n* = 4). Other psychological issues noted included OCD, bipolar depressive disorder and ADD (*n* = 4).

Twenty-two percent of the sample (*n* = 35) already practiced yoga or meditation with most (*n* = 15) practising yoga once per week. Few participants (*n* = 16) indicated that they practiced meditation, ranging from between daily to once per month, or as part of a yoga group.

**Table 3-1 Participant Sociodemographics**

| **Participant Characteristics** *n* = 156 | % | *n* |
|---|---|---|
| Age (range taken in brackets 18-20 - 46-50) | mode: 26-30, 37% | |
| UK residents | 65% | 102 |
| Oxfordshire residents | 17% | 27 |
| Currently married or cohabiting | 98% | 153 (112, 43) |
| Relationship length (range 1 month - 21 years) | mean: 6.03years, mode: 3years | |
| Educated to degree level | 31% | 49 |
| Educated to postgraduate level | 37% | 58 |
| Currently employed | 62% | 96 |
| Unemployed status-homemaker | 28% | 43 |
| Multiparous | 52% | 81 |
| First trimester | 17% | 27 |
| Second trimester | 75% | 116 |
| Third trimester | 8% | 13 |
| Physical ailments (non-perinatal) | 15% | 23 |
| Mental health problems | 12% | 20 |

| | | |
|---|---|---|
| Practice yoga or meditation | 22% | 35 |

### *3.3.3 Mood at baseline*

Baseline mood scores are presented in Table 3-2. One participant incorrectly completed the second trimester questions for discomfort whilst in their first trimester; four incorrectly completed the measure for the first trimester during their second.

**Table 3-2 Baseline mood scores of total sample *n* = 156**

| Measure | Mean | *SD* | Cronbach's α | Research Norms |
|---|---|---|---|---|
| PSS Stress | 17.96 | 7.38 | .89 | 11.9-14.7[18] |
| GAD-7 Anxiety | 6.97 | 5.37 | .91 | 2.7-3.8[19] |
| OWLS Labour Worry | 28.61 | 6.93 | .85 | 25.15[20] |
| TPDS Pregnancy Distress | 16.92 | 7.91 | .81 | 10.67[21] |
| PDQr Pregnancy Distress | 0.73* | 5.75 | .85 | 0.48-0.71[22] |
| EPDS Pregnancy Depression | 9.31 | 6.09 | .90 | 7.6[23] |
| PRD 1st Trimester Discomforts *n* = 30 | 38.97 | 14.59 | .90 | 36.9[24] |
| PRD 2nd Trimester Discomforts *n* = 126 | 27.46 | 10.41 | .86 | 26[16] |
| PES Frequency of positive experiences | 8.21 | 2.15 | .88 | 6.5-7.5[25] |
| PES Intensity score, positive | 1.93 | 0.55 | - | 2.4[17] |
| PES Frequency of negative experiences | 6.96 | 2.42 | .81 | 9.5[17] |
| PES Intensity score, negative | 1.52 | 0.48 | - | 1.4[17] |

*12.48 summed,0.73 calculated dividing by item number (17)

Mindfulness (FFMQ-15) mean score for the sample at baseline was 49.94 (*SD* 9.51) and similar to that found with non-clinical pregnant samples previously (48.10, *SD* 7.01) (Baer et al., 2012). Cronbach's α =.81.

[18] (Cohen & Williamson, 1988)
[19] (Löwe et al., 2008a)
[20] (Redshaw et al., 2009) Non-clinical sample of new mothers using the scale retrospectively.
[21] (Pop et al., 2011)
[22] (Coussons-Read et al., 2012) 0.71 during early pregnancy and 0.48 during later pregnancy
[23] (Cox et al., 1987; Cox et al., 1993) 9/10 potential for further screening; 12/13 probable depression.
[24] (Shinkawa et al., 2012)
[25] (DiPietro et al., 2008)

Sample means fell within the population norm means across the majority of measures with slightly higher scores for stress, anxiety (meeting the cut-off of 5 for 'mild' (Spitzer et al., 2006)), TPDS distress (almost meeting the threshold of 17 for 'distressed' (Pop et al., 2011)) and depression, meeting the score for potential depression 'in need of further screening' (Cox et al., 1993).

### *3.3.4 Potential of the online mindfulness course for this population*

To examine whether the measures found to previously improve upon completion of an mindfulness course were correlated with pregnancy-specific mood measures, correlations were conducted on the GAD-7 and PSS with the EPDS, PDQr and TPDS, see Table 3-3.

**Table 3-3 Correlations for anxiety and stress with pregnancy-related distress and depression *n* = 156**

| | EPDS Depression | TPDS Distress | PDQr Distress |
|---|---|---|---|
| PSS Stress | .801** | .508** | .530** |
| GAD-7 Anxiety | .745** | .334** | .383** |

**Correlations all significant at the .001 level

All measures were positively correlated.

### *3.3.5 The relationship between dispositional mindfulness and general mood*

Correlations examining the relationship with dispositional mindfulness and general measures of stress and anxiety showed a negative relationship; FFMQ with PSS stress ($r$ = -.608, $p$<.001) and with GAD-7 anxiety ($r$ = -.495, $p$<.001). A MANOVA using the mindfulness mean high/low split showed that there was a significant effect on mood, $F$(2,153)= 16.28, $p$<.001, Hotelling's Trace, $T$ = 0.21. The proceeding separate univariate ANOVAs showed that mindfulness had a significant effect on PSS stress $F$(1,154)= 32.65, $p$<.001 and anxiety $F$(1,154)= 19.86, $p$<.001.

### *3.3.6 The relationship between dispositional mindfulness and pregnancy-specific mood*

To examine the hypothesis that higher dispositional mindfulness would be associated with lower scores of pregnancy-related distress and depression, first, correlations were conducted with the FFMQ-15 for mindfulness, the EPDS for depression and the TPDS and the PDQr for distress. There were significant negative correlations for pregnancy-related measures of depression and distress with mindfulness; EPDS for depression ($r$ =-.667, $p$<.001), TPDS distress($r$ =-.462, $p$<.001) and PDQr distress ($r$ =-.445, $p$<.001). To explore this relationship further, a MANOVA was conducted with mindfulness as a categorical variable (high and low) with scores of 49 or less for low ($n$ = 75) and 50 or more for high ($n$ = 81), using the mean split and mid-point of the scale. Using Hotelling's Trace, $T$ = 0.37, there was a significant effect on mood, $F$(3, 152)= 18.70, $p$<.001. Between subjects, mindfulness had a significant effect on EPDS depression $F$(1,154)= 53.87, $p$<.001, TPDS distress $F$(1,154)= 23.08, $p$<.001 and PDQr distress $F$(1,154)= 19.46, $p$<.001. Labour worry and mindfulness were not correlated ($r$ =.101, $p$ >.05).

Partial correlations controlling for general mood in the form of PSS stress and GAD-7 anxiety examining pregnancy-specific depression and distress were all significant; EPDS ($r_{(PSS,GAD7)=}$ -.383, $p$<.001), TPDS ($r_{(PSS,GAD7)=}$ -.231, $p$<.005), PDQr ($r_{(PSS,GAD7)=}$ -.184, $p$<.05).

To explore mindfulness and discomfort, the sample was split into first ($n$ = 26) and second trimester participants ($n$ = 112) who completed the PRD measure correctly for discomforts related to their trimester. FFMQ mindfulness was negatively correlated with first trimester ($r$ = -.437, $p$<.05) and second trimester discomforts ($r$ = -.339, $p$<.001).

Regressions were conducted to examine whether levels of dispositional mindfulness predicted levels of discomfort, see Table 3-4 and Table 3-5.

**Table 3-4 Linear regression for mindfulness as a predictor for first trimester discomforts $n$ = 26**

| *B* | Standard Error | β | *p* |
|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| FFMQ | -.63 (-1.18, -0.08) | 0.27 | -.44 | <.05 |

Note: Dependent variable: PRD-1st trimester. $R^2$=.20

**Table 3-5 Linear regression for mindfulness as a predictor for second trimester discomforts *n* = 112**

| | *B* | Standard Error | β | *p* |
|---|---|---|---|---|
| FFMQ | -.37 (-0.56, -0.18) | 0.10 | -.34 | <.001 |

Note: Dependent variable: PRD-2nd trimester. $R^2$=.12

Higher levels of dispositional mindfulness predicted lower levels of discomfort in the first or second trimester of pregnancy. Controlling for general stress and anxiety, mindfulness was not correlated with first trimester ($r_{(PSS,GAD7)=}$ -.050, $p$ >.05) or second trimester ($r_{(PSS,GAD7)=}$ -.165, $p$ >.05) discomforts.

### *3.3.7 The relationship between dispositional mindfulness and pregnancy experiences*

To investigate whether there was a relationship between dispositional mindfulness and pregnancy experiences, correlations were conducted on the FFMQ with the PES scores for positive (uplifts) and negative (hassles) frequency and intensity ($n$ = 156), see Table 3-6.

**Table 3-6 Correlations with FFMQ dispositional mindfulness and PES pregnancy experience**

| | Uplifts frequency | Uplifts intensity | Hassles frequency | Hassles intensity |
|---|---|---|---|---|
| Spearman's rho | .083 | .114 | -.329** | -.365** |
| *P* | .305 | .158 | .000 | .000 |

** Correlation is significant at the .001 level

Only the frequency and intensity of negative pregnancy experiences were correlated (negatively) with dispositional mindfulness. Subsequently, regressions examined whether mindfulness predicted the frequency and intensity of hassles, see Table 3-7 and Table 3-8.

**Table 3-7 Bootstrapped linear regression for mindfulness as a predictor for frequency of negative experiences**

| | *B* | Standard Error | β | *p* |
|---|---|---|---|---|
| FFMQ | -.09 (-0.12, -0.05) | 0.02 | -.33 | <.001 |

Note: Dependent variable: Negative Frequency. $R^2$=.11. Confidence intervals and standard errors based on 1000 bootstrap samples.

**Table 3-8 Bootstrapped linear regression for mindfulness as a predictor for frequency of negative experiences**

| | *B* | Standard Error | β | *p* |
|---|---|---|---|---|
| FFMQ | -.02 (-0.03, -0.01) | 0.004 | -.43 | <.001 |

Note: Dependent variable: Negative Intensity. $R^2$=.18. Confidence intervals and standard errors based on 1000 bootstrap samples.

A higher level of dispositional mindfulness predicted fewer pregnancy-related hassles, and less intense hassles.

### *3.3.8 The change in mindfulness and mood over time*

To examine how mindfulness might affect mood over pregnancy, first, mindfulness and mood were examined to investigate how they may change over time. The followed-up sample who completed measures during their second and later, during their third trimester (*n* = 29) were investigated, see Table 3-9.

**Table 3-9 Mood and mindfulness scores during the second and third trimesters of pregnancy *n* = 29**

| | Second trimester | | Third trimester | | Paired t-test results | |
|---|---|---|---|---|---|---|
| Measure | Mean | *SD* | Mean | *SD* | *t(28)* | *p* |
| *General mood* | | | | | | |
| PSS Stress | 15.21 | 6.58 | 15.03 | 6.07 | 0.13 | .898 |
| GAD-7 Anxiety | 5.31 | 4.34 | 6.03 | 4.75 | -1.06 | .300 |
| *Pregnancy mood* | | | | | | |
| EPDS Depression | 7.07 | 4.86 | 8.17 | 5.13 | -1.81 | **.081** |
| TPDS Distress | 15.83 | 6.93 | 17.62 | 6.79 | -2.04 | **.051** |
| PDQr Distress | 11.50 | 5.14 | 12.12 | 5.05 | 1.37 | .181 |
| OWLS labour worry | 28.76 | 5.93 | 27.76 | 5.47 | -1.15 | .260 |
| PES Uplifts frequency* | 8.28 | 2.30 | 8.76 | 2.15 | -1.92 | **.073** |
| PES Hassles frequency* | 6.48 | 3.28 | 6.97 | 3.20 | -1.29 | .205 |
| PES Uplifts intensity* | 1.92 | 0.43 | 1.99 | 0.52 | -0.99 | .317 |
| PES Hassles intensity* | 1.40 | 0.59 | 1.47 | 0.54 | -0.85 | .408 |
| PRD Discomforts (*n* = 27) | 23.74 | 9.48 | 27.19 | 10.37 | -1.88 (26) | **.071** |
| *FFMQ Mindfulness* | 51.48 | 7.43 | 51.72 | 6.42 | -.25 | .808 |

Trends shown in bold
* Bootstrapped based on 1000 samples

Mood and mindfulness remained stable, although there was a trend for pregnancy-related depression, distress and discomfort increasing and uplift frequency increasing.

### *3.3.9 Mindfulness and mood at follow-up, during the third trimester*

Partial correlations were run to explore the relationship between mindfulness and mood during the third trimester, controlling for second trimester symptoms. Initially, third trimester general stress and anxiety were examined with mindfulness, controlling for second trimester mood and mindfulness. PSS stress ($r_{(PSS,FFMQ)=}$ -.410, $p$<.05) and GAD-7 anxiety ($r_{(GAD7,FFMQ)=}$ -.396, $p$<.05) were negatively correlated with mindfulness.

Examining pregnancy-specific mood, EPDS depression ($r_{(EPDS,FFMQ)=}$ -.250, $p$ >.05), PDQr distress ($r_{(PDQr, FFMQ)=}$ -.309, $p$ >.05) and OWLS labour worry ($r_{(T1OWLS,T1FFMQ)}$= -.034, $p$ >.05). were not correlated with mindfulness during the third trimester, controlling for second trimester mood and mindfulness. TPDS distress was still correlated with mindfulness during the third trimester ($r_{(TPDS,FFMQ)=}$ -.547, $p$<.005).

Bootstrapped partial correlations (based on 1000 samples) showed the relationship with mindfulness and hassle frequency ($r_{(PESHASSLEFreq, FFMQ)=}$ -.387, $p$<.05) and intensity ($r_{(PESHASSLEIntens, FFMQ)=}$ -.483, $p$<.05) was maintained during the third trimester, controlling for second trimester mindfulness and pregnancy-related hassles.

### *3.3.10 Dispositional mindfulness as a safeguard for negative mood later in pregnancy*

To examine the hypothesis that higher levels of mindfulness during the second trimester (T1) would predict healthier mood levels during the third trimester (T2), partial correlations were conducted with T1 mindfulness and T2 mood, controlling for T1 mood in each instance, see Table 3-10.

**Table 3-10 T1 mindfulness correlations with T2 mood, controlling for T1 (baseline) mood**

| T2 Measure | Correlation with T1 FFMQ mindfulness | *p* |
|---|---|---|
| **General mood** | | |
| PSS Stress | -.158 | .421 |
| GAD-7 Anxiety | -.078 | .694 |

| **Pregnancy mood** | | |
|---|---|---|
| EPDS Depression | .104 | .598 |
| TPDS Distress | -.008 | .966 |
| PDQr Distress | .064 | .745 |
| OWLS labour worry | -.257 | .187 |
| Uplifts frequency* | .248 | .204 |
| Hassles frequency* | .124 | .530 |
| Uplifts intensity* | -.168 | .392 |
| Hassles intensity* | .092 | .640 |
| Discomforts (*n* = 27) | .008 | .970 |

* Bootstrapped based on 1000 samples

Second trimester mindfulness was not related to mood during the third trimester when controlling for second trimester mood.

### *3.3.11 The relationship with change in mindfulness & mood over pregnancy*

Regressions were run on the variables which showed a significant correlation at third trimester controlling for second trimester. A regression with baseline mood as covariates in step one and the change in mindfulness as predictor in step two showed that the change in mindfulness from the second to the third trimester predicted a change in mood. An increase in mindfulness resulted in a trend for stress, see Table 3-11. and a significant prediction for the change in anxiety, see Table 3-12.

**Table 3-11 Linear regression for change in mindfulness as a predictor for change in perceived stress**

| *Step 1* | *B* | Standard Error | β | *p* |
|---|---|---|---|---|
| T1 PSS stress | -0.71 (-1.07, -0.36) | 0.17 | -.71 | **<.001** |
| T1 FFMQ mindfulness | -0.13 (-0.41, 0.16) | 0.14 | -.13 | >.05 |
| *Step 2* | | | | |
| T1 PSS stress | -0.69 (-1.03, -0.35) | 0.16 | -.69 | **<.001** |
| T1 FFMQ mindfulness | -0.43 (-0.54, 0.05) | 0.14 | -.24 | >.05 |
| Change in mindfulness (T2-T1) | -0.43 (-0.86, -0.004) | 0.21 | -.43 | **=.052** |

Note: Dependent variable: Change in PSS Stress. $R^2$=.39 ($p$<.005) for step 1; $\Delta R^2$=.08 for step 2 ($p$<.005)

**Table 3-12 Linear regression for change in mindfulness as a predictor for change in anxiety**

| *Step 1* | *B* | Standard Error | β | *p* |
|---|---|---|---|---|
| T1 GAD-7 anxiety | -0.30 (-0.67, 0.08) | 0.18 | -.35 | >.05 |
| T1 FFMQ mindfulness | -0.04 (-0.26, 0.18) | 0.11 | -.09 | >.05 |
| *Step 2* | | | | |
| T1 GAD-7 anxiety | -0.30 (-0.65, 0.05) | 0.17 | -.35 | >.05 |
| T1 FFMQ mindfulness | -0.16 (-0.39, 0.07) | 0.11 | -.16 | >.05 |
| Change in mindfulness (T2-T1) | -0.31 (-0.61, -0.01) | 0.14 | -.45 | **<.05** |

Note: Dependent variable: Change in GAD-7 anxiety. $R^2$=.10 ($p$>.05) for step 1; $\Delta R^2$=.14 for step 2 ($p$<.05)

TPDS distress and mindfulness were correlated during the third trimester, controlling for baseline levels.

A regression showed that the change in mindfulness did predict variance in scores of TPDS distress change, with baseline mood as covariates, see Table 3-13.

**Table 3-13 Linear regression for change in mindfulness as a predictor of change in distress in the third trimester**

| *Step 1* | *B* | Standard Error | β | *p* |
|---|---|---|---|---|
| T1 TPDS distress | -0.26 (-0.53, 0.02) | 0.14 | -.38 | =.069 |
| T1 FFMQ mindfulness | -0.005 (-0.27, 0.25) | 0.13 | -.008 | >.05 |
| *Step 2* | | | | |
| T1 TPDS distress | 0.28 (-0.52, -0.04) | 0.12 | -.41 | **<.05** |
| T1 FFMQ mindfulness | -0.22 (-0.48, 0.04) | 0.13 | -.34 | =.093 |
| Change in mindfulness (T2-T1) | -0.54 (-0.88, -0.20) | 0.17 | -.60 | **<.005** |

Note: Dependent variable: TPDS distress change. $R^2$=.14 ($p$>.05) for step 1; $\Delta R^2$=.26 for step 2 ($p$<.001)

Regressions also showed that the change in mindfulness predicted fewer hassles and less intense hassles during the third trimester, see Table 3-14 and Table 3-15.

**Table 3-14 Bootstrapped Regression examining change in mindfulness to predict change in hassle frequency**

| *Step 1* | *B* | Standard Error | β | *p* |
|---|---|---|---|---|
| T1 PES hassle freq | -0.21 (-0.46, -0.06) | 0.10 | -.35 | **<.05** |
| T1 FFMQ mindfulness | -0.02 (-0.02, 0.10) | 0.03 | -.09 | >.05 |
| *Step 2* | | | | |
| T1 PES hassle freq | -0.25 (-0.49, -0.09) | 0.10 | -.40 | **<.05** |

| | | | | |
|---|---|---|---|---|
| T1 FFMQ mindfulness | -0.03 (-0.09, 0.05) | 0.03 | -.10 | >.05 |
| Change in mindfulness (T2-T1) | -0.16 (-0.30, -0.06) | 0.06 | -.41 | **<.05** |

Note: Dependent variable: PES hassle frequency change. $R^2$=.37 ($p$>.05) for step 1; $\Delta R^2$=.14 for step 2 ($p$<.05) Confidence intervals and standard errors based on 1000 bootstrap samples.

**Table 3-15 Bootstrapped regression examining change in mindfulness to predict change in hassle intensity**

| *Step 1* | *B* | Standard Error | β | *p* |
|---|---|---|---|---|
| T1 PES hassle intens | -0.35 (-0.61, -0.07) | 0.14 | -.49 | **<.05** |
| T1 FFMQ mindfulness | -0.002 (-0.01, 0.02) | 0.008 | .03 | >.05 |
| *Step 2* | | | | |
| T1 PES hassle intens | -0.45 (-0.66, -0.22) | 0.11 | -.62 | **<.005** |
| T1 FFMQ mindfulness | -0.01 (-0.03, 0.002) | 0.01 | -.22 | >.05 |
| Change in mindfulness (T2-T1) | -0.04 (-0.08, -0.01) | 0.02 | -.51 | **<.05** |

Note: Dependent variable: PES hassle intensity change. $R^2$=.49 ($p$<.05) for step 1; $\Delta R^2$=.19 for step 2 ($p$=.001) Confidence intervals and standard errors based on 1000 bootstrap samples.

### *Exploration of pregnancy stage and parity*

The total sample was split into trimesters to examine whether mood was different for people at different stages of pregnancy, see Figure 3-1.

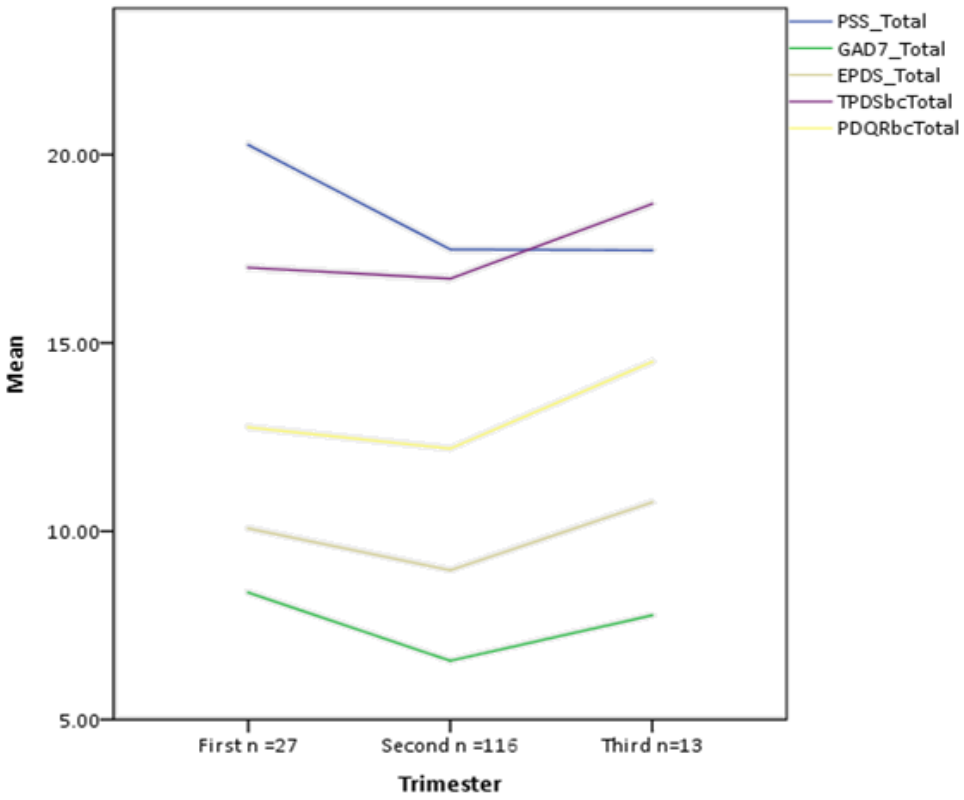


**Figure 3-1 Mood during Pregnancy by Trimester**

There were 27 participants in their first trimester, 116 in their second and 13 in their third. GAD-7 anxiety, EPDS depression, TPDS distress and PDQr distress were highest for those in their third trimester and lowest for those in their second, PSS stress was highest for those in their first trimester. ANOVAS revealed no significant differences in mood comparing trimesters.

Bootstrapped ANOVAS (based on 1000 samples) showed that participants in their third trimester reported more frequent uplifts, $F(2,153)= 11.73$, $p<.001$ (means: 1st trimester: 6.59 (*SD* 2.26), 2nd trimester: 8.46 (*SD* 2.04), 3rd trimester: 9.38 (*SD* 0.96)), and more intense uplifts, $F(2,153)=4.11$, $p<.05$ (means: 1st trimester: 1.82 (*SD* 0.61), 2nd trimester: 1.91 (*SD* 0.55), 3rd trimester: 2.32 (*SD* 0.35)). Likewise, there was a difference in the frequency of hassles reported by trimester, $F(2,153)= 3.93$, $p<.05$ with more being reported by people in their third trimester (means: 1st trimester: 6.04 (*SD* 2.12), 2nd trimester: 7.03 (*SD* 2.45), 3rd trimester: 8.23 (*SD* 2.24)) and a trend for participants in their first trimester

reporting more intense hassles, $F(2,153)= 2.61$, $p = .077$ (means: 1st trimester: 1.70 (*SD* 0.45), 2nd trimester: 1.48 (*SD* 0.49), 3rd trimester: 1.60 (*SD* 0.42)).

Mean OWLS labour worry (reverse scored) for people surveyed during the first trimester ($n = 27$) was 30.93 (*SD* 1.44), during the second trimester ($n = 116$) was 28.54 (*SD* 0.61) and the third trimester ($n = 13$) was 24.38 (*SD* 1.95). An ANOVA showed that labour worry was higher for expectant mothers in their third trimester, $F(2,153)= 4.09$, $p<.05$.

FFMQ mindfulness was highest for those in their first trimester and lowest for those in their third, though the difference was not significant.

Mood data was explored to investigate whether there were any differences in mood depending on parity, see Table 3-16.

**Table 3-16 Mood Examined by Parity**

| | Mean | Standard Deviation | Mean | Standard Deviation |
|---|---|---|---|---|
| | *Multiparous n = 81* | | *Nulliparous n = 75* | |
| **General mood measure** | | | | |
| PSS Stress | 18.46 | 7.89 | 17.43 | 6.81 |
| GAD-7 anxiety | 7.46 | 5.59 | 6.45 | 5.10 |
| EPDS depression | 9.09 | 6.03 | 9.55 | 6.19 |
| **Pregnancy mood measure** | | | | |
| TPDS distress* | 15.73 | 7.50 | 18.21 | 8.17 |
| TPDS partner involvement[1*] | 4.09 | 3.12 | 2.99 | 2.68 |
| PDQr distress** | 11.01 | 5.70 | 14.07 | 5.41 |
| OWLS labour worry[1**] | 31.22 | 5.93 | 25.79 | 6.86 |
| **Mindfulness measure** | | | | |
| FFMQ-15 mindfulness | 50.36 | 10.79 | 49.48 | 7.94 |
| **Pregnancy-related discomforts** | | | | |
| | *Multiparous n = 19* | | *Nulliparous n = 11* | |
| PRD 1st trimester discomforts | 36.58 | 13.25 | 43.09 | 16.50 |
| | *Multiparous n = 62* | | *Nulliparous n = 64* | |
| PRD 2nd trimester discomforts | 27.89 | 10.91 | 27.05 | 9.98 |

[1]NB. Reverse scored measures
* Significant at .05, ** significant at .001

T-tests revealed significant differences in labour worry, $t(154)=5.31$, $p<.001$, TPDS distress, $t(154)=-1.98$, $p=.05$, perceived partner involvement, $t(154)=2.35$, $p<.05$ and PDQr distress, $t(154)=-3.43$, $p=.001$ with nulliparous women being more worried about labour and more distressed but with higher perceived partner involvement.

## 3.4 Discussion

The intention of this study was to evaluate the relationship between mood and mindfulness in a cross-sectional analysis of pregnant women during their first and second trimesters and re-examine at third trimester follow-up, to inform the rationale for providing an intervention which has the potential to increase levels of mindfulness for women during pregnancy.

Levels of general stress and anxiety were assessed using the same measures which decreased previously after participating in an online mindfulness course. These measures were correlated with measures of pregnancy related depression and distress, suggesting that the online course may also benefit these pregnancy-specific constructs.

The level of dispositional mindfulness a woman reported had a significant association with mood such that higher mindfulness scores were associated with lower scores of pregnancy related depression, distress, discomfort and hassles and general stress and anxiety. This suggests that increasing levels of mindfulness in a sample of expectant mothers may be beneficial for mood. It was the change in mindfulness from the second to the third trimester in the followed-up subsample which was associated with improved stress (trend), anxiety and pregnancy-related distress and hassles later in pregnancy. These findings support previous research which found that dispositional mindfulness during pregnancy was associated with improved mood during and after pregnancy only if it was maintained or increased (Zoeterman, 2014). This has implications for the use of mindfulness courses during pregnancy. Potentially, sustaining levels of mindfulness over

pregnancy could be beneficial for low mood. This finding also suggests that a mindfulness course during pregnancy may be most suitably offered during the second trimester of pregnancy, when levels of negative mood tend to be at their lowest and a preventative intervention may be most useful, especially if mindfulness increases following the course and is maintained.

The hypothesis that higher levels of mindfulness would be associated with lower levels of physical discomfort was supported. Similarly, higher levels of mindfulness predicted a lesser frequency and intensity of negative pregnancy experiences (hassles). It is conceivable that paying attention to and acknowledging physical discomfort, without judgement, instead of worrying about discomfort and negative experiences, or trying to ignore them, would be beneficial and these are behaviours we might associate with higher dispositional mindfulness. Conversely, experiencing fewer, or less intense, negative experiences may allow for greater levels of mindfulness; a lack of negative experiences may inhibit the propensity for avoidance or worry. These findings suggest that completing a course which would feasibly increase dispositional mindfulness may be helpful for pregnancy-related discomforts and hassles. There was no relationship with dispositional mindfulness and positive pregnancy experiences. The reason for this is unknown; it would be interesting to re-examine this finding in future studies.

Higher levels of mindfulness during the second trimester did not protect from low mood during the third trimester. This may be due to mood remaining mild in the follow-up sample, thereby removing any scope for alleviation (Zoeterman, 2014).

It is not surprising that labour worry was highest for third trimester participants, being nearer to their due dates. A certain amount of labour worry is expected, however, offering an earlier intervention may ease an increase in worry later, particularly if worry is due to uncertainty or rumination which mindfulness skills could feasibly alleviate.

First time mothers also had significantly higher levels of labour worry, as well as pregnancy-specific distress. This is perhaps due to the lack of information when compared to their experienced counterparts. In this case, an intervention completed during pregnancy which includes pregnancy education may be most helpful for first-time mothers. That first-time mothers reported higher levels of perceived partner involvement may be because this was their first pregnancy, thereby offering more of a necessity for conversation about the upcoming life event and proceeding changes. It would be interesting to explore perceived partner involvement in future samples to investigate possible reasons for this difference.

This study has a number of limitations. First, the follow-up part of the study has a small sample size. The women who chose to participate in the survey once more, during the third trimester, did not exhibit a decline in mood usually reported during pregnancy. Their mood scores were also within population norms, perhaps meaning they were more willing to answer repeated questions regarding their mood and pregnancy; people experiencing low mood may prefer not to reflect on how they are feeling. Unfortunately, this means that these results cannot be generalised to other pregnant samples. It would be useful to repeat the study with a larger sample with a third trimester follow-up to investigate a potential decline in mood over gestation, as previously found. If mood declines as expected, it would be interesting to evaluate how mindfulness may be helpful for a sample with more scope or requirement to improve.

Second, the initial survey, omitting the small follow-up sample, is cross-sectional so it is difficult to posit how these women would have felt later in pregnancy. While splitting the sample by trimester gives an indication of mood during different times, it would be more informative to investigate how mood changes during pregnancy in the same sample.

Third, measures of pregnancy-specific anxiety and stress were not included to limit participant burden. While pregnancy-specific and general anxiety and stress may reflect

different emotional constructs, potential differences cannot be currently evaluated because of this omission and it may be helpful to include them in future studies.

Overall, the results suggest that offering a mindfulness intervention to mothers-to-be seems a potentially beneficial intervention for negative mood. This is one of the first studies to explore mood and dispositional mindfulness during pregnancy and as such, is a good precursor to future studies. Proceeding studies evaluate potential benefits of a face-to-face mindfulness course and an online mindfulness course for this population.

# 4 CHAPTER 4 AN EVALUATION OF FACE-TO-FACE MINDFULNESS COURSES FOR PROSPECTIVE PARENTS

## 4.1 Introduction

Chapter three showed that higher levels of dispositional mindfulness during pregnancy are associated with lower levels of general and pregnancy-specific negative mood. Completing a mindfulness course during pregnancy may therefore serve to increase mindfulness and improve prenatal mood. As discussed in chapter one, there are limited preliminary findings for the utility of mindfulness courses for prospective parents delivered in person. Research is sparse, especially with regards to expectant fathers and the few studies there are present a variety of limitations, particularly small sample sizes, a lack of pregnancy-specific measures and mixed results for general mood measures.

Perceived stress (PSS; Cohen et al., 1983) has decreased following mindfulness courses delivered during pregnancy pre-post (Beddoe et al., 2009; Woolhouse et al., 2014), although some randomised controlled studies have found either a negative trend (Vieten & Astin, 2008) or no difference (Woolhouse et al., 2014; Zhang & Emory, 2015) compared to waitlist controls. Dispositional mindfulness, measured with the Five Factor Mindfulness Scale (FFMQ; Baer et al., 2006), has been shown to increase following generic mindfulness courses delivered during pregnancy in clinical and non-clinical samples (Guardino et al., 2013; Miklowitz et al., 2015) and pregnancy-tailored courses have shown an increase in mindfulness for expectant mothers (Duncan & Bardacke, 2010; Woolhouse et al., 2014) and fathers (Gambrel & Piercy, 2014a). A decrease in prenatal depression using the Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987) has been found following generic (Dunn et al., 2012) and pregnancy-tailored mindfulness courses (Muzik et al., 2012) although one study found no change after a pregnancy-tailored course (Chan, 2014).

Anxiety measured using the Generalised Anxiety Disorder scale (GAD-7; Spitzer et al., 2006) has been shown to reduce following a mindfulness course in a pregnant clinical sample with high levels of anxiety (Goodman et al., 2014). Positive pregnancy experiences increased following one pregnancy-tailored mindfulness course, and negative experiences decreased at 1-month follow-up, compared to a control group (Chan, 2014), using the Pregnancy Experiences Scale (PES; DiPietro et al., 2008). Pregnancy-related distress measured by the Tilburg Prenatal Distress Scale (TPDS; Pop et al., 2011) and labour worry measured with the Oxford Worries about Labour Scale (OWLS; Redshaw et al., 2009) have not yet been evaluated for a pregnant sample taking a mindfulness course. Because of limited results, this study evaluated whether any previous findings were replicated and explored more measures of mood.

As a first step it seemed important to explore the acceptability and utility of mindfulness courses delivered in person to prospective parents, including fathers-to-be, since this is the traditional method of delivery for mindfulness-based programmes. The mindfulness courses evaluated are tailored to this stage of life and are based upon the Mindfulness-Based Childbirth and Parenting (MBCP; Duncan & Bardacke, 2010) programme, which was developed from Mindfulness-Based Stress Reduction (MBSR; Kabat-Zinn, 1990) by Nancy Bardacke in the USA and comprises of mindfulness practices blended with antenatal education.

Two course formats were evaluated: a weekend workshop format based upon the MBCP programme and one full 9 session MBCP programme. By offering the two course types and conducting an audit on them using measures of mindfulness, general mood and pregnancy specific mood a comparison of the two course types for potential benefits was possible. Previous research has been conducted on the longer courses. To our knowledge,

an exploration of a shorter course format (less than four weeks) for expectant parents had not been yet conducted.

General stress and anxiety, dispositional mindfulness, pregnancy-related depression, distress and experience and labour worry were measured before and after the course.

The hypotheses were that:

(1) General stress and anxiety would significantly decrease pre to post-course;

(2) Pregnancy specific measures of depression, distress and labour worry would significantly decrease pre to post-course,

(3) There would be an increase in reported positive pregnancy experiences and a decrease in negative pregnancy experiences pre to post-course,

(4) Dispositional mindfulness would increase post-course and that increase would be associated with the change in general and pregnancy related mood,

(5) Perceived partner involvement would increase pre to post-course and be associated with a reduction in negative mood and experience and an increase in positive pregnancy experience.

Due to non-independence, subsamples of male and female participants were explored individually. As such, an exploration of course type (short and long) follows.

## 4.2 Methods

### *4.2.1 Participants*

Opportunity samples were evaluated as part of an audit of courses delivered at the Oxford Mindfulness Centre (OMC). Expectant mothers were invited to attend and to bring

a course partner (all were expectant fathers in this case). Thirty-three participants (24 on the short course, 15 mothers-to-be and 9 fathers-to-be; 9 on the full-course, 5 mothers-to-be and 4 fathers-to-be) attended the MBCP courses.

The exclusion criteria were any severe physical or psychological problems that would prevent engagement with the course and/or home practice and age below 18 years. The courses were advertised as having the potential to enable participants to learn skills for working with pain and fear, thus reducing stress and/or low mood. The samples were non-clinical and answers were expected to vary within the normal range.

### *4.2.2 Procedure*

The courses were advertised on the OMC website and through flyers distributed at a local National Childbirth Trust event. Interested parties were invited to complete a registration form on the OMC website which included sociodemographic and prenatal status questions. Expectant mothers (and fathers, where possible) were telephone screened by a course instructor to ensure that the course was suitable for them and to discuss any questions, prior to course-start.

Questionnaires and consent forms were available on the OMC website or sent via email for participants to complete and bring to the first class, or else forms were completed upon arrival. Participants were invited to complete the same questionnaires at course completion.

Two course formats were evaluated: 1) a weekend workshop based upon MBCP, comprising two all-day sessions and one two and a half hour session (14.5 hours total) and 2) a full 9-week MBCP course with nine weekly three-hour sessions over 10 weeks (with a one week break) and one all-day practice after the sixth session (34 hours total). The shorter course was offered free to the general public and there was a fee of £350 per couple for the 9-session course. The courses were available for women at any stage of pregnancy but

particularly recommended for women in their second or third trimester, so long as there was time to complete the course before the expected delivery date. The shorter course was created to allow people to attend for free and for a shorter period of time.

Research governance was contacted to confirm that specific ethical approval was not necessary owing to the study being an audit. Participation in the audit was voluntary.

### *4.2.3 Measures*

Measures were taken before the course and immediately after the course. The following measures were taken (see page numbers for a full description):

- The Perceived Stress Scale (PSS; Cohen et al., 1983), page 90. Cronbach's α for mothers was .83 and for fathers was .84.
- The Generalised Anxiety Disorder Scale (GAD-7; Spitzer et al., 2006), page 91. Cronbach's α for mothers was .89 and for fathers was .53.
- The Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987); page 91. Cronbach's α for mothers was .89 and for fathers was .83. The EPDS has also been validated for expectant mothers and fathers during the antenatal period (Cox et al., 1987; Murray & Cox, 1990);
- The Tilburg Pregnancy Distress Scale (TPDS; Pop et al., 2011); page 92. Cronbach's α for mothers was .68 and for fathers was .71. For the subscale of Perceived Partner Involvement, Cronbach's α for mothers was .77 and for fathers was .74.
- The Oxford Worries about Labour Scale (OWLS; Redshaw et al., 2009); page 93. Cronbach's α for mothers was .86 and for fathers was .70.
- The Pregnancy Experience Scale (PES-Brief version; DiPietro et al., 2008); page 94. For the positive experiences subscale, Cronbach's α for mothers was .81 and for

fathers was .56. For the negative experiences subscale, Cronbach's α for mothers was .83 and for fathers was .82.

- The Five Facet Mindfulness Questionnaire-Short Form (FFMQ; Baer et al., 2006), FFMQ-SF; Bohlmeijer, ten Klooster, Fledderus, Veehof, & Baer, 2011), see page 118, section 4.2.3.4; Cronbach's α was .81. Sample of mothers and fathers combined as α required larger sample size for the 24-item measure (approximate required $n$ = 30).
- A demographic questionnaire comprised of questions about age, familial and occupational status and questions about previous birth experiences.

Cronbach's αs for the GAD-7 and PES subscale for positive pregnancy experiences for expectant fathers were poor at .53 and .56 respectively, however, this is not unexpected owing to the small sample size. Combined male and female sample αs are .91 for the GAD-7 and .70 for the items of the PES positive subscale completed by all participants (6/10 items, see details below). The following changes were made to existing measures:

#### *4.2.3.1 The Tilburg Pregnancy Distress Scale*

The TPDS was also administered to expectant fathers to examine their levels of pregnancy-related distress. Fathers-to-be were asked to answer the questions based on their partners' pregnancy and the question text was altered from 'my pregnancy' to 'the pregnancy' to reflect this. Fathers were asked not to answer the last question, pertaining to weight gain distress (as not applicable) and as a result, the range for the TPDS for expectant fathers is 0-45 instead of 0-48.

#### *4.2.3.2 The Oxford Worries about Labour Scale*

The wording of the OWLS was altered so that partners could also answer; for example, the question "Not knowing when I will go into labour" was changed to "...when I/my partner will..."

#### *4.2.3.3 The Pregnancy Experience Scale*

Expectant fathers were asked to answer the PES questions with regard to the pregnancy and how positive or negative this made them feel. Four questions were removed from the list of possible uplifts and five questions were removed from the list of possible hassles as they were not relevant to fathers-to-be. Questions removed included those relating to comments from others, feelings about being pregnant and discomfort due to pregnancy. Frequency scores for fathers range from 0 - 6 and 0 - 5 (instead of 0-10) for uplifts and hassles respectively.

#### *4.2.3.4 The Five Facet Mindfulness Questionnaire-Short Form*

The FFMQ-SF is used to measure dispositional mindfulness. The FFMQ-SF ranges from 24 (low) to 120 (high) with each question scored from 1-5 and has been shown to be a reliable, acceptable model fit for the FFMQ (Bohlmeijer et al., 2011).

Remaining measures of mood were unchanged and are outlined in chapter 3 (see page numbers above).

## 4.3 Results

For the purposes of primary analysis the samples from the short and full courses were pooled into two subsamples of male and female participants. This is due to a lack of subsample independence between the groups and because some of the measures for the two groups are slightly different (i.e. pregnancy measures for men have been edited to reflect their partner's pregnancy or irrelevant items have been removed). Because couples attended

the courses together, we cannot be sure that their scores did not impact on one another potentially resulting in non-independent data if analysed together. Analyses examining the potential differences between course types are presented in a subsequent section.

### *4.3.1 Data checks: Outliers, normality and homogeneity*

The data was checked for outliers and issues with score distribution. Shapiro Wilk's tests indicated that the frequency of pre-course scores of uplifts, $W(18)= 0.780$, $p =.001$, and hassles, $W(18)= 0.890$, $p<.05$, were significantly non-normal for the sample of mothers. Shapiro Wilk's tests for fathers showed positive pregnancy experience frequency, $W(10)= 0.805$, $p<.05$, scores as non-normal. Interpreting these results in conjunction with histograms, the analysis using the PES subscales was conducted using non-parametric testing.

### *4.3.2 Sample characteristics*

Data from 18 expectant mothers[26] (13 on the short course and 5 on the full course) and 13 expectant fathers[27] (9 on the short course and 4 on the full course) was analysed.

Age data were unavailable for participants taking the short course. The age of expectant mothers-to-be taking the full course ($n = 5$) ranged from 30-38 years (mean 33). Seven expectant mothers were in their second trimester and 11 were in their third trimester. Remaining sociodemographic data was missing for one of the expectant mothers. Eight of the expectant mothers had children. All expectant mothers were educated to at least degree level (13 postgraduate).

[26] 2 mothers-to-be on the short course did not complete pre-course measures so their data were removed.

[27] 1 expectant father did not complete the TPDS, OWLS or PES pre and post-course, 1 did not complete the OWLS pre-course and another did not complete the PES pre-course. 1 expectant father omitted 3 of the pre-course positive PES questions so this measure data was removed. None of the expectant fathers on the full course completed the OWLS or PES post-course.

The age of fathers-to-be (*n* = 4) attending the full-course ranged from 31-46 years (mean 36). Four expectant fathers participated during the second trimester and 9 during the third trimester. One father's education data was missing, all others (*n* = 12) were educated to at least A-level (5 postgraduate). All participants were married and had been in their relationships between 5 and 23 years (mean 10 years).

### *4.3.3 Mood at baseline*

For baseline mood, see Table 4-1.

**Table 4-1 Baseline Mood for all Participants**

| Measure | Expectant Mothers n = 18 | | Expectant Fathers n = 13[1] | |
|---|---|---|---|---|
| *General mood* | Mean | *SD* | Mean | *SD* |
| PSS | 18.56 | 5.19 | 13.08 | 4.65 |
| GAD7 | 9.39 | 5.33 | 3.54 | 1.81 |
| *Pregnancy specific mood* | | | | |
| EPDS | 9.22 | 5.48 | 5.00 | 3.92 |
| TPDS | 17.72 | 6.19 | 12.25 | 5.28 |
| TPDS-Partner Involvement | 3.11 | 2.27 | 3.67 | 2.35 |
| OWLS[2] | 28.65 | 6.29 | 31.55 | 4.84 |
| PES Positive Frequency | 8.72 | 1.67 | 3.54 | 1.81 |
| PES Negative Frequency | 6.89 | 2.54 | 2.70 | 1.49 |
| PES Positive Intensity | 1.90 | 0.38 | 1.94 | 0.51 |
| PES Negative Intensity | 1.53 | 0.41 | 1.11 | 0.51 |
| *Dispositional mindfulness* | 77.61 | 10.90 | 83.31 | 7.49 |

[1](TPDS n = 12, OWLS *n* = 11, PES *n* =10)
[2]1 expectant mother attending the full course did not complete all of the pre-course OWLS, answering 3 out of a possible 10 questions so this data was removed.
NB. OWLS is reversed scored where lower scores indicate higher levels of labour worry. TPDS Partner Involvement is reverse scored where higher scores indicate lower perceived involvement (and therefore higher distress).

Mean baseline scores for expectant mothers indicated a level of stress on the PSS higher than the published population norms (between 11.9 and 14.7) (Cohen & Williamson, 1988), a moderate level of anxiety on the GAD-7, where 10 is the cut-off (Spitzer et al.,

2006), a moderate level of depression on the EPDS, where a score of 9/10 indicates probable depression (Cox et al., 1987), a notable level of distress on the TPDS where a score of 17 indicates "pregnancy-related distress" (Pop et al., 2011), and a 'typical' level of labour worry on the OWLs, where a previous non-clinical sample scored a mean of 25.15 (Redshaw et al., 2009). Participants reported more frequent but less intense positive pregnancy experiences on the PES compared to a previous sample (6.5-7.5 for uplifts frequency and 2.4 for intensity) and a less frequent number of negative experiences of a similar intensity to that previously found (previous sample means 9.5 for hassle frequency and 1.4 for intensity) (DiPietro et al., 2008).

Mean baseline scores for expectant fathers indicated mild to no depression and anxiety, stress levels within the range for published population norms and mild pregnancy-related distress and labour worry.

Expectant mothers and fathers reported a similarly high level of partner involvement (3.11 and 3.67 respectively out of a possible 12, where 0 is the highest possible score for perceived involvement).

Previous research evaluating mindfulness courses for pregnant women using the 39-item FFMQ report baseline scores for non clinical samples of 119.64 (24-item equivalent 74) (Guardino et al., 2013) and 121.55 (24-item equivalent 75) (Woolhouse et al., 2014), similar to the baseline score of the current sample of pregnant women.

### *4.3.4 Analysis for expectant mothers*

#### *4.3.4.1 Pre-post comparison of general mood data for expectant mothers*

Table 4-2 shows the results of paired t-tests examining the changes in general mood scores for expectant mothers pre-to-post course. There were significant improvement in stress and anxiety scores.

**Table 4-2 Expectant mothers change in general mood (stress and anxiety) pre to post-course[1]**

| | Pre-Course *n* = 17 | | Post-course *n* = 17 | | | | | |
|---|---|---|---|---|---|---|---|---|
| Measure | Mean | *SD* | Mean | *SD* | 95% CI | *t* (16) | *p* | ES(*g*) |
| PSS Stress | 18.00 | 4.77 | 15.47 | 6.21 | 0.71, 4.35 | 2.95 | **.009** | **0.45** |
| GAD-7 Anxiety | 8.82 | 4.90 | 6.29 | 4.27 | 1.04, 4.02 | 3.60 | **.002** | **0.54** |

[1]1 expectant mother did not complete the post-course measures.
NB. Significant differences and effect sizes at or above threshold for small (0.2) presented in bold.

#### *4.3.4.2 Pre-post pregnancy-related mood for expectant mothers*

Paired t-tests examined the change in pregnancy specific mood measures, see Table 4-3. There were significant improvements in TPDS pregnancy distress and partner involvement. Labour worry declined, though not significantly, showing a small effect size; most notably one participant's labour worry reduced from 9 to 36 where 40 indicates the minimum score of worry. The intensity of uplifts showed a positive trend and moderate effect size.

**Table 4-3 Expectant mothers pregnancy specific mood pre to post-course**

| | Pre-course *n* = 17 | | Post-course *n* = 17 | | | | | |
|---|---|---|---|---|---|---|---|---|
| Measure | Mean | *SD* | Mean | *SD* | 95% CI | *t* (16) | *p* | ES(*g*) |
| EPDS Depression | 8.71 | 5.18 | 7.65 | 4.99 | -0.61, 2.73 | 1.34 | .198 | **0.20** |
| TPDS Distress | 16.94 | 5.39 | 12.76 | 5.70 | 1.55, 6.81 | 3.37 | **.004** | **0.74** |
| TPDS-Partner Involvement | 3.00 | 2.29 | 2.41 | 2.12 | 0.04, 1.14 | 2.28 | **.037** | **0.26** |
| OWLS Labour worry (*n* = 16) | 29.31 | 5.85 | 30.50 | 5.29 | -2.95, 0.58 | -1.43(15) | .172 | **0.21** |
| PES[1] Uplifts Frequency | 8.65 | 1.69 | 8.94 | 1.48 | -0.88, 0.35 | -0.86 | .406 | 0.18 |
| PES Hassles Frequency | 6.82 | 2.60 | 6.18 | 2.19 | --0.12, 1.53 | 1.54 | .161 | **0.26** |
| PES Uplifts Intensity | 1.87 | 0.38 | 2.10 | 0.37 | -0.43, -0.03 | -2.09 | .062 | **0.60** |
| PES Hassles Intensity | 1.49 | 0.38 | 1.39 | 0.40 | -0.04, 0.24 | 1.30 | .202 | **0.25** |

NB. Significant differences and effect sizes at or above threshold for small (0.2) presented in bold.
The OWLS and TPDS Partner Involvement scales are reverse scored.

[1] PES T-tests were bootstrapped owing to non-normal distribution.

#### *4.3.4.3 Pre-post mindfulness in expectant mothers*

Dispositional mindfulness ($n$ = 17) significantly increased from pre-course (mean 78.06, *SD* 11.06) to post-course (mean 84.59, *SD* 11.90, Hedge's $g$ = -0.56), $t(16)$=-3.74, $p$<.005. To explore whether rates of dispositional mindfulness and mood were related, first, correlations were run on the baseline scores ($n$ = 18). There were no significant correlations with general mood incorporating stress ($r$ = -0.278, $p$>.05) or anxiety ($r$ = -0.310, $p$>.05). Further, there were no significant correlations with measures of pregnancy specific mood including depression ($r$ = -0.353, $p$>.05), distress ($r$ = -0.093, $p$>.05), partner involvement ($r$ = 0.147, $p$>.05), labour worry ($r(17)$= 0.261, $p$>.05), frequency of uplifts ($r_s$ = -0.051, $p$>.05) or hassles ($r_s$ = -0.185, $p$>.05) or the intensity of uplifts ($r_s$ = 0.237, $p$>.05), though there was a trend for hassle intensity ($r_s$ = -0.413, $p$=.089).

Next, regressions were run to explore whether the increase in dispositional mindfulness predicted the change in those pregnancy measures which significantly improved post-course, namely TPDS distress, TPDS partner involvement and PES positive pregnancy experience intensity (showing a near significant trend and a moderate effect size[28]).

The independent variables of pre-course TPDS and FFMQ were entered into step one to control for baseline distress and mindfulness. Post-course mindfulness was the independent variable entered into step two of the regression to assess the impact of post-course mindfulness. Post-course distress was the dependent variable. See Table 4-4 for the results of the multiple regression.

[28] 0.5 or higher for Hedge's $g$

**Table 4-4 Linear model of mindfulness predictor of distress with baseline distress and mindfulness covariates**

| *Step 1* | *B* | Standard Error | *β* | *p* |
|---|---|---|---|---|
| TPDS Baseline | 0.61 (0.17, 1.05) | 0.21 | .58 | <.05 |
| FFMQ Baseline | -0.19 (-0.40, 0.03) | 0.10 | -.37 | >.05 |
| *Step 2* | | | | |
| TPDS Baseline | 0.51 (0.20, 0.83) | 0.14 | .49 | <.01 |
| FFMQ Baseline | 0.20 (-0.06, 0.45) | 0.12 | .39 | <.05 |
| FFMQ Post-course | -0.45 (-0.69, -0.21) | 0.11 | -.94 | =.001 |

Note: Dependent variable: TPDS Post-course. $R^2$=.47 ($p$<.05) for step 1; $\Delta R^2$=.30 for step 2 ($p$<.001)

Controlling for baseline distress severity and dispositional mindfulness, an increase in post-course mindfulness predicted a decrease in post-course distress.

To assess whether an increase in mindfulness predicted an increase in perceived partner involvement (TPDS-PI), scores for baseline mindfulness and partner involvement were entered into step one of a regression as covariates. Post-course mindfulness was entered into step two of the model to assess the impact of baseline mood and post-course mindfulness accounting for baseline mood. See Table 4-5 for the results of the regression.

**Table 4-5 Linear model of mindfulness predictor of partner involvement with baseline partner involvement and mindfulness covariates**

| *Step 1* | *B* | Standard Error | *β* | *p* |
|---|---|---|---|---|
| TPDS-PI Baseline | 0.86 (0.63,1.08) | 0.11 | .93 | <.001 |
| FFMQ Baseline | -0.04 (-0.09, 0.01) | 0.02 | -.20 | >.05 |
| *Step 2* | | | | |
| TPDS-PI Baseline | 0.84 (0.62, 1.05) | 0.10 | .90 | <.001 |
| FFMQ Baseline | 0.01 (-0.06, 0.09) | 0.03 | .06 | >.05 |
| FFMQ Post-course | -0.06 (-0.13, 0.01) | 0.03 | -.32 | >.05 |

Note: Dependent variable: TPDS-PI Post-course. $R^2$=.83 ($p$<.001) for step 1; $\Delta R^2$=.04 for step 2 ($p$>.05)

For TPDS partner involvement, neither baseline mindfulness nor post-course mindfulness predicted post-course partner involvement scores. Baseline TPDS partner involvement was a predictor of post-course partner involvement.

A bootstrapped regression (owing to the non-normal distribution of the PES) was run examining the impact of post-course mindfulness on positive pregnancy experience intensity. As before, the independent variables to control for baseline PES positive intensity (PES-Pos-Intensity) and FFMQ mindfulness were entered into step one, with post-course FFMQ mindfulness as the independent variable entered into step two and PES positive post-course intensity as the dependent variable. See Table 4-6.

**Table 4-6 Linear model of mindfulness predictor of positive pregnancy experience intensity with baseline intensity and mindfulness covariates, with 95% bias corrected and accelerated confidence intervals reported in parentheses.**

| *Step 1* | *B* | Standard Error | *β* | *p* |
|---|---|---|---|---|
| PES-Pos-Intensity Baseline | 0.47 (-0.01,0.90) | 0.23 | .47 | =.057 |
| FFMQ Baseline | -0.01 (-0.03, 0.01) | 0.01 | -.40 | >.05 |
| *Step 2* | | | | |
| PES-Pos-Intensity Baseline | 0.47 (0.10, 0.91) | 0.21 | .48 | <.05 |
| FFMQ Baseline | -0.04 (-0.06, -0.02) | 0.01 | -1.07 | <.05 |
| FFMQ Post-course | 0.03 (0.00, 0.05) | 0.01 | .83 | >.05 |

Note: Dependent variable: PES-Pos-Intensity Post-course.$R^2$=.23 ($p$>.05) for step 1; $\Delta R^2$=.24 for step 2 ($p$<.05). Confidence intervals and standard errors based on 1000 bootstrap samples.

When controlling for baseline pregnancy experience and mindfulness, post-course mindfulness did not predict post-course pregnancy experience intensity[29]. However, when including post-course mindfulness into the regression model, there was an $R^2$ change of 0.24, ($p$<.05) resulting in a significant prediction model for positive pregnancy experience.

[29] There was evidence of multicollinearity for baseline and post-course mindfulness (sharing 0.89 variance of 0.003 eigenvalue).

#### *4.3.4.4 Exploration of perceived partner involvement for expectant mothers*

As shown in Table 4-3, perceived partner involvement significantly increased from pre to post-course. To examine the hypothesis that the increase in partner involvement would be associated with a reduction in negative mood and experience, correlations were run examining the relationship with baseline data ($n$ = 18). There were no significant relationships with general mood, incorporating stress ($r$ = 0.19, $p$>.05) and anxiety ($r$ = -0.37, $p$>.05) . For pregnancy specific measures of mood, there were no significant correlations with depression ($r$ = -0.14, $p$>.05), labour worry ($r$ = 0.07, $p$>.05), hassle frequency ($r_s$ = -0.86, $p$>.05) or intensity ($r_s$ = -0.15, $p$>.05), though there was a trend for uplift frequency ($r_s$ = -0.46, $p$ =.052) and intensity ($r_s$ = -0.46, $p$ =.056).

### *4.3.5 Analysis for expectant fathers*

#### *4.3.5.1 Pre-post comparison of general mood data for expectant fathers*

Table 4-7 shows the scores, paired t-test results and effect sizes for general stress and anxiety pre to post-course.

**Table 4-7 General mood pre to post-course (stress and anxiety) for expectant fathers**

| | Pre-course $n$ = 13 | | Post-course $n$ = 13 | | | | | |
|---|---|---|---|---|---|---|---|---|
| Measure | Mean | *SD* | Mean | *SD* | 95% CI | $t$ (12) | $p$ | ES ($g$) |
| PSS Stress | 13.08 | 4.65 | 13.15 | 4.38 | -2.21, 2.05 | -0.08 | .939 | 0.02 |
| GAD-7 Anxiety | 3.54 | 1.81 | 3.23 | 1.92 | -0.72, 1.34 | 0.65 | .527 | 0.16 |

Levels of stress and anxiety remained stable and mild pre to post-course.

#### *4.3.5.2 Pre-post pregnancy-related mood for expectant fathers*

Pregnancy related mood measures were examined in expectant fathers pre to post-course, see Table 4-8. There were no statistically significant improvements. Pregnancy related distress decreased post-course showing a moderate effect size and statistical trend.

**Table 4-8 Expectant father's pregnancy specific mood pre to post-course and post-course measure**

| | Pre-course $n = 13$[1] | | Post-course $n = 13$[2] | | | | | |
|---|---|---|---|---|---|---|---|---|
| Measure | Mean | *SD* | Mean | *SD* | 95% CI | *t (df)* | *p* | ES (*g*) |
| EPDS Depression | 5.00 | 3.92 | 5.08 | 3.68 | -1.65, 1.49 | -0.11(12) | .917 | 0.02 |
| TPDS Distress | 12.25 | 5.28 | 9.50 | 3.48 | -0.34, 5.84 | 1.96(11) | .076 | **0.59** |
| TPDS-Partner Involvement | 3.67 | 2.35 | 2.83 | 1.70 | -0.31, 1.98 | 1.60(11) | .137 | **0.40** |
| OWLS Labour Worry | 31.55 | 4.84 | 32.88 | 3.04 | -5.63, 2.77 | -0.83(6) | .437 | **0.31** |
| PES[3] Uplifts Frequency | 5.10 | 0.88 | 5.63 | 0.52 | -0.86, 0.14 | -1.44(6) | .230 | **0.69** |
| PES Hassles Frequency | 2.70 | 1.49 | 2.63 | 1.85 | -1.14, 1.43 | 0.20(6) | .856 | 0.04 |
| PES Uplifts Intensity | 1.94 | 0.51 | 1.80 | 0.42 | -0.04, 0.20 | 0.99(6) | .412 | **0.28** |
| PES Hassles Intensity | 1.11 | 0.51 | 1.25 | 0.83 | -1.18, 0.58 | -0.26(6) | .767 | 0.19 |

[1](TPDS $n = 12$, OWLS $n = 11$ & PES $n = 10$)
[2](TPDS $n = 12$, OWLS & PES $n = 8$, $n = 7$ pairwise)
[3] PES T-tests are bootstrapped owing to non-normal distribution.
NB. Effect sizes at or above threshold for small (0.2) presented in bold. The OWLS and TPDS Partner Involvement scales are reverse scored.

#### *4.3.5.3 Exploration of mindfulness for expectant fathers*

Dispositional mindfulness ($n = 13$) did not increase significantly from pre-course (mean 83.31, *SD* 7.49) to post-course (mean 86.65, *SD* 5.65), $t(12)=-1.53$, $p>.05$ (Hedge's $g = 0.49$).

Correlations were run on the baseline scores to explore whether rates of dispositional mindfulness and mood were related. There were no significant correlations with general mood ($n$ = 13) incorporating stress ($r$ = -0.013, $p$>.05) and anxiety ($r$ = 0.018, $p$>.05). Further, there were no significant correlations with measures of pregnancy specific mood including depression ($r$ = -0.284, $p$>.05), distress ($r(12)$= 0.218, $p$>.05), partner involvement ($r(12)$= 0.094, $p$>.05), labour worry ($r(11)$= 0.361, $p$>.05), or the frequency ($r_s(10)$= 0.559, $p$>.05) or intensity of uplifts ($r_s(10)$= 0.165, $p$>.05), or with the intensity of hassles ($r_s(10)$= 0.580, $p$>.05). There was a significant positive correlation with mindfulness and the frequency of hassles ($r_s(10)$= 0.761, $p$<.05).

To explore whether dispositional mindfulness predicted the change in mood, a regression was run with TPDS distress ($n$ = 12) which showed a statistical trend and moderate effect size for change pre to post-course. The independent variables entered into step one were baseline TPDS distress and baseline FFMQ mindfulness as covariates with post-course mindfulness entered into step two and post-course TPDS distress as the dependent variable. See Table 4-9.

**Table 4-9 Linear model of mindfulness predictor of distress with baseline distress and mindfulness covariates**

| *Step 1* | *B* | Standard Error | *β* | *p* |
|---|---|---|---|---|
| TPDS Baseline | 0.30 (-0.16,0.80) | 0.20 | .45 | >.05 |
| FFMQ Baseline | -0.02 (-0.33, 0.29) | 0.14 | -.05 | >.05 |
| *Step 2* | | | | |
| TPDS Baseline | 0.31 (-0.20, 0.82) | 0.22 | .47 | <.05 |
| FFMQ Baseline | -0.03 (-0.37, 0.32) | 0.15 | -.06 | <.05 |
| FFMQ Post-course | 0.04 (-0.43, 0.50) | 0.20 | .06 | >.05 |

Note: Dependent variable: TPDS Post-course.$R^2$=.20 ($p$>.05) for step 1; $\Delta R^2$=.003 for step 2 ($p$>.05).

Neither post-course mindfulness nor baseline mindfulness or baseline distress predicted post-course distress scores. The small sample size ($n$ = 7) meant that no further

investigation of the relationship with mindfulness and pregnancy experiences could be conducted.

#### *4.3.5.4 Exploration of perceived partner involvement for expectant fathers*

Perceived partner involvement[30] for fathers did not increase significantly after the course but showed a small effect size, see Table 4-8. There were no correlations with perceived partner involvement and measures of general mood ($n$ = 12) including stress ($r$ = -0.387, $p$>.05) and anxiety ($r$ = -0.409, $p$>.05). Partner involvement was not correlated with pregnancy measures of depression ($r$ = -0.341, $p$>.05), labour worry ($r(11)$= -0.398, $p$>.05), intensity of uplifts ($r_s$ (10)= -0.485, $p$>.05) or hassles ($r_s(10)$= 0.244, $p$>.05) or the frequency of hassles ($r_s(10)$= 0.233, $p$>.05). There was a negative trend with partner involvement and the frequency of uplifts ($r_s(10)$= -0.608, $p$ =.06).

### *4.3.6 Comparison of course types*

The samples of men and women were split by course type (short vs long) to examine any differences between in the two courses. The short course sample consisted of 13 expectant mothers and 9 expectant fathers and the full course consisted of 5 expectant mothers and 4 expectant fathers.

#### *4.3.6.1 Short-course sample characteristics*

Age data were unavailable for participants taking the short course. Four mothers were in their second trimester of pregnancy and nine were in their third. Seven of expectant mothers already had children. All mothers taking the short course had degrees (10 postgraduate).

[30] Measuring how involved they perceived their partner to be.

Two fathers participated in the short course during the second trimester and seven during the third. One father's education data was missing, all others (*n* = 8) were educated to at least A-level (5 postgraduate). All participants taking the short course were married (range 5-23 years, mean 10.7).

#### *4.3.6.2 Full-course sample characteristics*

The age of expectant mothers taking the full course (*n* = 5) ranged from 30-38 years (mean 33). Three mothers were in their second trimester and two were in their third. Remaining sociodemographic data was missing for one of the expectant mothers completing the full course. One of the expectant mothers had children (*n* = 4). Three expectant mothers had postgraduate degrees and one had a degree.

The age of fathers-to-be (*n* = 4) attending the full-course ranged from 31-46 years (mean 36). Two fathers took the full course during the second trimester and two during the third. Three fathers had postgraduate degrees and one had a degree. All participants taking the full course were married (range 6-11 years, mean 9).

#### *4.3.6.3 Mood at baseline*

Baseline measure data for mothers and fathers in the two course groups is shown in Table 4-10.

**Table 4-10 Baseline data for expectant mothers and fathers split by course type**

| | Expectant mothers | | | | Expectant Fathers | | | |
|---|---|---|---|---|---|---|---|---|
| | *Short course n = 13* | | *Full course n = 5*[1] | | *Short course n = 9*[2] | | *Full course n = 4*[3] | |
| **Measure** | **Mean** | ***SD*** | **Mean** | ***SD*** | **Mean** | ***SD*** | **Mean** | ***SD*** |
| PSS Stress | 19.00 | 5.35 | 17.40 | 5.13 | 14.00 | 4.56 | 11.00 | 4.76 |
| GAD-7 Anxiety | 9.54 | 5.06 | 9.00 | 6.60 | 3.44 | 1.51 | 3.75 | 2.63 |
| EPDS Depression | 9.23 | 5.07 | 9.20 | 7.12 | 5.56 | 3.78 | 3.75 | 4.50 |
| TPDS Distress | 17.69 | 6.59 | 17.80 | 5.72 | 13.00 | 6.30 | 10.75 | 2.22 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| TPDS Partner Involvement | 3.38 | 2.40 | 2.40 | 1.95 | 3.88 | 2.23 | 3.25 | 2.87 |
| OWLS Labour Worry | 27.77 | 6.57 | 31.50 | 4.93 | 31.43 | 5.62 | 31.75 | 3.86 |
| PES Uplift Frequency | 8.69 | 1.84 | 8.80 | 1.30 | 5.14 | 0.90 | 5.00 | 1.00 |
| PES Hassle Frequency | 7.31 | 2.43 | 5.80 | 2.77 | 2.57 | 1.72 | 3.00 | 1.00 |
| PES Uplift Intensity | 1.92 | 0.36 | 1.84 | 0.46 | 1.90 | 0.47 | 2.01 | 0.69 |
| PES Hassle Intensity | 1.57 | 0.44 | 1.43 | 0.33 | 1.12 | 0.61 | 1.08 | 0.14 |
| FFMQ Mindfulness | 77.54 | 10.82 | 77.80 | 12.40 | 85.22 | 6.48 | 79.00 | 8.76 |

[1]OWLS n = 4
[2]TPDS n = 8, OWLS & PES n =7
[3]PES n = 3
NB The OWLS and TPDS Partner Involvement scales are reverse scored.

There were no significant differences in baseline scores for mothers or fathers depending on the course taken. The baseline scores were not dissimilar to the pooled data.

#### *4.3.6.4 Pre-post comparison of general mood data by course*

The outcomes which significantly improved for the pooled sample of expectant mothers or showed a moderate effect size for the pooled sample of expectant fathers were examined split by course type[31], see Table 4-11.

**Table 4-11 Significant improvements compared by course type**

| | *Expectant mothers* | |
|---|---|---|
| Measure | Short-course ES (*d*) *n* = 12[1] | Full-course ES (*d*) *n* = 5 |
| TPDS Distress | 0.38 | **1.93** |
| TPDS Partner Involvement | 0.14 | **0.67** |
| FFMQ Mindfulness | 0.30 | **1.40** |
| | *Expectant fathers* | |
| Measure | Short-course ES (*d*) *n* = 9 | Full-course ES (*d*) *n* = 4 |
| TPDS[2] Distress | **0.71** | 0.33 |
| FFMQ Mindfulness | 0.14 | **1.33** |

[1] Post-course data missing for one participant
[2] TPDS data missing for one participant
NB. Higher effect size comparing course type presented in bold

[31] Comparison of PES uplifts was omitted as full-course fathers did not complete the post-course measure

All significant improvements found initially produce larger effect sizes for participants taking the full-course except for TPDS distress in fathers which showed a greater effect for participants taking the short course.

#### *4.3.6.5 Perceived partner involvement*

Perceived partner involvement increased for participants taking either MBCP course (distress decreased). Participants taking the short course started with lower perceived partner involvement than their full-course counterparts and had less of an increase in perceived partner involvement. See Figure 4-1.

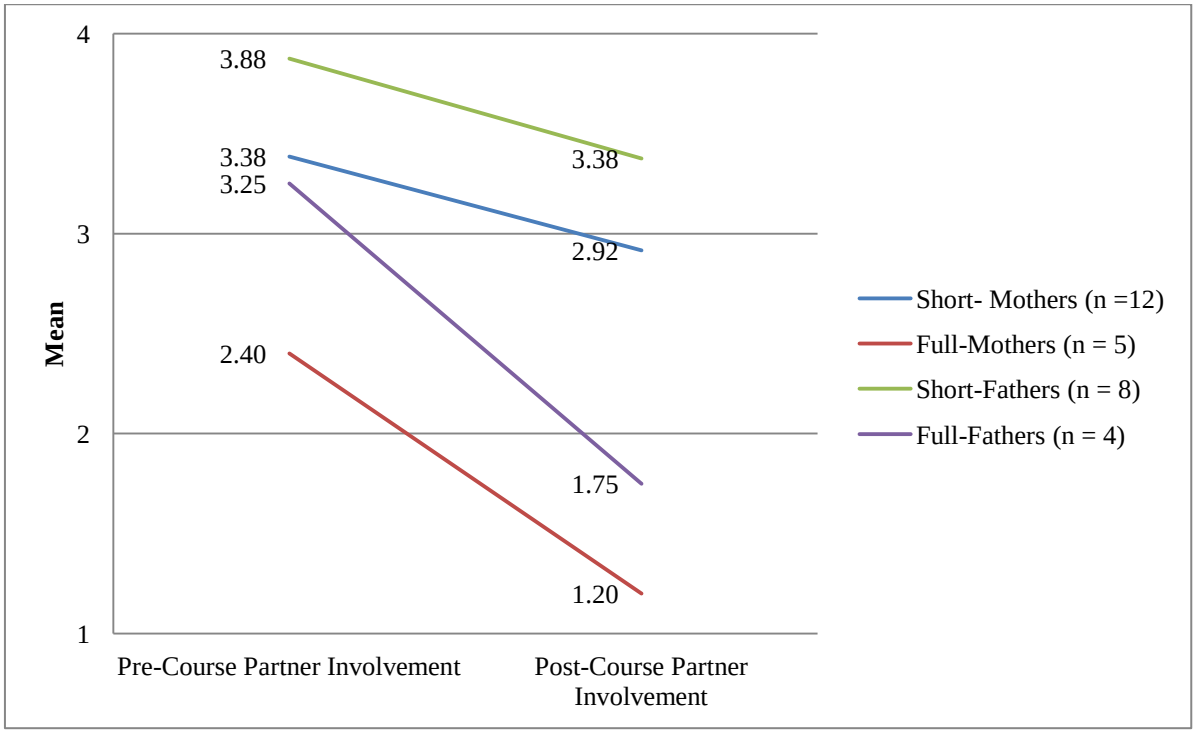


**Figure 4-1 Mean TPDS Partner Involvement Pre-to Post Course**
NB. Lower scores represent higher perceived partner involvement.

## 4.4 Discussion

The aim of this investigation was to evaluate Mindfulness-Based Childbirth & Parenting (MBCP) courses delivered in person to prospective parents for improvements in mood. Earlier studies had shown promise but had not evaluated the potential of shortened courses, had very little evaluation of the potential benefits to prospective fathers and had

not examined the change in pregnancy related distress, labour worry or pregnancy experience.

Participants completing these courses appear to find them helpful with an overall improvement in mood pre to post-course. Stress, anxiety and distress decreased and perceived partner involvement and positive pregnancy experience intensity increased in expectant mothers taking the MBCP courses. Expectant fathers showed similar benefits with pregnancy specific mood, particularly distress and the frequency of positive pregnancy experiences. All improvements showed larger effect sizes for the full course participants when split by course type, except for pregnancy distress in men which showed a larger effect size for the short course.

The difference in mood improvements in male and female participants may be due to the baseline scores, where expectant fathers began with mild scores for general mood with less scope for improvement. There is also a possibility that men and women benefit from different elements of the course. That women improve in general and pregnancy specific measures of mood and men improve in pregnancy specific mood may reflect the elements of the course which are most beneficial to the two groups; perhaps women are attending for pregnancy education and stress reduction and men are attending primarily for pregnancy education, without the need to reduce their stress levels. That expectant fathers completing the short course showed a larger effect size for distress than those attending the full course also supports the notion that they are attending for pregnancy information.

All course participants showed an increase in dispositional mindfulness and higher levels predicted lower distress for women but not for men. Mindfulness at baseline showed positive trends when correlated with hassle intensity in women and the frequency of uplifts and hassles in men. Further research with larger samples would be required to explore this

further. It would be important to elucidate whether men and women benefit from these courses in different ways to better tailor them to participants at this time of life.

Mindfulness did not predict any difference in perceived partner involvement in women and the two seemed unrelated in men, suggesting that there are different mechanisms of change at work in these courses. It was theorised that becoming more aware and accepting (mindful) may bring awareness to and increase partner involvement through helping with communication and because previous research suggests that mindfulness courses can improve relationships. Examining perceived partner involvement alone indicated that while it was related to the frequency and intensity of pregnancy experiences in men and women, it did not predict improved frequency and intensity for women. Higher partner involvement was associated with more uplifting experiences for men and it seems plausible that men would notice more pregnancy related experiences by taking part in the course with their partners and bringing more attention to the pregnancy. This may also explain why the frequency of negative pregnancy experiences increases post-course for men. In terms of causality, it may be that having less pregnancy experiences also discourages partner involvement, i.e. there may be less to discuss. This result is not unexpected because the pregnancy experiences measure includes questions about how the couple are enjoying the pregnancy together.

Perceived partner involvement was higher and showed a larger increase for participants taking the full course. This seems logical given that the full course requires more time, money and commitment so the couples participating together would likely feel their partners are highly involved in the pregnancy before and after the course. The short course participants also indicated an increase in perceived partner involvement which is to be expected having participated in a course together, especially because the couples will have

been discussing and learning about the pregnancy, birth and considering their lives as parents afterwards.

The current study does have limitations. First, there was no control group so we cannot be sure that the mindfulness courses were responsible for mood improvement or whether this result represents reversion to the mean or natural progression over pregnancy. Previous literature suggests that there is an increase in stress, anxiety and depression over pregnancy and the results showing that negative mood decreases post-course in women seem promising.

Second, the sample sizes are small, particularly for any analyses splitting the two samples and only reflect the responses of those offering to participate in the study. The data available gives an indication of potential benefits for course completers who were also willing to complete questionnaires. Without examining the change in more participants, it is unclear whether life events, usual changes in mood, or the course was responsible for any improvements. More research is needed to evaluate the benefits of these courses with a larger number of participants, particularly to evaluate the usefulness for expectant fathers.

Third, there is no follow-up data available so it is unclear whether these changes are maintained. It may be hypothesised that benefits resulting from participation in the full course could be maintained for a longer time than those found with the short course but this data is unavailable. Whether participants continue to use the information given to them during the classes or continue to practice may also be beneficial but further research is required to investigate this.

Fourth, the sociodemographic information showing a relatively mature group of expectant parents, with a high level of education, all living in and around Oxford, mean that the results cannot be generalised to other populations. It has been noted previously that

mindfulness programmes are usually taken by people who are 'highly-resourced' and motivated (Woolhouse et al., 2014), resulting in a relatively older and more educated sample than the average, which seems to be the case in this study. This sample is not representative of others who may benefit around the UK and elsewhere.

Lastly, there is missing data. The measures for labour worry and pregnancy experience were not completed by expectant fathers completing the full course so that analysis was unavailable.

Even though there are limitations with this investigation, it was one of the first to evaluate the efficacy of an MBCP course in two forms and for use with both prospective parents. Anecdotally, good rates of class adherence suggest that these courses are acceptable to prospective parents, perhaps because of social norms whereby couples frequently attend pregnancy and childhood preparation courses together. If this be the case then these courses are likely to carry no social stigma as 'educational' classes but have the potential to improve well-being in expectant mothers experiencing low mood. This could be particularly helpful during pregnancy because of any fear surrounding requests for psychiatric help.

In conclusion, the results for the usefulness of these courses show potential and a need for further investigation. The next step was to re-evaluate dispositional mindfulness and mood in a larger sample and to then evaluate the usefulness for mothers-to-be taking an online MBCT course. The potential utility of a more accessible course for improvements in mood pre and post-birth would be evaluated.

# 5 Chapter 5. A Cross-Sectional Replication of Dispositional mindfulness & Mood during Pregnancy

## 5.1 Introduction

This study explored measures of dispositional mindfulness and mood during pregnancy to investigate whether the findings of chapter three were replicated in a larger sample.

Previous studies found that higher dispositional mindfulness is associated with lower levels of anxiety, depression and distress during pregnancy (Truijens et al., 2015; van den Heuvel et al., 2015). Chapter three found that higher levels of dispositional mindfulness were associated with lower levels of pregnancy-related depression and distress and general stress and anxiety in a cross-sectional analysis. Higher levels of mindfulness were associated with lower levels of pregnancy-related discomforts and hassles.

Anxiety over pregnancy trimesters has been shown to be at its lowest during the second trimester (Newham et al., 2012). Similarly, chapter three showed that people during the second trimester scored lower for negative mood compared with participants in their first or third trimesters. When examining the sample in terms of gestational age, labour worry was lowest for people in their first trimester and highest for those in their third. When examining differences in mood by parity, expectant mothers who had no previous children were significantly more distressed and worried about labour and also reported higher levels of perceived partner support.

Two samples recruited for proceeding studies were combined to make a larger sample of pregnant women. Participants were recruited using similar methods to chapter three, but for two studies offering an online mindfulness course. A measure of general depression was also included for evaluation.

The hypotheses were replicated from chapter three (omitting the follow-up hypotheses as this data are unavailable):

(1) the measures for perceived stress, anxiety and depression previously found to reduce following an online mindfulness course would be correlated with pregnancy measures of depression and distress,

(2) higher dispositional mindfulness scores would be associated with lower levels of general stress, anxiety and depression,

(3) participants with higher dispositional mindfulness would score lower on the pregnancy measures of depression and distress.

Once more, gestational age and parity were explored to find whether the results from chapter three were replicated.

## 5.2 Methods

### *5.2.1 Participants*

The aim was to recruit 50 expectant mothers to a pilot study and a further 80 for a randomised study investigating the utility an online mindfulness course for pregnancy. Women were enlisted between 12 and 30 weeks of gestation and completed an online survey concerning dispositional mindfulness and mood. Participants were excluded if they had previously taken, or were currently taking, any type of mindfulness course, or if they lived outside of the European Union. The minimum age for participants was 18 years.

In total, 273 participants signed up to the studies, of which 207 participants completed the initial survey (22 of 36 for the pilot and 185 of 237 for the randomised study; 22 participants started and did not complete the initial survey).

### *5.2.2 Procedure*

The methods used to recruit were the same as in chapter three; the majority was online advertising, (Facebook, Twitter, Google Adwords, motherhood forums), emails to colleges and departments around the UK; and posters sent to baby-groups and shops in Oxford. The sign-up survey URLs were advertised alongside study information and contact details.

Participants in the pilot study were requested to sign-up, consent to the study, read the study information and submit contact details from 12-22 weeks gestation and were emailed a link to the survey questionnaires at 20-22 weeks gestation. Participants in the randomised study were invited to read the study information, consent and sign-up between 12-30 weeks gestation and invited to complete the survey (with a separate link) immediately. The questionnaires were completed using the Bristol Online Survey website (http://www.survey.bris.ac.uk/). There were no missing values because the online questionnaire site would not allow it.

Oxford CUREC Ethics approval was obtained for each study (pilot reference: MSD-IDREC-C1-2014-010, randomised study reference: MSD-IDREC-C1-2014-183).

### *5.2.3 Measures*

Measures were taken at 12-30 weeks gestation.

#### *5.2.3.1 Measures of mood and mindfulness*

The following measures were taken for the both samples (measures taken only for the pilot study were omitted due to small sample size):

- The Perceived Stress Scale (PSS; Cohen et al., 1983), see page 90.
- The Generalised Anxiety Disorder Scale (GAD-7; Spitzer et al., 2006), see page 91.
- The Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001), see page 72.

- The Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987); see page 91 .
- The Tilburg Pregnancy Distress Scale (TPDS; Pop et al., 2011); see page 92.
- The Oxford Worries about Labour Scale (OWLS; Redshaw et al., 2009); see page 93.
- The Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006); see below[32].
- A demographic questionnaire comprised of questions about age, familial and occupational status, alcohol and smoking habits and questions about previous birth experiences.

#### 5.2.3.1.1 The Five Facet Mindfulness Questionnaire

The FFMQ measures mindfulness in general ('what is generally true for you') and comprises of 39 items measuring five mindfulness facets: observe, describe, non-judgement, non-reactivity and awareness. Each item is scored from 1-5 so the measure ranges from 39 to 195, with higher scores indicating higher levels of dispositional mindfulness. An increase in dispositional mindfulness measured using the Five Factor Mindfulness Questionnaire (FFMQ; Baer et al., 2006) has been found following generic mindfulness courses delivered during pregnancy for clinical and non-clinical samples (Guardino et al., 2013; Miklowitz et al., 2015). Pregnancy-tailored courses have also resulted in an increase in dispositional mindfulness for women (Duncan & Bardacke, 2010; Woolhouse et al., 2014) and men (Gambrel & Piercy, 2014a), though one study showing a positive trend was not maintained at 3-month postpartum follow-up (Vieten & Astin, 2008).

## 5.3 Results

### *5.3.1 Data checks: Outliers, normality and homogeneity*

[32] Described in this chapter as previous scales for mindfulness were different (shorter) versions.

The data was checked for non-normal distribution and outliers. The total sample showed no outliers or concerns with normality. When examining the sample split by trimester (first *n* = 20, second *n* = 162, third *n* = 25), Shapiro Wilk's tests were significant for measures pertaining to the first or third trimesters indicating that data for the subsamples by trimester was non-normal. One outlier was found for the third trimester participants for the PHQ-9, however, the outlier score (27) was within the boundaries of -13.6 and 29.6 using Tukey's formula. Standardised residual scores were within reasonable limits for each measure and the outlier was not present for the total sample so the data was retained. Levene's test was significant for the OWLS scale indicating unequal variance by trimester, $F(2,204)=3.47$, $p<.05$ (plots showed no concerns).

The full sample needed no correction for analyses, however, examining the sample by trimester, the analysis was non-parametric or bootstrapped.

### *5.3.2 Sample characteristics*

Participants characteristics for survey completers are shown in Table 5-1.

**Table 5-1 Total study sample sociodemographics**

| **Participant Characteristics** *n* = 207 | % | *n* |
|---|---|---|
| Age (range 18-44 years) | mean: 31.5 years, mode: 34 years | |
| UK residents | 90.8% | 188 |
| Oxfordshire residents | 13.0% | 27 |
| Ethnicity British/White-British/White | 80.7% | 167 |
| Currently married or cohabiting | 90.3% | 187 |
| Living separately from partner | 5.8% | 12 |
| Relationship length (range 1 month - 21 years) | mean: 6.72 years, mode: 4 years | |
| Single (never together *n* = 1, previously together *n* = 5, friends *n* = 2) | 3.9% | 8 |
| Educated to high school/college level | 24.2% | 50 |
| Educated to degree level | 41.1% | 85 |

| | | |
|---|---|---|
| Educated to postgraduate level | 31.4% | 65 |
| Currently employed | 75.8% | 157 |
| Unemployed status-homemaker | 16.9% | 35 |
| Unemployed other (student, disability allowance, seeking employment) | 7.3% | 15 |
| Planned pregnancy | 71.0% | 147 |
| Months trying to conceive (range 0-60 months) | mean: 5.35 months, mode: 1 month | |
| Multiparous | 60.0% | 124 |
| One child (two *n* = 22, three *n* = 8, four *n* = 4, six *n* = 2) | 41.1% | 85 |
| First trimester | 9.7% | 20 |
| Second trimester | 78.3% | 162 |
| Third trimester | 12.1% | 25 |
| Physical ailments (non-perinatal; asthma, heart & blood pressure, diabetes, joint problems, IBS, hypothyroidism) | 27.0% | 56 |
| Mental health problems | 16.9% | 35 |
| -Mental health: Depression | 7.7% | 16 |
| -Mental health: Anxiety | 4.3% | 9 |
| -Mental health other or comorbid (bipolar, OCD, GAD, panic disorder, PTSD, phobias, depression, anxiety) | 5.3% | 11 |
| Practice yoga (daily-monthly, mode: 11.6% weekly *n* = 24) | 19.8% | 41 |
| Practice meditation (daily-monthly, mode: fortnightly 26.3% n = 5) | 9.2% | 19 |

Of note, most participants were located in the UK, educated to degree level or higher, married or cohabiting and employed. A majority of participants planned their pregnancies and over half of the sample already had children.

### *5.3.3 Mood at baseline*

There were no missing values for the measures of mood because the online questionnaire site would not allow incomplete pages to be submitted.

For baseline mood, see Table 5-2.

**Table 5-2 Baseline mood & mindfulness for the total sample and pilot study sample**

*Total sample n = 207*

| Measure | Mean | *SD* | Cronbach's α | Research Norms |
|---|---|---|---|---|
| PSS Stress | 20.66 | 7.16 | .91 | 11.9-14.7[33] |
| GAD-7 Anxiety | 8.72 | 5.16 | .89 | 2.7-3.8[34] |
| PHQ-9 Depression | 8.84 | 5.58 | .86 | 8.1[35] |
| OWLS Labour Worry | 27.84 | 6.60 | .83 | 25.15[36] |
| TPDS Pregnancy Distress | 21.03 | 8.37 | .81 | 10.67[37] |
| EPDS Pregnancy Depression | 11.79 | 5.81 | .88 | 7.6[38] |
| *FFMQ Mindfulness* | 116.46 | 21.82 | .93 | 119.64-121.55[39] |

The sample had more negative mood overall than in the previous cross-sectional study (chapter 3) and t-tests confirmed that this sample had significantly higher scores of PSS stress $t(361)= -3.51$, $p<.005$, GAD-7 anxiety $t(361)= -3.14$, $p<.01$, EPDS depression $t(361)= -3.95$, $p<.001$, TPDS distress $t(361)= -4.74$, $p<.001$ and reported less perceived partner support $t(353.90)= -4.03$, $p<.001$ (variance equality not assumed). Mood scores indicated high levels of stress and pregnancy-related distress and depression with scores meeting the 'mild' thresholds for anxiety and general depression.

### *5.3.4 Potential of the online mindfulness course for this population*

To examine whether the measures found to previously improve upon completion of an online mindfulness course were once more correlated with pregnancy-specific mood measures, now including the PHQ-9 for general depression, correlations were run on the PSS, GAD-7 and PHQ-9 with the EPDS and TPDS ($n$ = 207), see Table 5-3.

[33] (Cohen & Williamson, 1988)
[34] (Löwe et al., 2008a)
[35] (Flynn, Sexton, Ratliff, Porter, & Zivin, 2011)
[36] (Redshaw et al., 2009) Non-clinical sample of new mothers using the scale retrospectively.
[37] (Pop et al., 2011)
[38] (Cox et al., 1987; Cox et al., 1993) 9/10 potential for further screening; 12/13 probable depression.
[39] (Guardino et al., 2013; Woolhouse et al., 2014)

**Table 5-3 Correlations of general stress, anxiety & depression with pregnancy-related depression & distress**

| | EPDS Depression | TPDS Distress |
|---|---|---|
| PSS Stress | .771** | .536** |
| GAD-7 Anxiety | .751** | .578** |
| PHQ-9 Depression | .783** | .523** |

All measures were positively correlated ($p$ <.001).

### *5.3.5 The relationship between dispositional mindfulness and general mood*

Correlations examining dispositional mindfulness and general measures of stress, anxiety and depression ($n$ = 207) showed significant negative relationships; FFMQ with PSS stress ($r$ = -.638, $p$ <.001), GAD-7 anxiety ($r$ = -.618, $p$ <.001) and PHQ-9 depression ($r$ = -.557, $p$ <.001).

A MANOVA using the high/low ($n$ = 92/115) mean split showed that level of mindfulness had a significant effect on mood, $F(3,203)= 25.43$, $p$<.001, Roy's Largest Root, Θ =.38. The proceeding separate univariate ANOVAs showed that mindfulness had a significant effect on PSS stress $F(1,205)= 61.08$, $p$<.001, GAD-7 anxiety $F(1,205)= 52.14$, $p$<.001 and PHQ-9 depression $F(1,205)= 57.50$, $p$<.001. See Table 5-3 for the mean scores by high or low mindfulness.

**Table 5-4 General mood split by high or low mindfulness score**

| | **High mindfulness *n* = 92** | | **Low mindfulness *n* = 115** | |
|---|---|---|---|---|
| *Measure* | *Mean* | *SD* | *Mean* | *SD* |
| PSS Stress | 16.84 | 6.31 | 23.72 | 6.28 |
| GAD-7 Anxiety | 6.13 | 4.56 | 10.79 | 4.66 |
| PHQ-9 Depression | 5.92 | 4.28 | 11.17 | 5.41 |

### *5.3.6 The relationship between dispositional mindfulness and pregnancy-specific mood*

Correlations ($n$ = 207) examining mindfulness and pregnancy related mood showed that the FFMQ for mindfulness and EPDS for depression ($r$ = -.657, $p$ <.001) and TPDS for distress ($r$ = -.494, $p$ <.001) were significantly correlated.

A MANOVA using a high/low mid-point and mean split for FFMQ mindfulness (<=116 low $n$ = 115, 55.6%,>=117 high $n$ = 92, 44.4%) was conducted with EPDS depression and TPDS distress. Using Roy's Largest Root, Θ =.37, level of mindfulness has a significant effect on depression and distress, $F$(2, 204)= 37.76, $p$<.001. Separate univariate ANOVAs were significant for depression, $F$(1, 205)= 74.68, $p$<.001 and distress, $F$(1, 205)= 25.77, $p$<.001. For the low mindfulness group, the mean depression score was 14.47 ($SD$ = 5.13) and for the high mindfulness group, 8.45 ($SD$ = 4.80). For TPDS distress, the low mindfulness group mean was 23.53 ($SD$ = 7.59) and the high mindfulness group mean was 17.91 ($SD$ = 8.45).

### *5.3.7 Exploration of trimester and parity*

The total sample was split into trimesters to examine whether mood was different for people at different gestational ages. Twenty participants were in their first trimester, 162 in their second and 25 in their third.

General stress, anxiety and depression measured with the PSS, GAD-7 and PHQ-9, were lowest for participants in their second trimester. Bootstrapped ANOVAs (based on 1000 bootstrap samples) showed that the difference in stress and anxiety by trimester was not significant but the difference in depression was, $F$(2,204)= 3.78, $p$ <.05, with

participants in the first trimester having significantly higher depression scores than those in their second (means: 11.90, *SD* 4.89; 8.38, *SD* 5.58; 9.36, *SD* 5.45 respectively).

Exploring pregnancy-related mood by trimester showed a similar trend to general mood with participants in their second trimester having lower TPDS distress, EPDS depression and OWLS labour worry but higher TPDS perceived partner involvement. Bootstrapped ANOVAs revealed no significant differences in pregnancy-related mood by trimester, but there was a trend for OWLS labour worry $F(2,204)= 2.53$, $p = .08$ (means: 25.35, *SD* 8.50; 28.36, *SD* 6.35; 26.44, *SD* 6.10 respectively) with participants in the second trimester being the least worried.

Scores for FFMQ mindfulness were highest for second trimester participants, though a bootstrapped ANOVA showed that the difference was not significant (means: 108.50, *SD* 21.29; 118.02, *SD* 22.32; 112.72, *SD* 17.35 respectively).

Mood data was explored to investigate any differences in mood depending on whether participants had children ($n = 124$) or were first time parents ($n = 83$), see Table 5-5.

**Table 5-5 Measure scores explored by parity**

| | Mean | Standard Deviation | Mean | Standard Deviation |
|---|---|---|---|---|
| | *Primiparous, n = 124* | | *Nulliparous, n = 83* | |
| **General mood measure** | | | | |
| PSS Stress | 21.21 | 7.09 | 19.84 | 7.22 |
| GAD-7 anxiety | 8.98 | 5.14 | 8.34 | 5.19 |
| PHQ-9 depression | 9.35 | 5.61 | 8.07 | 5.47 |
| **Pregnancy mood measure** | | | | |
| EPDS depression | 12.15 | 5.84 | 11.25 | 5.75 |
| TPDS distress | 20.98 | 8.20 | 21.11 | 8.68 |
| TPDS partner involvement[1**] | 5.71 | 3.49 | 3.71 | 2.92 |
| OWLS labour worry[1*] | 28.95 | 6.47 | 26.18 | 6.48 |

| **Mindfulness measure** | | | | |
|---|---|---|---|---|
| FFMQ mindfulness* | 113.71 | 21.20 | 120.57 | 22.20 |

[1]NB. Reverse scored measures
* Significant at .05, ** significant at .001

T-tests revealed significant differences in TPDS perceived partner involvement, $t(195)= 4.46$, $p<.001$ (equal variances not assumed $p<.01$) and labour worry, $t(205)= 3.02$, $p<.01$, with women without previous children being more worried about labour but reporting higher perceived partner involvement. Mindfulness scores were significantly higher for women without previous children $t(205)= -2.24$, $p<.05$.

## 5.4 Discussion

The purpose of this study was to explore dispositional mindfulness and mood during pregnancy to investigate whether previous findings in chapter three were replicated with a different sample, recruited for online mindfulness course studies.

The sample was significantly more stressed, anxious, depressed and distressed than the previous sample, perhaps owing to the difference in study type. This study was recruiting participants to take part in an online mindfulness (stress reduction) course during pregnancy, as opposed to a survey designed to explore mood during pregnancy. Perhaps participants were self-selecting to take part in a course because they were feeling stressed, anxious, depressed or distressed. Exploring the relationship between dispositional mindfulness and mood in this sample gives further insight for a sample with lower mood.

The hypotheses that higher dispositional mindfulness would be associated with lower scores of negative mood were supported, replicating the previous study findings. Further, a measure of general depression in the PHQ-9 was included with the current sample and higher levels of dispositional mindfulness were also associated with lower depressive scores using that measure.

The relationship with measures found to previously improve following an online mindfulness was replicated. As the PHQ-9 was included in this study, this measure found to previously improve following the online mindfulness course was also associated with pregnancy measures for depression and distress, suggesting that the course may be of use in improving these pregnancy-related measures.

Examining the sample in terms of trimester showed similar results with a trend for labour worry being lowest during the second trimester, though not significantly higher during the third trimester as before. This could reflect the difference in mood by sample, whereby this sample had significantly lower mood than in the previous study. That labour worry was lowest for people in their second trimester is not surprising given that mood overall seems best during the second trimester.

One new finding with this sample was that general depression was significantly higher for people in their first trimester than those in their second or third trimesters, perhaps reflecting the usual stress and discomfort associated with the first trimester and coming to terms with a new pregnancy, especially given that 30% were unplanned. It could be that these participants were actually more tired, had a different appetite and had less energy owing to the normal discomforts which can accompany the first trimester of pregnancy. Without following this sample over pregnancy, unfortunately an analysis over time cannot be conducted. The inclusion of a measure of general depression is a strength of the current study, providing further findings for the relationship of dispositional mindfulness and mood during pregnancy, building upon the sparse existing literature.

Findings for parity were replicated with people scoring lower for partner involvement and labour worry if they already had children. Again, this is likely due to the experience of participants who have already given birth. That participants score more highly for perceived

partner involvement without children is interesting. In chapter three, one reason posited for this finding was the necessity for discussion with partners given the life changes surrounding the first infant being born, but this needs to be explored in future studies. Distress was not lower for participants who do not have children as it was in the previous study. This may be due to the current sample exhibiting higher levels of distress overall, but requires further investigation.

Interestingly, dispositional mindfulness was higher for participants without children. However, the difference in mood was not significant and so it would be interesting for future studies to re-examine this finding.

There are limitations with this study. First, there was no follow-up data available so an exploration of how mood may have changed over trimester was unavailable; replicating all findings of chapter three was not possible.

Second, measures of PDQr distress, pregnancy-related discomfort and pregnancy experience were only included in the pilot study to reduce participant load in future studies so a replication of the findings with these measures was also unavailable.

Third, sample sizes for the first and third trimester were small. It would be beneficial to investigate mood and dispositional mindfulness in future samples with larger numbers for those trimesters.

Higher dispositional mindfulness predicted better scores of mood overall, suggesting that offering a mindfulness course during pregnancy, potentially increasing levels of dispositional mindfulness, could be beneficial. It is especially promising that measures previously found to improve following the online mindfulness course were correlated with pregnancy measures of mood, suggesting that the course may also benefit these constructs.

A study which combines the samples of chapters three and five is being conducted and prepared for publication (Krusche et al, 2015). Proceeding studies explored an online mindfulness course for general and pregnancy-related mood improvements in a sample of prospective parents, compared to a waitlist control group.

# 6 Chapter 6. A Randomised Controlled Study of Online Mindfulness During Pregnancy

## 6.1 Introduction

Chapter one outlined the current evidence for using a mindfulness course to improve well-being during pregnancy. There are few studies showing pre to post-course improvements in mood following a mindfulness course in pregnant non-clinical (Beddoe et al., 2009; Byrne et al., 2013; Duncan & Bardacke, 2010; Woolhouse et al., 2014) and clinical samples (Dimidjian et al., 2014; Goodman et al., 2014; Miklowitz et al., 2015; Muzik et al., 2012) and few randomised controlled studies (Chan, 2014; Dunn et al., 2012; Gambrel & Piercy, 2014a; Guardino et al., 2013; Vieten & Astin, 2008; Woolhouse et al., 2014; Zhang & Emory, 2015). The findings thus far look promising for mood improvements during pregnancy, some of which are maintained postpartum (Byrne et al., 2013; Dunn et al., 2012; Miklowitz et al., 2015; Zhang & Emory, 2015). The current literature does have limitations however, in particular, small sample sizes, a lack of findings for expectant fathers and limited measures of mood. Additionally, while there are reasons to suggest that an online mindfulness course would be beneficial for the prenatal period, especially given that a lack of therapist interaction does not seem to adversely influence outcomes for mindfulness therapy (Snippe et al., 2015) and many courses are readily available online, there are no studies examining the potential of courses completed in this medium during pregnancy. This chapter addresses the research gap by conducting a randomised controlled study of a generic mindfulness course delivered online to improve prenatal mood and examine whether any improvement is maintained postpartum.

Chapter two showed improvements in stress, anxiety and depression in a sample of highly stressed online mindfulness course service users who completed the course outside of the

perinatal period. Higher rates of reported mindfulness practice predicted larger mood improvements and a subset of women of childbearing age showed similar course benefits.

Chapters three and five found that higher levels of dispositional mindfulness predict lower levels of general stress, anxiety and depression and pregnancy-specific depression and distress during pregnancy. Furthermore, the general mood measures used and found to improve following the online mindfulness course in chapter two were correlated with pregnancy measures of depression and distress in pregnant samples, providing potential for use with these pregnancy-specific mood constructs.

Chapter four added to existing literature with a preliminary face-to-face mindfulness course audit for prospective parents showing mood improvements for mothers and fathers, including more measures of mood than previously examined. With good class adherence, these courses also seem acceptable for both prospective parents during pregnancy.

The current study aimed to recruit prospective parents to participate in an online mindfulness course, initially as a pilot study of acceptability, recruitment methods and measures. The effectiveness of the recruitment methods utilised were evaluated to confirm the feasibility of the sample size and the methods used to recruit said sample. Consequently, the aim of the proceeding randomised controlled study was to recruit expectant parents to complete an online mindfulness course during pregnancy, or to wait as part of a control group. Improvements in mood comparing active to control were evaluated during the prenatal period, pre to-post course and at two-month postnatal follow-up.

The primary outcome was the change in perceived stress. The secondary outcomes were improvement in general mood incorporating anxiety and depression and improvement in pregnancy-specific mood, incorporating depression , distress and labour worry.

The hypotheses were:

1. Relative to waitlist control, course completers would have improved levels of perceived stress pre to post-course and at two month postnatal follow-up,
2. Relative to waitlist control, course completers would have improved levels of general anxiety and depression pre to post-course and at two month postnatal follow-up,
3. Relative to waitlist control, course completers would have improved levels of pregnancy-related depression, distress and labour worry pre to post-course and depression from pre-course to postnatal follow-up,
4. Higher levels of dispositional mindfulness would mediate the improvements in mood pre to post-course,
5. Higher levels of self-reported mindfulness practice would mediate the improvement in mood pre to post-course,
6. Parity would moderate the improvement in mood pre to post-course.

## 6.2 Pilot Study Methods

### *6.2.1 Participants*

Participants were recruited via email lists (University departments, colleges, postgraduate mailings), via Facebook using thumbnail advertising and a study Facebook page, Twitter, Google advertising, posts in pregnancy and new mother forums and other community sites (such as Gumtree and Daily Information, an Oxford based site) and posters sent to schools, churches, community centres and shops around Oxfordshire.

The aim of the pilot investigation was to recruit 50 couples to complete an online mindfulness course. Expectant mothers were invited to sign-up to the study from 12 to 24 weeks gestation and were informed that their partners could also sign-up to participate in the study. The minimum age for participants was 18 years. The exclusion criteria were completion

or current attendance of a mindfulness course and current suicidal ideation. Forty-two participants signed-up to take part in the pilot study, of which six were the partners of recruited mothers-to-be (and expectant fathers themselves). Six expectant mothers and no fathers completed the course and study measures.

### *6.2.2 Procedure*

Expectant mothers were invited to sign-up to the pilot study using a secure online survey website which consisted of the participant information sheet, consent form and submission of their due-date and contact details. They were then sent an email with their unique participant ID. At 20-24 weeks gestation they were emailed a link to baseline survey questions. Expectant mothers were sent a separate sign-up link to forward to their partner, if appropriate. When baseline questionnaires were complete participants were sent their online mindfulness course login details.

Participants were asked to complete the course in four weeks, where possible, to ensure completion before their due-date. If participants had not logged on for more than a week, they received an email reminding them to login or to get in touch with the research team if they were experiencing any problems (up to three emails with the last one informing them of study withdrawal). As part of the online course website, participants were asked to submit answers to the Perceived Stress Scale (Cohen et al., 1983), the Generalized Anxiety Disorder-7 (Spitzer et al., 2006) and the Patient Health Questionnaire-9 for depression (Kroenke et al., 2001) before the course began, immediately after the course and at one month follow-up (requested via automated email through the course website). Upon course completion, participants were sent the study follow-up measures via a new secure survey link in an email.

For postnatal follow-up data collection, participants were again sent a link via email, 60 days after their due-date. The reason for the two month postnatal follow-up time was to allow

time for acclimatisation to having a new baby and to the usual somatic sequelae following childbirth (fatigue, change of appetite, lack of sleep, cognitive disturbance) which could otherwise be attributed to a depressive episode, to allow time for baby-blues to subside if it had occurred and because postnatal depression is found to occur within 12 weeks post delivery (e.g. (Cox et al., 1993; Forty et al., 2006), see chapter one).

Oxford CUREC Ethical approval was obtained for the pilot (reference: MSD-IDREC-C1-2014-010).

### *6.2.3 Measures*

*The following measures were taken:*

- Perceived Stress Scale (PSS; Cohen et al., 1983); see page 90.
- Generalised Anxiety Disorder Scale (GAD-7; Spitzer et al., 2006); see page 91.
- Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001); see page 72.
- Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987); see page 91.
- Tilburg Pregnancy Distress Scale[40] (TPDS; Pop et al., 2011); see page 92.
- Oxford Worries about Labour Scale[40] (OWLS; Redshaw et al., 2009); see page 93.
- Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006); see page 140.
- Prenatal Distress Questionnaire[40] (revised; PDQr; Lobel et al., 2008); see page 92.
- Pregnancy-Related Discomforts Scale[40] (PRD; Shinkawa et al., 2012); see page 94.
- Pregnancy Experience Scale[40] (PES-Brief version; DiPietro et al., 2008); see page 94.
- A demographic questionnaire comprised of questions about age, familial and occupational status, psychological and physical problems and current yoga and meditation practice.
- Weekly self-report practice logs were administered on the course website, see 6.2.3.1 below.

[40] Not presented at T2 postnatal follow-up as no longer relevant.

#### *6.2.3.1 Mindfulness practice*

The amount of weekly mindfulness practice was determined by weekly self-report. Since first analysing the online mindfulness course, the practice questions were edited to better reflect the amount of practice people completed; in each instance the responses were amended to reflect more specific instances and into a 5-point response, so from *'Every day, Most days, One or Twice or Never'* to *'Every day, 4-5 days, 2-3 days, 1 day, Never or Not at all'*. Participants were asked to complete three practice questions each week (12 in total). As before, the first question concerned frequency of formal practice, the second, informal practice and the third, another practice for the week, for example, bringing attention to a chosen activity. The practice scores were totalled to create a scale variable from 60-12 with 12 being the most practice. If a score was missing, no practice was assumed.

### *6.2.4 Intervention*

The 'Be Mindful Online' (www.bemindfulonline.co.uk) mindfulness course consists of ten interactive sessions completed over four or more weeks. Participants learn to use formal and informal meditation practices through videos and assignments. The intervention comprises elements of Mindfulness-Based Stress Reduction (MBSR) and Mindfulness-Based Cognitive Therapy (MBCT). The online course follows the same class sequence as the eight week mindfulness course, condensed to a four week format, but allowing for participants to stop and start as required. For a detailed description, see chapter 2.2.3, page 68. Participants were given free course membership.

## 6.3 Pilot Study Results

Forty-two participants signed-up to take part in the pilot study; six were fathers-to-be. Twenty four participants completed the pre-course questionnaires including two expectant

fathers. Six expectant mothers (and no fathers) completed the course and follow-up measures, see Figure 6-1.

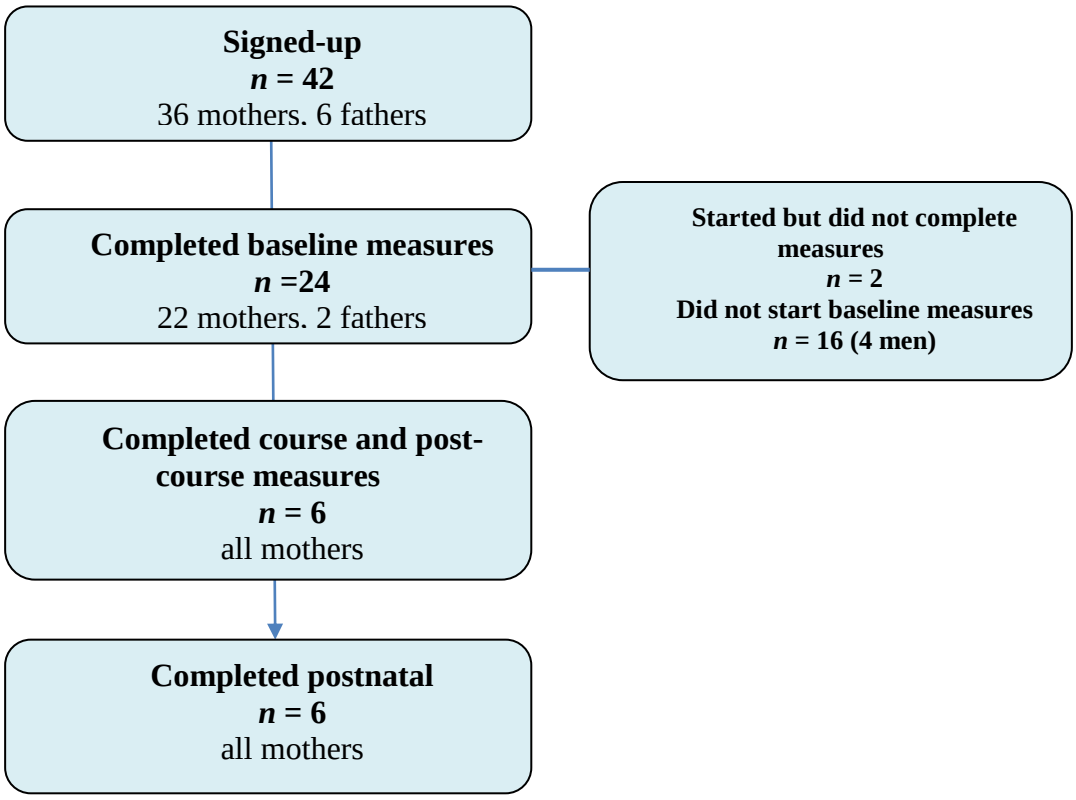


**Figure 6-1 Pilot Study CONSORT flow diagram**

There were significant differences in baseline mood for maternal completers ($n$ = 6) and non-completers ($n$ = 16) for pregnancy-related distress TPDS $t(20)=-2.66$, $p<.05$, means: 11.67 (*SD* 7.23) & 19.38 (*SD* 5.60) respectively, PDQr $t(20)=-2.80$, $p<.05$, means: 4.00 (*SD* 3.41) & 9.50 (*SD* 4.32) respectively, and the frequency of hassles $t(20)=-2.11$, $p<.05$, means: 4.83 (*SD* 3.37) & 7.44 (*SD* 2.25) with completers reporting better mood and fewer hassles at baseline.

## 6.4 Sample Size Calculations for Randomised Study

Initially, previous research was examined to determine an adequate sample size using perceived stress as the main outcome measure[41]. Owing to the limited research (and

[41] Previous study data indicate large effect sizes ($d$) when evaluating the online course for perceived stress in a sample of non-perinatal completers (1.57, $f$ = 0.79, (Krusche et al., 2012), 1.20, $f$ = 0.60, in chapter two) and

particularly randomised controlled studies where there are few studies using the PSS and studies show mixed results) surrounding mindfulness courses for pregnancy, a conservative moderate effect size of 0.25 (*f*) (Cohen, 1992) was used to determine a robust sample size, using G*Power software (Erdfelder, Faul, & Buchner, 1996). The sample size required for a repeated measures within-between interaction design with 95% power was 54 participants (27 per group). Accounting for attrition, the aim was for a sample of at least 80 participant completers and taking an approximate course drop-out rate of 60% (similar to previous rates before post-course data collection on the website and other online research), 200 participants or more was the initial recruitment target.

## 6.5 Randomised Study Methods

### *6.5.1 Participants*

Participants were recruited in the same way as for the pilot investigation. Following the pilot, the aim of the randomised study was to recruit at least 200 expectant mothers so that at least 80 would participate at 12-34 weeks gestation. Expectant fathers were no longer invited because of lack of interest in the pilot. Criteria for inclusion were otherwise unchanged.

### *6.5.2 Procedure*

Procedural changes were made to the randomised study design following difficulties with recruitment and high attrition in the pilot study (86%). The process was amended so that participants signed-up to the study (submitting consent and contact information following participant information sheet view) and were immediately given the separate survey link for baseline measures. Expectant mothers were invited to participate in the study from 12-34

the pilot study produced a large effect size of 1.54, *f* = 0.77m (*d*) but for only six participants; these studies are also pre-post and do not have a control group.

weeks gestation to allow sufficient time to complete the online mindfulness course before the due-date.

After completion of baseline measures, participants were randomly allocated to take the online mindfulness course immediately or to wait with the aim of a 1:1 ratio. Participants were stratified by perceived stress score (high/low, with a score of 15 or less as low and 16 or more as high, using population norms (Cohen & Williamson, 1988)) and previous children (yes/no) producing four groups. Randomisation was conducted using a randomisation website to produce a list of active/control for the four groups which participants were entered into in the order in which they completed the baseline survey. When participants withdrew or were lost from the study, their randomisation slot was re-used for newly randomised participants with the creation of a new randomisation ID to distinguish data sets.

The date for control participant post-course data collection was calculated as 45 days from their baseline survey completion to match previously found approximate times for participants to complete the course (approximately six and a half weeks).

Qualitative data was also requested from active participants at post-course and post-natal follow-up. Where possible, participants were interviewed in person with regard to their course participation: what they thought of the course, what they found useful and not useful and discussion surrounding barriers to participation. Few participants signed-up to take part in this optional part of the study and so an online form was made available for those wishing to add further comments but not available to be interviewed. Four participants were interviewed after course completion, including one who dropped out from the course and the three completers were followed up postnatally. Seven participants issued feedback online, of which two did not complete the course and one of the five completers also supplied feedback at post-natal

follow-up. The results of the qualitative study are to be written up for publication separately, though a summary of emerging findings is included proceeding the quantitative results.

Oxford CUREC Ethical approval was obtained for the study, including the qualitative work (reference: MSD-IDREC-C1-2014-183).

### *6.5.3 Measures*

The following measures were taken before the course (T0), immediately after (T1), and at eight weeks postpartum (T2, except where noted):

- Perceived Stress Scale (PSS; Cohen et al., 1983); see page 90, α=.93.
- Generalised Anxiety Disorder Scale (GAD-7; Spitzer et al., 2006); see page 91, α=.90.
- Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001); see page 72, α=.88.
- Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987); see page 91, α=.91.
- Tilburg Pregnancy Distress Scale[42] (TPDS; Pop et al., 2011); see page 92, α=.83.
- Oxford Worries about Labour Scale[42] (OWLS; Redshaw et al., 2009); see page 93, α=.86.
- Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006); see page 140, α=.93.
- A demographic questionnaire comprised of questions about age, familial and occupational status, psychological and physical problems and current yoga and meditation practice.
- Weekly self-report practice logs were administered on the course website.

### *6.5.4 Analysis plan*

The success of random allocation was analysed with t-tests for continuous data and chi-square tests for categorical data. If significant differences were found between actives and controls, they were used as covariates for the proceeding analysis. The same analysis strategy was used to assess the difference between completers and non-completers, followed by binary

[42] Not presented at T2 as no longer relevant.

logistic regression predicting completion. Mixed factorial repeated measures ANCOVAs were used to investigate change in mood over time (pre- to post-course; T0 to T1) between and within groups comparing active and control participants, controlling for potential confounders. For the postnatal follow-up analysis, pre-course (T0) and postnatal (T2) time points were used, omitting post-course (T1) scores. For mediation and moderation analysis, an estimation of the indirect effect of the mediator on the outcome variable/s and the interaction effect for moderation was examined, using software installed to SPSS (which uses pre-programmed syntax to calculate effects) named the Process tool (Hayes, 2012; Hayes & Matthes, 2009).

## 6.6 Randomised Study Results

### *6.6.1 Data checks: Outliers, normality and homogeneity*

The data was checked for non-normal distribution and outliers. The sample ($n$ = 72) showed no outliers. Using Kolmogorov-Smirnov's test for normality, GAD-7 anxiety scores, $D(72)=.12$, $p<.05$, FFMQ mindfulness scores, $D(72)=.43$, $p<.005$ and TPDS partner involvement scores, $D(72)=.18$, $p<.001$, were significantly non-normal. Standardized residual ($z$) scores were within limits for each measure and plots showing distributions appeared normal.

### *6.6.2 Sample characteristics*

Two hundred and thirty-seven participants signed up to the study of which 185 completed the initial survey (T0) and 107 were randomised to active and 78 to control.

Twenty-two active (21%) and 50 (64%) control participants completed the post-course (T1) measures (39% overall completion rate), and 16 active (15%) and 32 control (41%) completed postnatal (T2) measures, see Figure 6-2.

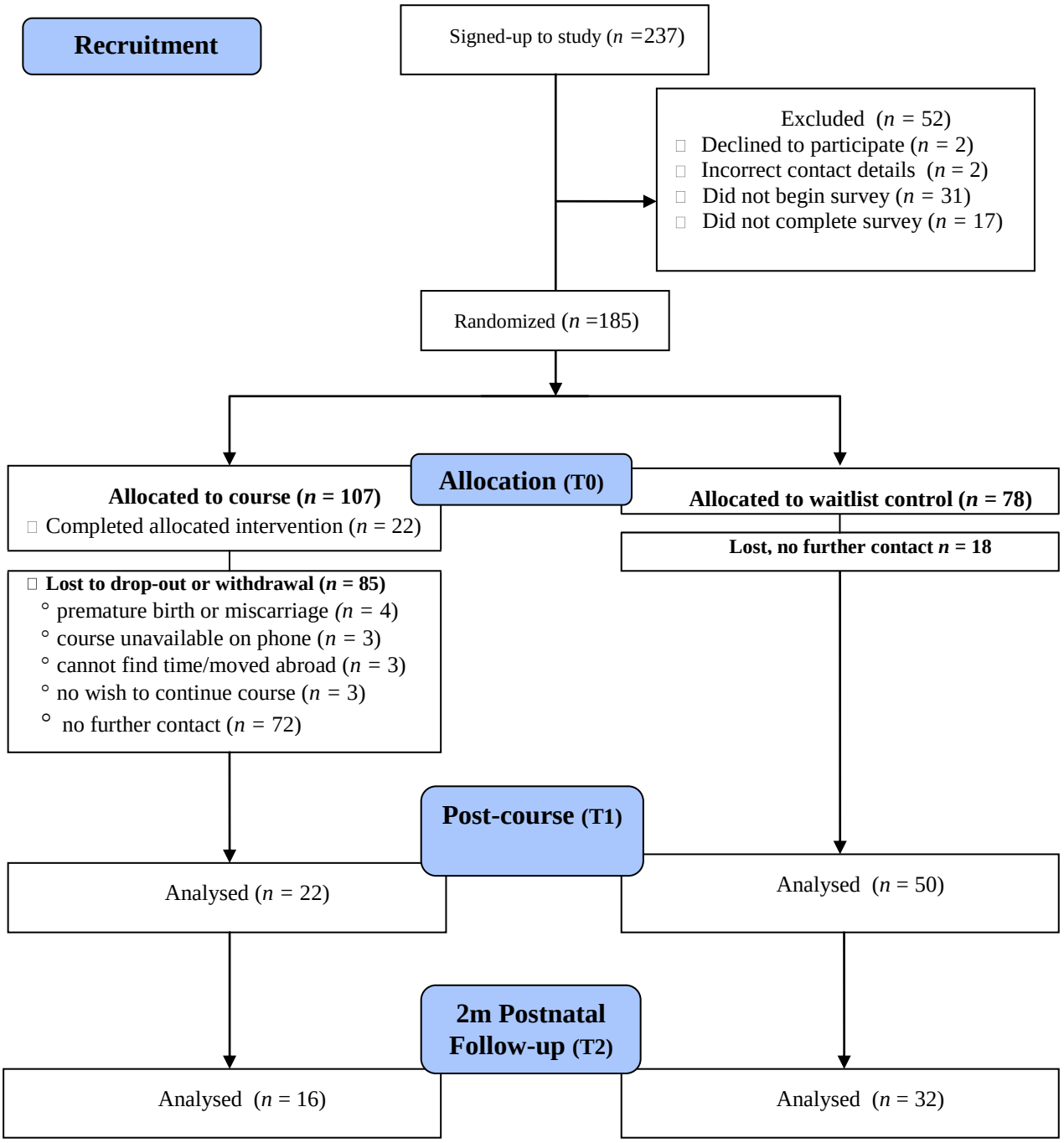


**Figure 6-2 CONSORT diagram of participant flow through study**

### *6.6.3 Adherence*

Of the 107 participants allocated to take the online mindfulness course, 85 were lost to contact or withdrew. Four participants withdrew due to premature delivery or miscarriage and are excluded from the exploration of course adherence, leaving 81 course drop-outs. Of those who discontinued the course, 42% ($n$ = 34) did not begin the course, either not logging in to

the website at all or only logging in to the introduction, 17.3% ($n$ = 14) discontinued at week one, 24.7% ($n$ = 20) at week two, 12.3% ($n$ = 10) at week three and 3.7% at week four ($n$ = 3). The mean time to complete the course for those who did ($n$ = 22) was 8.41 weeks and the mode completion time was 6 weeks.

### *6.6.4 Comparing study completers and non-completers*

#### *6.6.4.1 Comparing waitlist control completers and non-completers*

Comparing participants randomly allocated to waitlist control who completed ($n$ = 50) and did not complete ($n$ = 28) the questionnaires at time one (post-course), non-completers were more likely to have children (86%, 24/28) than completers (54%, 27/50), $\chi^2$ (1)=7.98, $p$<.005. Significantly more completers were in a relationship compared to non-completers (with three of 28 non-completers not in a relationship and all completers in relationships), $\chi^2$ (1)=5.57, $p$<.05. There was a significant difference in the accommodation status of people who completed and did not complete, $\chi^2$ (3)=12.37, $p$<.01 with 64% of completers as homeowners, 34% renting and one person living with their partner who was the homeowner (other) and 57% of non-completers as homeowners, 21% renting and 21% living in council housing. Non-completers also reported a lower gross annual household income than completers who submitted an answer to this question ($n$ = 43 and $n$ = 25, the item was optional), $t$(66)=2.61, $p$<.05. Otherwise, there were no differences between controls who completed and did not complete time one measures, nor any differences in baseline mood.

A binary logistic regression was conducted to explore the potential predictors of non-completion. Initially, parity (children, yes/no), relationship status, accommodation type and annual income were entered into a linear model. Only parity predicted whether or not participants would complete the questionnaires at time one in the multivariate analysis, see

Table 6-1. The more children a participant had, the less likely they were to complete the second set of questionnaires (model predicting non-completers).

**Table 6-1 Binary Logistic Regression of Parity as Predictor of Study Non-Completion (Control Participants)**

| | ***B*** | **95% CIs for Odds Ratio** | | |
|---|---|---|---|---|
| *Model 1* | | Lower | Exp(*B*) | Upper |
| Constant | -1.75 | - | 0.17 | - |
| Children | 1.63 | 1.55 | 5.11 | 16.90 |

Note: $R^2$=.09 (Homer & Lemeshow), .11 (Cox & Snell) .14 (Nagelkerke). Model $\chi^2(1)=9.66$, $p<.005$.

Comparing the control participants who completed the postnatal questionnaires ($n$ = 32) with those who did not at T0 ($n$ = 46) there were no differences in mood or mindfulness scores, nor any differences in sociodemographics.

At T1, there were no mood differences for completers ($n$ = 32) or non-completers ($n$ = 18) of T2 questionnaires, however, there was a significant difference in whether or not participants had pregnancy complications at T1, $\chi^2(1)=4.97$, $p<.05$, with 44% of non-completers (8/18) and 16% of completers (5/32) having complications by their post-course data collection time.

Due to the survey website changing servers and implementing new procedures, postnatal data collection was unavailable for certain participants who did complete the measures but did not reach the very end of the survey (closing the webpage instead of clicking to submit). This affected 15 control participants, so the comparison between completers and non-completers may be slightly inaccurate.

#### *6.6.4.2 Comparing active completers and non-completers*

The sociodemographic and mood data at baseline was examined comparing active participants who completed ($n$ = 22) or did not complete the course ($n$ = 85). Significantly

more course completers practiced yoga (41%, $n$ = 9) than non-completers (14% $n$ = 12), $\chi^2$ (1)=7.95, $p$<.01 with 17 non-completers stating that they had stopped temporarily. Course completers were also significantly older (mean age 33.59 years, *SD* 4.73) than non-completers (mean age 30.67 years, *SD* 4.98), $t$(105)=2.47, $p$<.05. Furthermore, course completers reported more (reverse scored) TPDS perceived partner support (mean 3.05, *SD* 2.48) than non-completers (mean 4.93, *SD* 3.43), $t$(44.30)=-2.92, $p$<.01 (equal variances not assumed).

Regressions were run to examine which of these differences, if any, predicted study incompletion. The less yoga a participant practiced already, the less likely they were to complete the online course. Age and partner support did not predict course completion in the multivariate analysis.

**Table 6-2 Binary Logistic Regression of Current Yoga Practice as Predictor of Course Completion**

| | ***B*** | **95% CIs for Odds Ratio** | | |
|---|---|---|---|---|
| *Model 1* | | Lower | Exp(*B*) | Upper |
| Constant | 1.72 | - | 5.62 | - |
| Yoga | -1.44 | .08 | 0.24 | 0.68 |

Note: $R^2$=.07 (Homer & Lemeshow), .06 (Cox & Snell) .01 (Nagelkerke).
Model $\chi^2$(1)=7.00, $p$<.01.

Active participants who completed ($n$ = 16) and did not complete postnatal questions ($n$ = 90, omitting one participant not yet due for T2 data collection) were compared at T0. Postnatal completers scored higher for TPDS perceived partner involvement than non-completers at baseline, $t$(104)=2.21), $p$<.05. There was a trend for more postnatal completers practicing meditation $\chi^2$ (2)=5.72, $p$=.057, (4/16 or 25% completers practicing with one stopped temporarily and 8/90 or 9% non-completers practicing with one stopped temporarily).

There were no mood or sociodemographic differences at T1 for postnatal completers ($n$ = 16) and non-completers ($n$ = 5). Again, because of website changes, five active participants may have completed postnatal questionnaires where data was unavailable for analysis.

### *6.6.5 Sample sociodemographic data and baseline mood*

Participants characteristics for study completers are shown in Table 6-3.

**Table 6-3 Randomised Study Sample Characteristics**

| *Participant Characteristics n =72* | *%* | *n* |
|---|---|---|
| Age (range 22-40 years) | mean: 32.7 years, mode: 34 years | |
| UK residents | 90.3% | 65 |
| Oxfordshire residents | 5.6% | 4 |
| Ethnicity British/White-British/White | 88.9% | 64 |
| Currently married or cohabiting (other *n* = 1; partner sectioned) | 95.8% | 69 |
| Living separately from partner | 2.8% | 2 |
| Relationship length (range 6 months - 17 years) | mean: 6.67 years, mode: 7 years | |
| Educated to high school/college level* | 15.3% | 11 |
| Educated to degree level | 40.3% | 29 |
| Educated to postgraduate level | 40.3% | 29 |
| Currently employed | 76.4% | 55 |
| Unemployed status-homemaker | 19.4% | 14 |
| Planned pregnancy | 76.4% | 55 |
| Months trying to conceive (range 0-60 months) | mean: 5.13 months, mode: 1 month | |
| Multiparous | 54.2% | 39 |
| One child (two *n* = 4, three *n* = 1, four *n* = 1, six *n* = 1) | 40.3% | 29 |
| First trimester | 12.5% | 9 |
| Second trimester | 76.4% | 55 |
| Third trimester | 11.1% | 8 |
| Physical ailments (non-perinatal; asthma, heart & blood pressure, diabetes, joint problems, IBS, hypothyroidism) | 26.4% | 19 |
| Mental health problems | 13.9% | 10 |
| Mental health: Depression | 5.6% | 4 |
| Mental health: Anxiety | 2.8% | 2 |
| Mental health other or comorbid(bipolar, OCD, GAD, panic disorder, PTSD, phobias, depression, anxiety) | 5.6% | 4 |
| Practice yoga (daily-monthly, mode: 15.3% weekly *n* = 11) | 29.2% | 21 |
| Practice meditation (daily-monthly) | 6.9% | 5 |

*One participant is missing education data due to survey glitch, two participants stated 'other' education: 'Vocational' and 'HND'.

One participant was expecting twins, the rest of the sample had singleton pregnancies.

#### *6.6.5.1 Baseline mood*

There was no missing data for mood because the online survey cannot be submitted with missing items. See Table 6-4 for baseline mood for the study sample.

**Table 6-4 Baseline mood for study sample**

*Total sample n = 72*

| Measure | Mean | *SD* | Research Norms |
|---|---|---|---|
| PSS Stress | 21.65 | 8.02 | 11.9-14.7[43] |
| GAD-7 Anxiety | 9.10 | 5.56 | 2.7-3.8[44] |
| PHQ-9 Depression | 9.18 | 6.12 | 8.1[45] |
| EPDS Pregnancy Depression | 12.33 | 6.48 | 7.6[46] |
| TPDS Pregnancy Distress | 21.85 | 8.97 | 10.67[47] |
| OWLS Labour Worry | 27.31 | 7.13 | 25.15[48] |
| *FFMQ Mindfulness* | 115.04 | 22.50 | 119.64-121.55[49] |

Participants were highly stressed, with scores of moderate general anxiety and depression and pregnancy-related depression and met the cut-off (17) for pregnancy-related 'distress'.

#### *6.6.5.2 Baseline comparisons of allocated condition*

Active participants reported significantly less TPDS distress, $t(70)=-2.28$, $p<.05$ and more perceived participant involvement on the TPDS subscale, $t(53.46)=-3.52$, $p<.005$ (equal variances not assumed). Significantly more active participants practiced meditation ($n=4/22$) than controls ($n=1/50$), $\chi^2(1)=6.19$, $p<.05$, resulting in a trend examining amount of practice as a scale variable, $t(21.69)=1.89$, $p=.07$ (equal variances not assumed)[50]. There was a trend for control participants being more depressed at baseline measured by the PHQ-9, $t(70)=-1.87$, $p=.07$. Subsequent analysis controlled for TPDS distress.

[43] (Cohen & Williamson, 1988)
[44] (Löwe et al., 2008a)
[45] (Flynn et al., 2011)
[46] (Cox et al., 1987; Cox et al., 1993) 9/10 potential need for further screening; 12/13 possible depression.
[47] (Pop et al., 2011)
[48] (Redshaw et al., 2009) Non-clinical sample of new mothers using the scale retrospectively.
[49] (Guardino et al., 2013; Woolhouse et al., 2014)
[50] Subsequent analysis will not use meditation as a covariate because so few participants (including only one control participant) meditated.

The majority of participants started the study during their second trimester; 9.1% ($n$ = 2) of active and 14% ($n$ = 7) of control participants were in their first trimester, 77.3% ($n$ = 17) of active and 76% ($n$ = 38) of control participants were in their second trimester and 13.6% ($n$ = 3) of active participants and 10% ($n$ = 5) of control participants were in their third trimester. The difference in trimester comparing active and control participants was not significant ($p$ >.05).

### *6.6.6 Changes in mood over time by random allocation*

Baseline, time one and time two mean scores for outcomes are presented in Table 6-5.

**Table 6-5 Group means for active and control participants at baseline (T0), post-course (T1) and at 2-month postnatal follow-up (T2)**

| | **Active** | | ***n* = 22** | | | ***n* = 16** | | | **Control** | | ***n* = 50** | | | ***n* = 32** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Baseline T0 | | Time 1 | | | Time 2 | | | Baseline T0 | | Time 1 | | | Time 2 | | |
| *Measure* | *Mean* | *SD* | *Mean* | *SD* | *d* | *Mean* | *SD* | *d*[51] | *Mean* | *SD* | *Mean* | *SD* | *d* | *Mean* | *SD* | *d*[51] |
| PSS Stress | 20.45 | 7.05 | 12.86 | 5.12 | *1.30* | 12.56 | 8.81 | *0.05* | 22.18 | 8.42 | 18.60 | 8.21 | *0.43* | 15.63 | 7.33 | *0.38* |
| GAD-7 Anxiety | 7.55 | 5.08 | 3.95 | 3.24 | *0.84* | 3.31 | 4.09 | *0.18* | 9.78 | 5.68 | 7.42 | 5.38 | *0.43* | 6.16 | 5.24 | *0.24* |
| PHQ-9 Depression | 7.18 | 4.50 | 4.32 | 3.60 | *0.70* | 3.75 | 3.49 | *0.16* | 10.06 | 6.56 | 8.50 | 6.90 | *0.23* | 5.19 | 3.74 | *0.56* |
| EPDS Depression | 10.77 | 6.28 | 5.00 | 4.79 | *1.03* | 5.25 | 4.91 | *0.05* | 13.02 | 6.51 | 11.50 | 6.92 | *0.23* | 8.25 | 4.57 | *0.53* |
| TPDS Distress[1] | 18.32 | 8.77 | 12.68 | 7.41 | *0.69* | - | - | - | 23.40 | 8.69 | 20.94 | 9.17 | *0.28* | - | - | - |
| TPDS Partner Involvement | 3.05 | 2.48 | 2.91 | 2.93 | *0.05* | - | - | - | 5.54 | 3.35 | 5.38 | 3.48 | *0.05* | - | - | - |
| OWLS Labour Worry | 29.05 | 5.96 | 31.68 | 6.61 | *0.42* | - | - | - | 26.54 | 7.52 | 26.74 | 6.70 | *0.03* | - | - | - |
| FFMQ Mindfulness | 118.27 | 20.19 | 143.91 | 19.34 | *1.30* | 145.13 | 18.17 | *0.06* | 113.62 | 23.50 | 118.66 | 25.86 | *0.20* | 124.00 | 28.13 | *0.20* |

[1]TPDS distress was significantly higher for participants randomly allocated to waitlist control at baseline ($p<.05$).

[51] Effect size (*d*) from T1 to T2.

#### *6.6.6.1 General mood for active participants*

Measures of PSS stress, GAD-7 anxiety and PHQ-9 depression were taken on the course website before the start of the course, after course completion and at one month follow-up[52]. Seventeen participants completed the post-course measures. A repeated measures ANOVA ($n$ = 17) was conducted to examine mood over time (study baseline, website questions immediately before starting the course, website questions after course completion and post-course study questions). Stress decreased over time, $F(3,48)=22.62$, $p<.001$, $\eta^{2=}.74$. Pairwise comparisons showed that stress scores taken on the study survey and course website at pre-course were not significantly different and nor were the post-course scores ($p>.05$). Using the Greenhouse-Geisser correction, GAD-7 anxiety decreased over time, $F(1.72, 27.51)=10.83$, $p<.005$. Pairwise comparisons showed that pre-course survey and website scores did not differ significantly and neither did post-course website and survey responses ($p>.05$). PHQ-9 depression decreased over time, using the Greenhouse-Geisser correction, $F(1.31, 20.91)=8.14$, $p<.01$. There was no significant difference between pre-course scores of depression taken via the study survey and course website and post-course measures on the website and study survey ($p>.05$). Baseline and post-course scores taken via the study survey website were a good indication of mood.

### *6.6.7 Mood over time comparing active and control participants*

#### *6.6.7.1 Stress pre-post and pre-postnatal follow-up*

To test the hypothesis that completing the online mindfulness course would result in significantly less PSS stress post-course (T1), a mixed factorial repeated measures ANCOVA was conducted with the within-subjects variable of time, between-subjects

[52] Three participants completed the one-month follow-up measures so that time-point is omitted from analysis.

variable of group allocation and baseline TPDS distress as a covariate. Consistent with the hypothesis, controlling for baseline distress, there was a significant interaction of time x random group allocation, $F(1,69)=7.78$, $p<.01$, $\eta^2=.10$. Post-hoc comparisons examining stress over time were significant for active participants ($n = 22$), $F(1,69)=33.36$, $p<.001$, $\eta^2=.33$ (mean difference -8.10) and control participants ($n = 50$), $F(1,69)=13.39$, $p<.001$, $\eta^2=.16$ (mean difference -3.36) with more of a decrease for active participants. The difference in scores between groups at T1 was significant, $F(1,69)=4.26$, $p<.05$, $\eta^2=.058$.

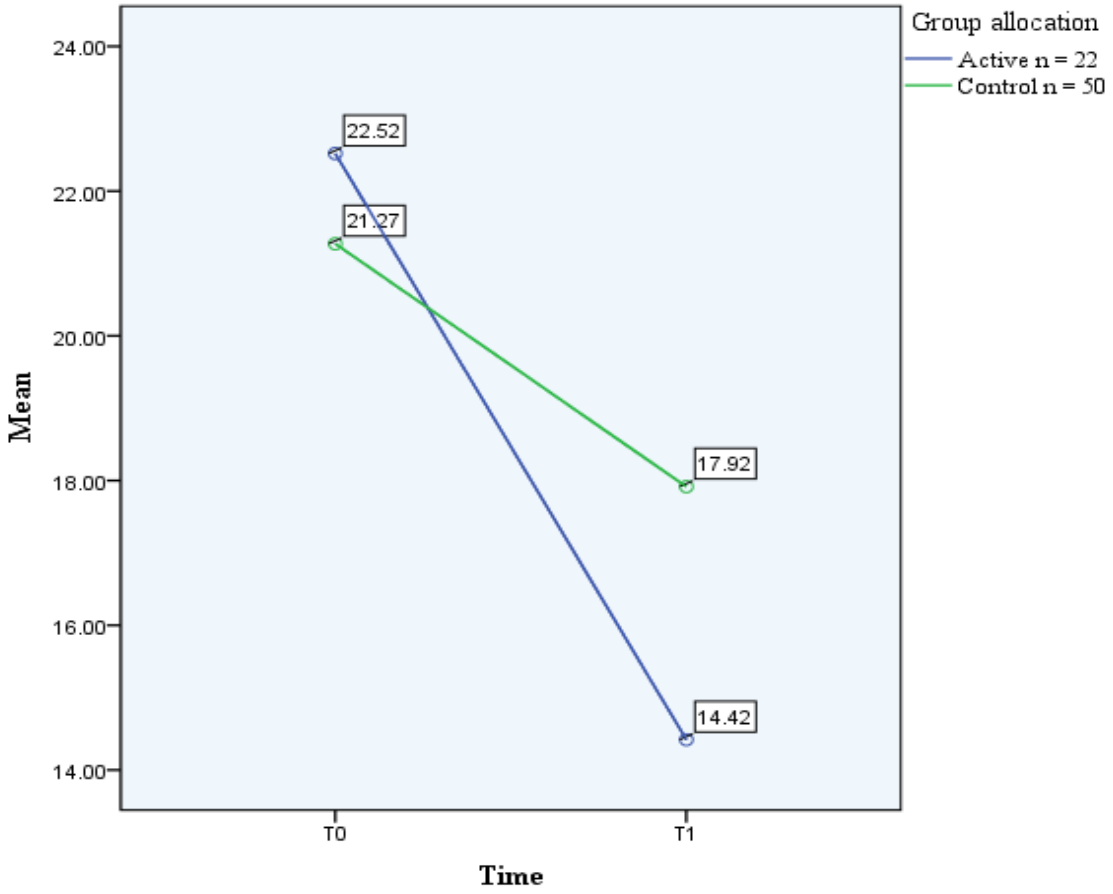


**Figure 6-3 Pre-post Perceived Stress (PSS) Means**

Comparing active ($n = 16$) and control ($n = 32$) participants from T0 to T2 postnatal follow-up, the time x group interaction was not present, $F(1,45)=0.70$, $p>.05$. Actives, $F(1,45)=10.57$, $p<.005$, $\eta^2=.19$, and controls, $F(1,45)=10.06$, $p<.005$, $\eta^2=.18$, both decreased in PSS from T0 to T2.

### *6.6.7.2 General anxiety & depression pre-post and pre-postnatal follow-up*

A mixed factorial ANCOVA was conducted examining GAD-7 anxiety over time, controlling for TPDS distress. There was no time x group interaction, $F(1,69)=2.26$, $p>.05$. Pairwise comparisons showed a decrease in anxiety for active participants, $F(1,69)=18.42$, $p<.001$), $\eta^2=.21$ (mean difference -3.88) and control participants, $F(1,69)=14.27$, $p<.001$, $\eta^2=.17$ (mean difference -2.23). There was a trend for active participants having lower anxiety at T1 compared to controls, $F(1,69)=3.15$, $p=.08$, $\eta^2=.04$.

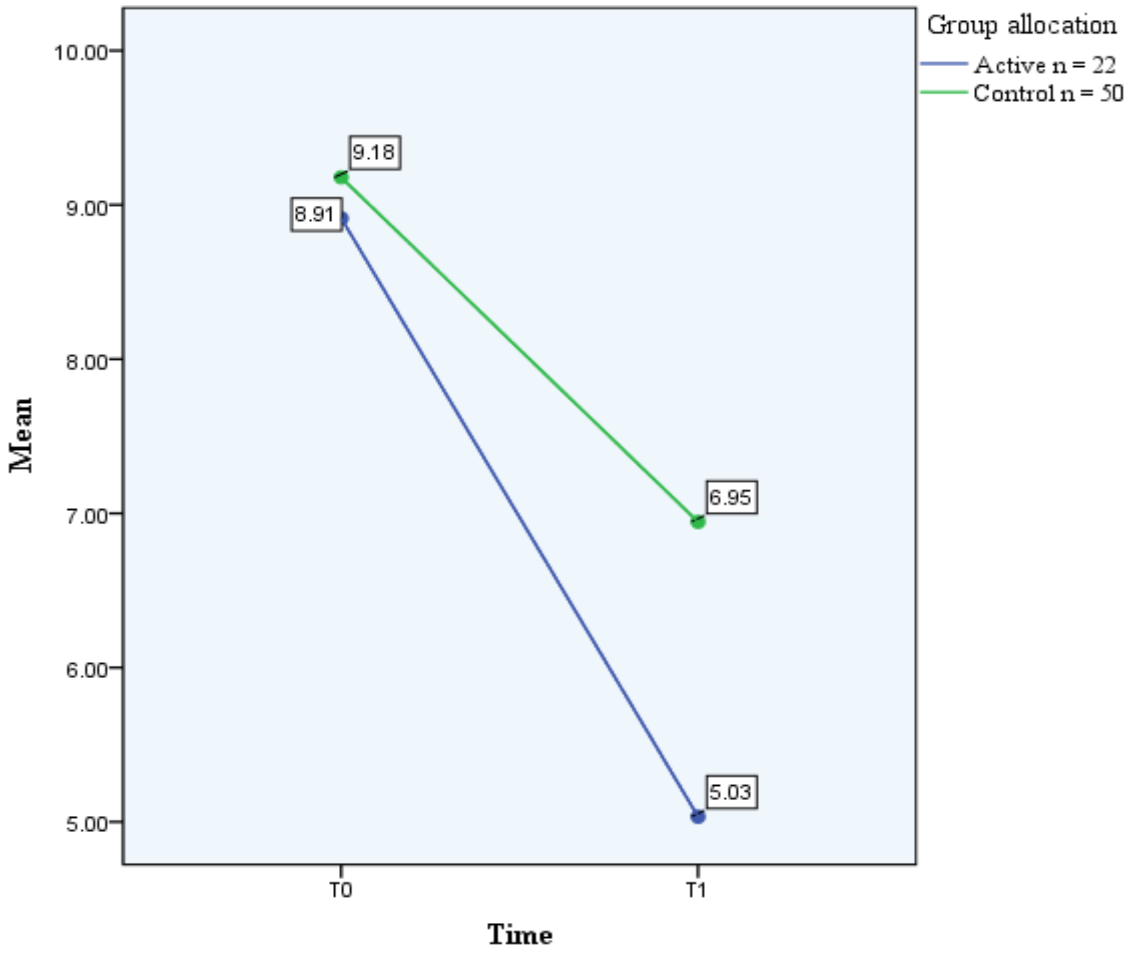


**Figure 6-4 Pre-post Anxiety (GAD-7) Means**

Comparing anxiety for active and control participants from T0 to T2 postnatal follow-up, there was no time x group effect, $F(2,45)=0.58$, $p>.05$. There was a significant decrease in anxiety from T0 to T2 for actives, $F(1,45)=8.92$, $p=.005$, $\eta^2=17$ and controls, $F(1,45)=8.57$, $p=.005$, $\eta^2=16$.

A mixed factorial ANCOVA examining PHQ-9 depression from T0 to T1 did not find an interaction effect controlling for TPDS distress, $F(1,69)=1.45$, $p>.05$. Post-hoc tests showed that active, $F(1,69)=8.96$, $p<.005$, $\eta^2=.12$ (mean difference -2.96) and control participants, $F(1,69)=5.49$, $p<.05$, $\eta^2=.07$ (mean difference -1.52) reduced in depression. There was a trend for actives having lower PHQ-9 scores at T1 than controls, $F(1,69)=2.92$, $p=.09$.

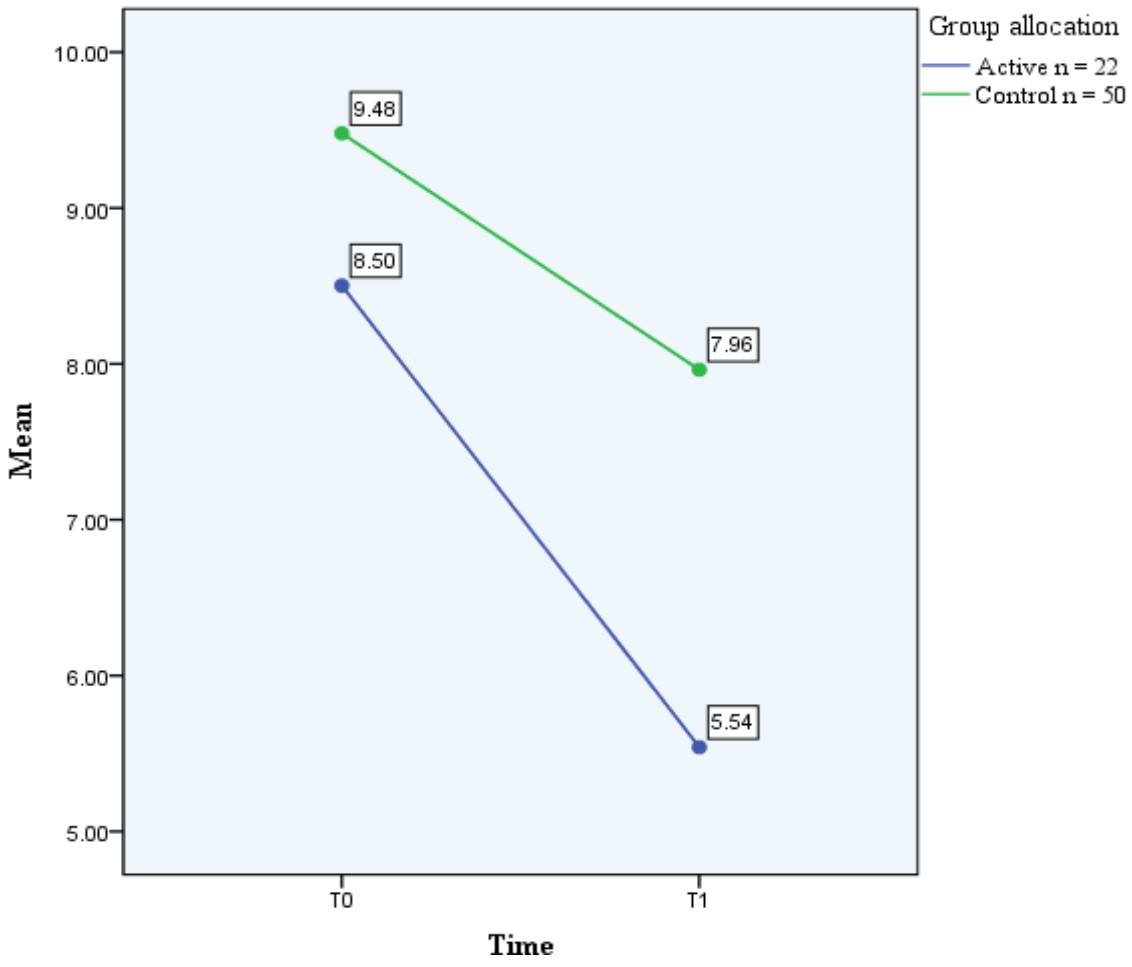


**Figure 6-5 Pre-post General Depression (PHQ-9) Means**

There was no time x group effect from T0 to T2, $F(1,45)=0.01$, $p>.05$. Depression decreased significantly from T0 to T2 for actives, $F(1,45)=18.91$, $p<.001$, $\eta^2=30$ and controls, $F(1,45)=41.19$, $p<.001$, $\eta^2=48$.

### *6.6.7.3 Pregnancy-related mood pre-post and at postnatal follow-up (T0-T1-T2)*

A mixed factorial ANCOVA showed a significant time x group effect for EPDS depression pre-post controlling for TPDS distress, $F(1,69)=11.25$, $p<.005$, $\eta^{2=}.14$. Pairwise comparisons showed that active participants decreased in depression, $F(1,69)=28.64$, $p<.001$, $\eta^{2=}.29$ (mean difference -5.97) and there was a trend for control participants, $F(1,69)=3.85$, $p=.054$, $\eta^{2=}.05$ (mean difference -1.43). There was a significant difference in scores at T1 between groups, $F(1,69)=10.06$, $p<.005$, $\eta^{2=}.13$.

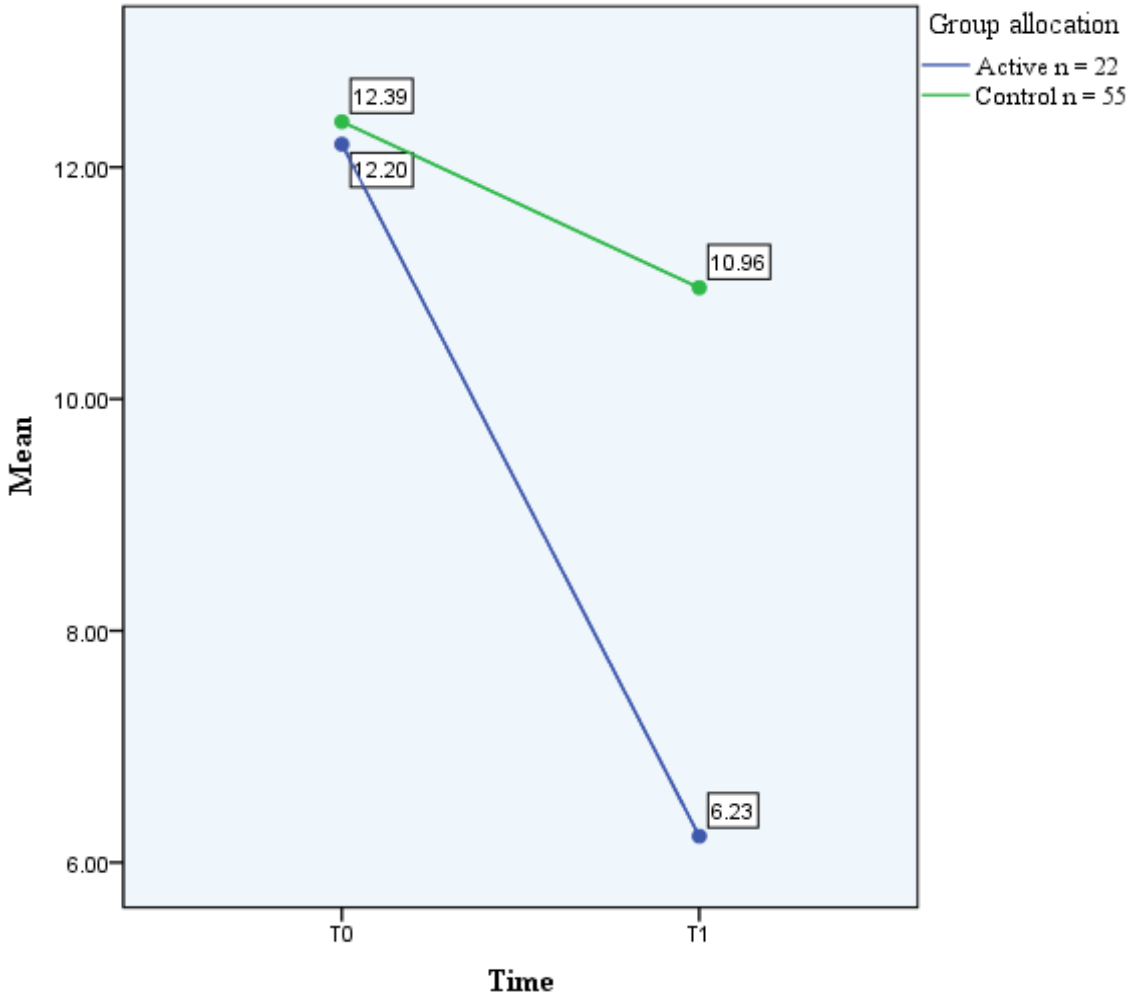


**Figure 6-6 Pre-post Pregnancy-related Depression (EPDS) Means**

There was no interaction effect for depression from T0 to T2, $F(1,45)=1.10$, $p>.05$. Depression reduced significantly from T0 to T2 for actives, $F(1,45)=15.67$, $p<.001$, $\eta^2=26$ and controls, $F(1,45)=14.46$, $p<.001$, $\eta^2=24$.

A mixed factorial ANCOVA examining the change in TPDS distress over time showed a time x group interaction, $F(1,70)=4.27$, $p<.05$, $\eta^2=.057$. Pairwise comparisons showed a difference over time in distress for active participants, $F(1,70)=19.36$, $p<.001$), $\eta^2=.22$ (mean difference -5.64) and control participants, $F(1,70)=8.38$, $p<.01$, $\eta^2=.11$ (mean difference -2.46), more so for active participants. Active participants had significantly lower distress scores at T1 than controls, $F(1,70)=5.19$, $p<.05$, $\eta^{2=}.17$.

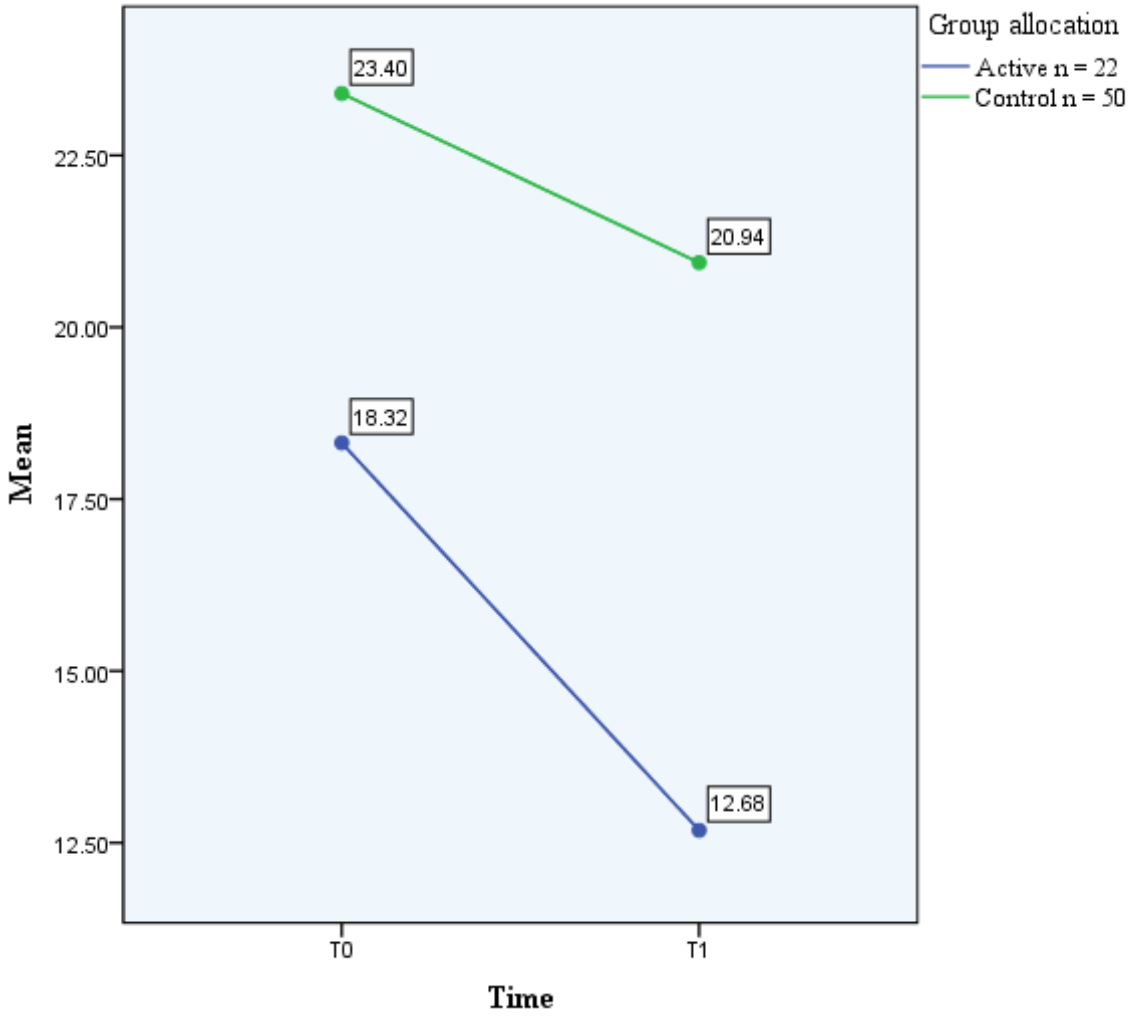


**Figure 6-7 Pre-post Pregnancy-related Distress (TPDS) Means**

TPDS pregnancy-distress data was not collected at postnatal follow-up.

A mixed factorial ANCOVA was conducted for (reverse scored) labour worry from T0 to T1, controlling for baseline TPDS distress. There was a near significant time x group interaction, $F(1,69)=3.73$, $p=.058$, $\eta^2=.051$. Pairwise comparisons showed a significant

difference in labour worry over time with controls showing no improvement, $F(1,69)=0.00$, $p>.05$ (mean difference -.02) and actives improving, $F(1,69)=5.42$, $p<.05$, $\eta^2=.07$, (mean difference 3.14). At T1, the difference between control and active scores showed a trend, $F(1,69)=3.53$, $p=.065$, $\eta^2=.05$, see Figure 6-8. Labour worry was not measured at postnatal follow-up.

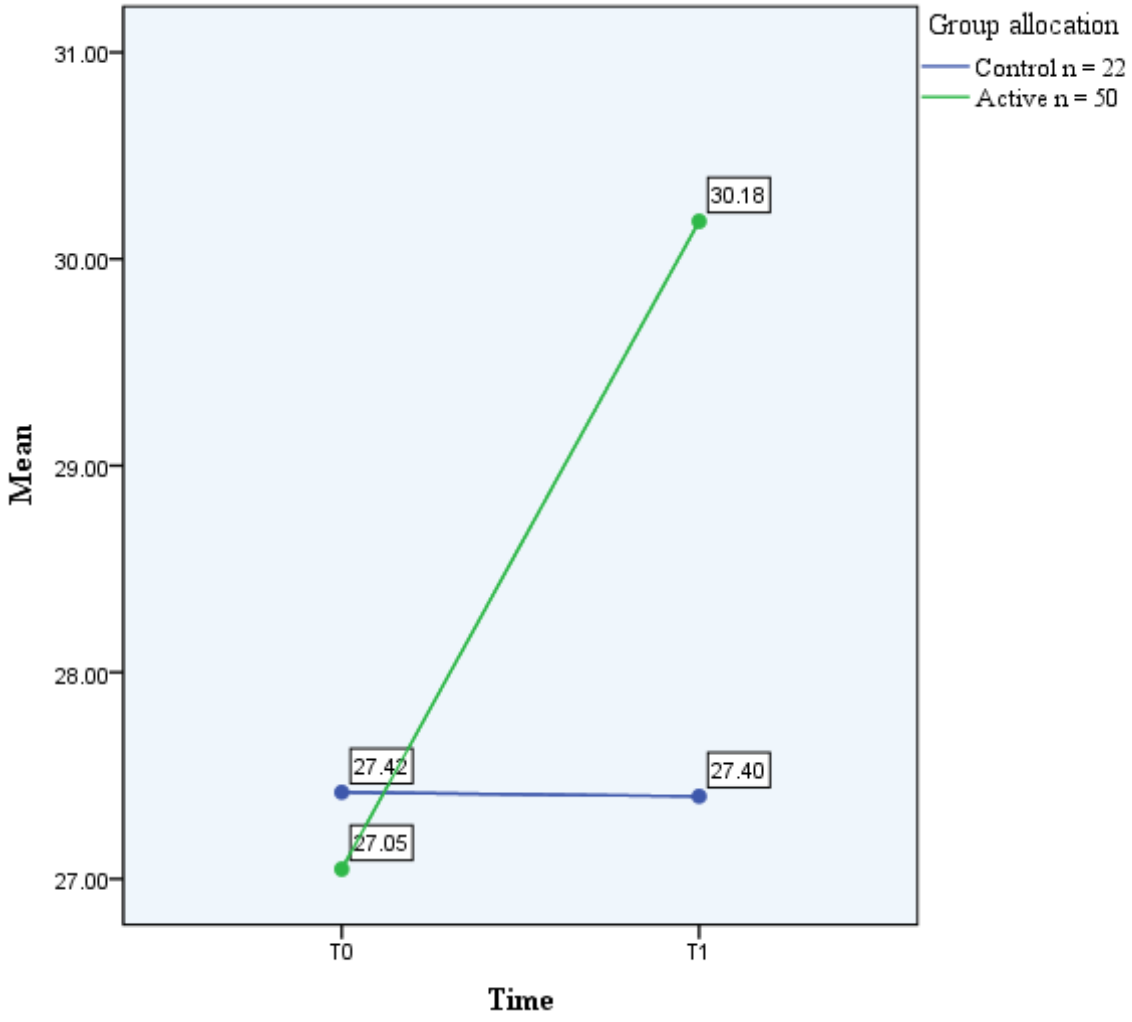


**Figure 6-8 Pre-post Labour Worry (OWLS) Means**

### *6.6.8 Dispositional mindfulness as a mediator of change in mood*

First, a mixed factorial ANCOVA was conducted to explore the difference in dispositional mindfulness from T0 to T1 comparing active and control participants, controlling for baseline TPDS distress. There was a significant time x group effect, $F(1,69)=16.09$, $p<.001$, $\eta^2=.19$, with active participants increasing significantly,

$F(1,69)=39.03$, $p<.001$, $\eta^2=.36$ (mean difference 24.68) and control participants also increasing, $F(1,69)=4.46$, $p<.05$, $\eta^2=.06$ (mean difference 5.45). The difference between scores at T1 was significant, $F(1,69)=10.70$, $p<.005$, $\eta^2=.13$.

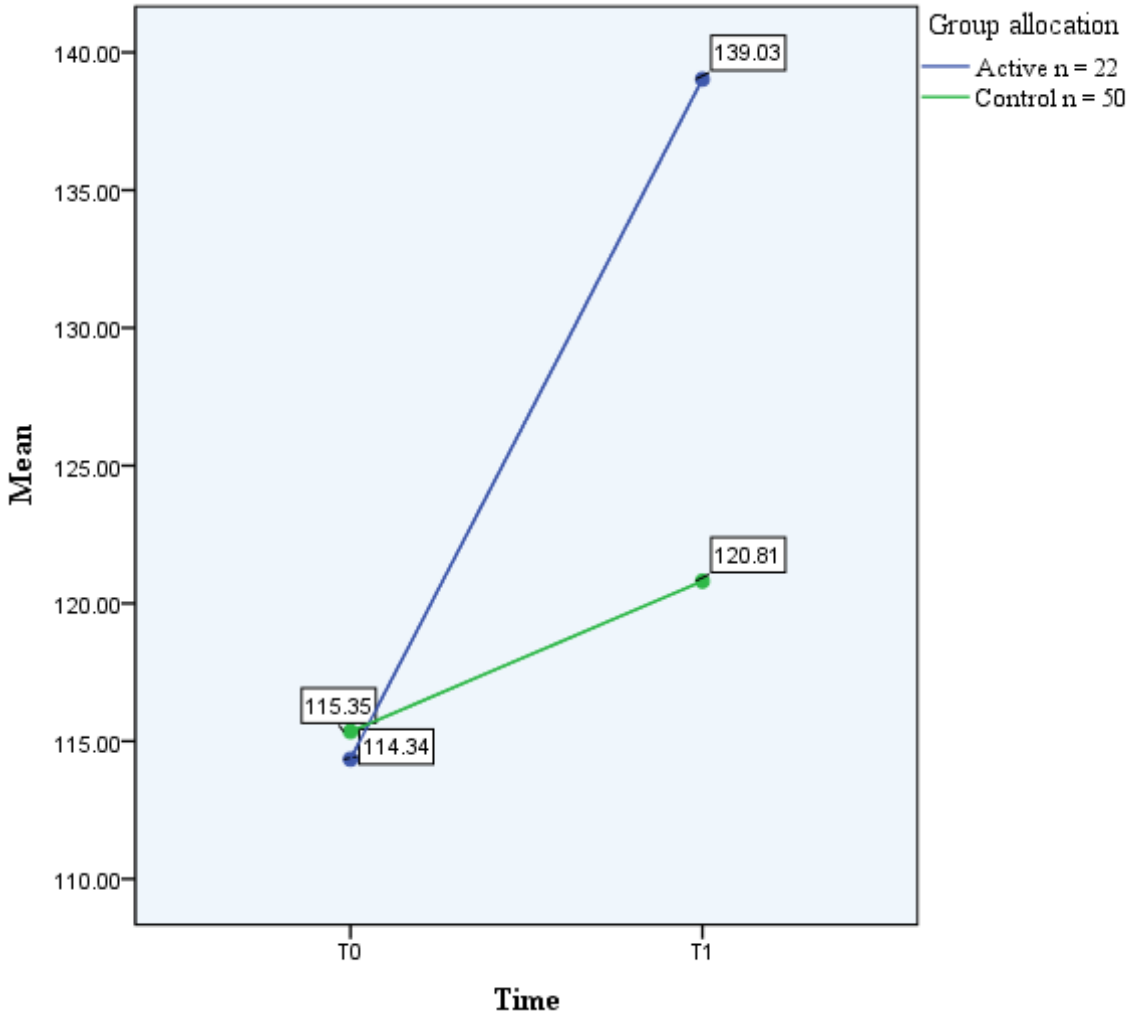


**Figure 6-9 Pre-post Dispositional mindfulness (FFMQ) means**

For the sample of postnatal completers ($n$ = 16 active, $n$ = 32 control), there was a significant time x group effect from T0 to T2, $F(1,45)=6.73$, $p<.05$, $\eta^2=.13$. Active participants significantly increased in mindfulness from T0 to T2, $F(1,45)=23.56$, $p<.001$, $\eta^2=.34$ and so did controls, $F(1,45)=5.53$, $p<.05$, $\eta^2=.11$. There was a significant difference between T2 scores, $F(1,45)=4.35$, $p<.05$, $\eta^2=.09$.

To examine whether the change in dispositional mindfulness from baseline (T0) to post-course (T1) mediated the outcome at T1 as a function of group allocation, a mediation

analysis was conducted (Hayes, 2012)[53]. For the purposes of mediation analysis, the variables which showed a significant group x time interaction, namely general measures of PSS stress and pregnancy-related measures of EPDS depression, TPDS distress and OWLS labour worry, were analysed. In each instance, baseline mindfulness and mood and baseline TPDS distress were controlled for[54].

Examining the outcome of PSS stress, the change in dispositional mindfulness mediated stress outcome, dependent on group allocation, $b$=-4.21, BCa CIs [-6.66, -2.18], $R^2$=.72. This represents a large effect, standardized $b$ for indirect effect= -0.33, 95% BCa CIs [-0.49, -0.17], see Figure 6-10.

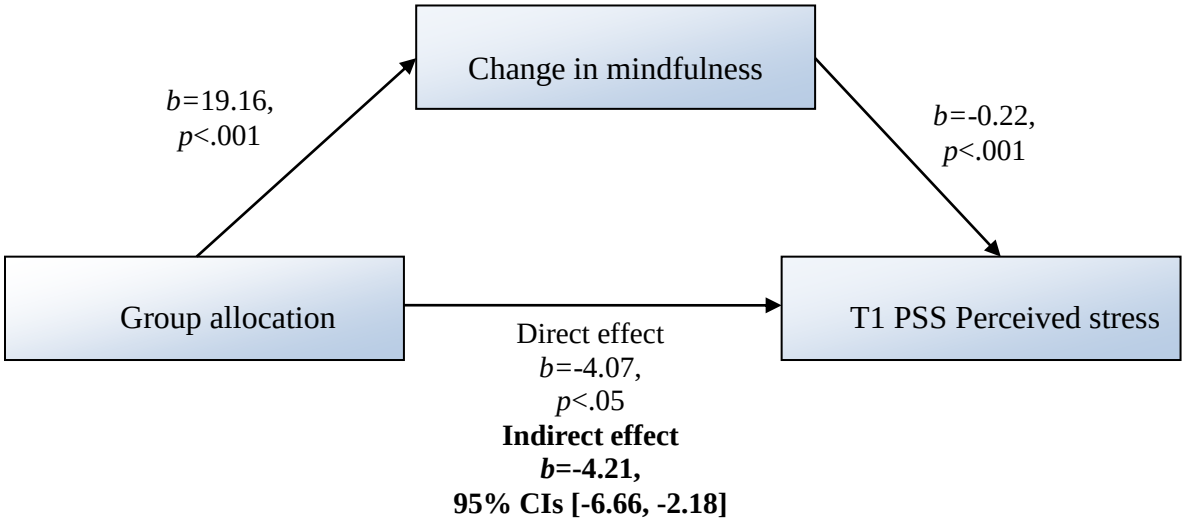


**Figure 6-10 Model of random allocation as a predictor of perceived stress outcome, mediated by the change in dispositional mindfulness. The confidence interval for the indirect effect is bootstrapped based on 1000 samples.**

The change in dispositional mindfulness mediated EPDS depression outcome, $b$=-2.99, BCa CIs [-4.86, -1.44], $R^2$=.74. This represents a large effect, standardized $b$ for indirect effect=-0.27, 95% BCa CIs [-0.43, -0.14], see Figure 6-11.

[53] Analyses are bootstrapped based on 1000 samples.
[54] Owing to the significant difference in scores between active and control participants at baseline.

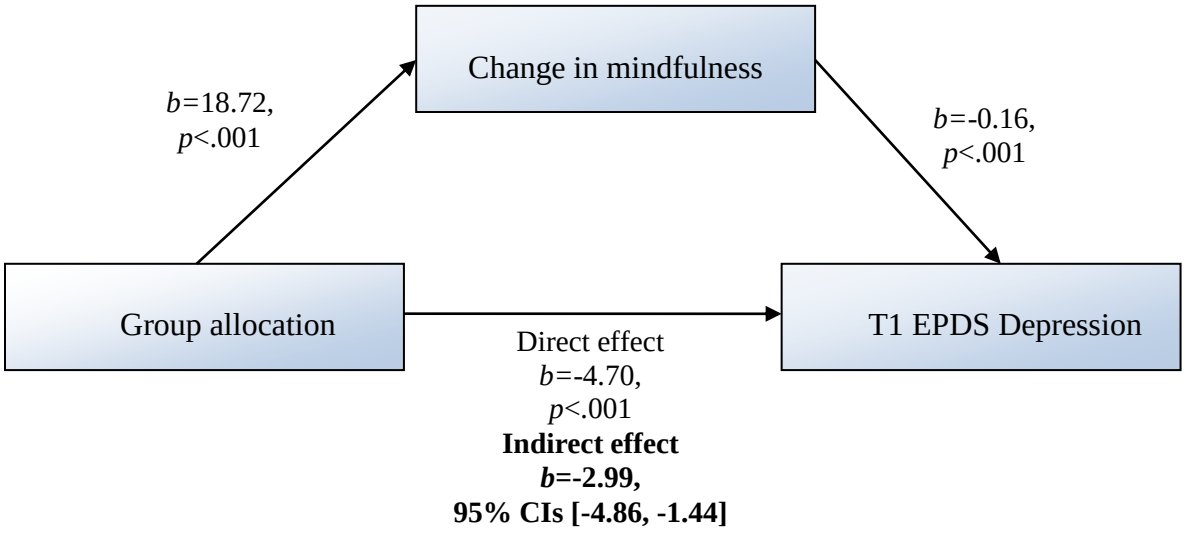


**Figure 6-11 Model of random allocation as a predictor of depression outcome, mediated by the change in dispositional mindfulness. The confidence interval for the indirect effect is bootstrapped based on 1000 samples.**

The change in dispositional mindfulness mediated the outcome in TPDS distress, *b*=-3.25, BCa CIs [-5.74, -1.68], $R^2$=.74. This represents a large effect, standardized *b* for indirect effect=-0.25, 95% BCa CIs [-0.43, -0.13], see Figure 6-12.

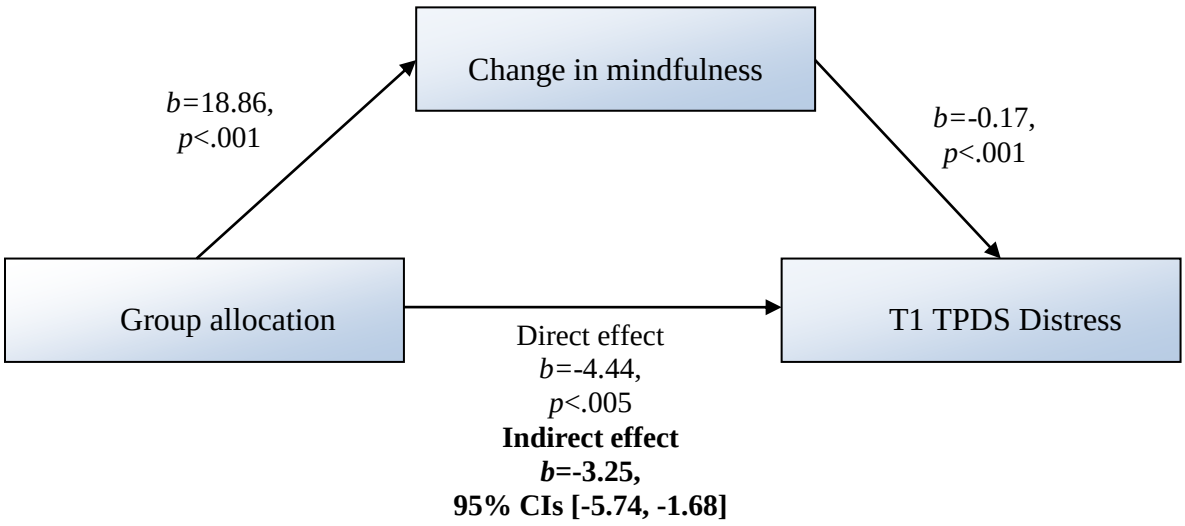


**Figure 6-12 Model of random allocation as a predictor of distress outcome, mediated by the change in dispositional mindfulness. The confidence interval for the indirect effect is bootstrapped based on 1000 samples.**

Change in mindfulness mediated the change in OWLs labour worry[55], by group, *b*=1.25, BCa CIs [0.08,3.32], $R^2$=.48. This represents a small effect, standardized *b* for indirect effect=0.11, 95% BCa CIs [0.01,0.27], see Figure 6-13.

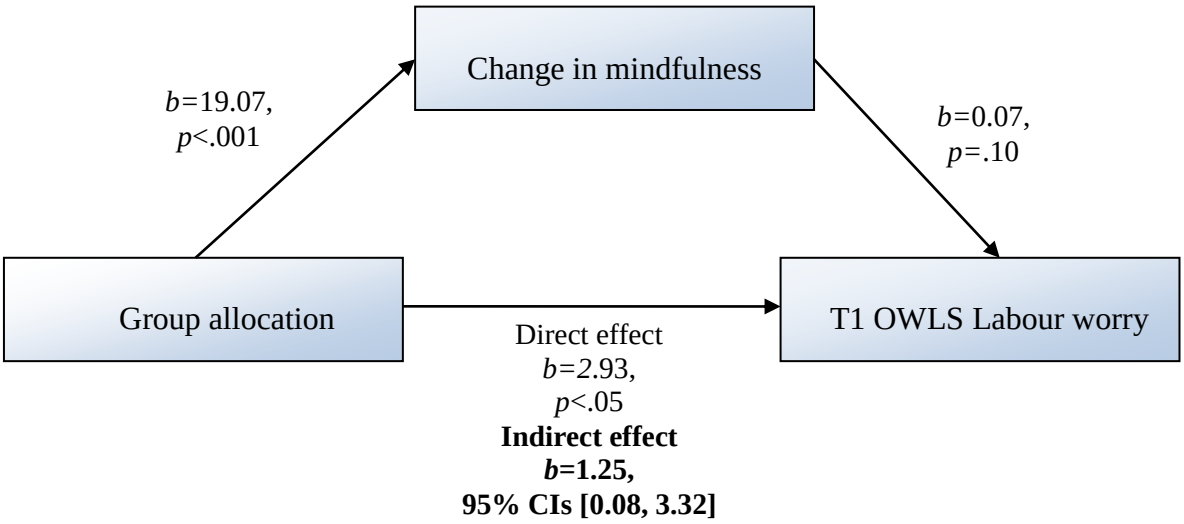


**Figure 6-13 Model of random allocation as a predictor of labour worry, mediated by the change in dispositional mindfulness. The confidence interval for the indirect effect is bootstrapped based on 1000 samples.**

### *6.6.8.1 Amount of mindfulness practice as mediator of change in mood*

Three participants completed no practice questions on the course website so their data are missing from analysis, leaving 19 course completers with weekly practice data. Participants who did not complete all practice questions missed up to four items (usually three items/one week of questions). Overall, 67% of all practice items were completed. The mean amount of practice as a scale variable was 30.58, with 12 being the highest possible amount and 60 being the lowest. Most participants reported completing practice 2-3 days a week. Correlations with (reverse scored) amounts of practice and baseline mood were significant for OWLS labour worry, *r*=-.612, *p*<.05 and TPDS distress, *r*=.46, *p*<.05.

[55] Labour worry is reverse scored.

There were no significant correlations with practice and mood at T1[56], so a mediation analysis was not conducted.

Because of missing weekly self-report data for some participants, post-course surveys were amended to ask two questions about average amount of practice over the course (formal and informal). Each question was a scale of 1-5, with 5 being most practice. Participants ($n$ = 20; two participants completed the study prior to the amendment) reported more informal (mean 3.5) than formal practice (mean 2.85) over the course. There were no significant baseline mood correlations. At T1, informal practice was negatively correlated with PSS stress, $r$=-.552, $p$<.05, GAD-7 anxiety, $r$=-.545, $p$<.05 and EPDS depression, $r$=-.505, $p$<.05 and positively correlated with FFMQ mindfulness, $r$=.524, $p$<.05.

Average informal practice was examined in regressions to explore whether more practice predicted the mood improvements that informal practice was correlated with at T1, controlling for baseline mood[57]. More informal practice did not predict any difference in PSS stress, EDPS depression or FFMQ mindfulness. More informal practice predicted lower T1 anxiety controlling for baseline anxiety, see Table 6-6.

**Table 6-6 Linear model of informal practice as predictor of anxiety with baseline anxiety covariate**

| *Step 1* | *B* | Standard Error | *β* | *p* |
|---|---|---|---|---|
| GAD-7 Baseline | 0.37 (0.11, 0.62) | 0.12 | .57 | <.01 |
| *Step 2* | | | | |
| GAD-7 Baseline | 0.34 (0.12, 0.56) | 0.10 | .53 | <.005 |
| Informal Practice | -1.92 (-3.17, -0.65) | 0.60 | -.50 | <.01 |

Note: Dependent variable: GAD-7 Post-course.$R^2$=.33 ($p$<.01) for step 1; $\Delta R^2$=.25 for step 2 ($p$<.005).

[56] Linear regressions examining the amount of self-reported practice predicting distress and labour worry outcome, controlling for baseline mood, were also not significant ($p$ >.05)

[57] Regressions examining amounts of formal practice as a predictor of mood were not significant.

A mediation analysis showed that informal practice did not mediate anxiety via change in mindfulness, controlling for baseline anxiety and mindfulness, indirect effect *b*=-.02, 95% CIs -0.09, 0.01[58].

### *6.6.9 Parity as a potential moderator of mood*

To examine whether parity moderated the effect of the course on mood, a moderation analysis was conducted on the outcomes which showed a significant time x group effect, namely general PSS stress and pregnancy-related EPDS depression, TPDS distress and OWLS labour worry. Approximately half of active and control participants had children (54.5%, *n* = 12 and 54%, *n* = 27, respectively). Baseline TPDS distress and baseline mood were controlled for. Parity did not moderate the outcome of PSS stress, EPDS depression, TPDS distress or OWLS labour worry (*p* >.05).

### *6.6.10 Initial Emerging Qualitative Findings*

Four interviews were conducted with three active course completers and one non-completer and thereafter the course completers were interviewed at post-natal follow-up. Seven participants provided feedback online as they could not meet in person, two of which had not completed the course and one of these completers also provided feedback once more at post-natal follow-up.

The emerging findings are as follows:

Six participants found the course instructors off-putting in some way or found the format of watching them sit in a video a little strange: *"I have to admit I found the tone and of voice of the two main lecturers somehow annoying and patronizing."* (course completer

[58] Bootstrapped based on 1000 samples.

1054), *" Found it a bit strange to be looking at two people in chairs the whole time - felt a little unnatural."* (non-completer 1047).

Five participants (four completers and one non-completer) would have liked the inclusion of pregnancy information or pregnancy-specific meditations: *"It would be even better if a Mindfulness course could be developed especially for pregnant women - maybe including the baby in the guided meditation and with pregnancy specific mindful movement."* (course completer 1121).

Six participants did not like other website elements or had difficulty with an element of the website (including two non-completers): *"I just found the layout of the web-site a little bit old school. More dynamic features and functions are currently available on similar on-line platforms."* (course completer 1054), *" Some of the videos were overly repetitive or slow and it could get frustrating with the multiple stops to read a screen and then go back to the video...Didn't find it that easy to find where things were."* (course completer 1032), *"I became quite confused about which week I was on, what was next, how much time I needed to set aside, how many sessions were in each module etc."* (course non-completer 1147).

Three participants, including one non-completer, said that there was too much to do on the course: *"...to begin with I did find it useful but I felt that there were too many exercises to do each week which for some people might be a little too much (i.e. If you're working full time, looking after children etc). It put me off."* (non-completer 1092). Similarly, three participants (one non-completer) found it difficult to keep track of homework, or remembering to do the homework: *"I didn't always realise what I was supposed to do on a daily or weekly basis in terms of the homework assignments."* (course completer 1032).

Seven participants found the lack of a mobile app, or the fact that it was too difficult to navigate the website and complete course elements on a phone, frustrating: *"A mobile app*

*would be really useful to complete the course as it was difficult to view all the screens on my phone...I had to log on to my laptop each time."* (course completer 1157), *"I think it would be much better if it was available as an app which could be easily accessed on a smart phone. Having to get the laptop out was a bit of a faff and cumbersome."* (non-completer 1092).

When asked about barriers to participation, nine participants (two non-completers) sited timing issues (particularly finding time alone), work commitments, family commitments (especially trying to find time when rearing infants) and becoming more busy during later stages of pregnancy preparing for the newborn: *"My toddler likes to nap next to me during the day so I didn't watch the videos then in case it disturbed him"* (course completer 1121), *"The late stages of pregnancy got the better of my to-do list."..." Finding quiet space without others around to complete the course [was a barrier to participation]"* (non-completer 1147).

The feedback varied with regard to specific course elements or meditation practices: *"... being constantly reminded to 'be kind to yourself' I found particularly annoying." ..." particularly mindful breathing has been helpful in managing stressful situations particularly in work."* (course completer 1032), *"Maybe ignore the mindful eating."..." I have found certain aspects useful for relaxation for example body scan."* (course completer 1191), *"I gave it up in the end as I simply didn't like it."* (course non-completer 1192), *"The mindful movement has inspired me to make time to do yoga again and I really liked the 'writing a letter to your future self during a stressful time' exercise"* (course completer 1121). All participants said that they found the course helpful in some way, varying from being more mindful on a daily basis and using practice to help with sleep to using mindfulness meditation for pain during labour (two participants specifically used mindfulness techniques during childbirth).

The analysis and paper publication for the qualitative study are being prepared for future publication (Krusche et al., in prep).

## 6.7 Discussion

This study aimed to compare mood outcomes for participants randomly allocated to either complete an online mindfulness course, or wait as control participants, during pregnancy. Expectant fathers were not included because of a lack of interest in the pilot. All participants improved in mood over time, except for labour worry, in which only active participants improved. People allocated to take the online mindfulness course had a significant improvement in general stress compared with their waitlist peers. Similarly, participation in the course produced greater improvements in pregnancy related mood, incorporating depression, distress and labour worry, compared to waitlist controls. Taking the course did not improve mood over waiting when examining mood from pre-course to postnatal follow-up. The change in dispositional mindfulness from baseline to post-course mediated the effect of participating in the course on general stress and pregnancy-related depression, distress and labour worry. Participants taking the online course did not have a significant improvement in general anxiety or depression compared to controls. The findings support previous research examining the use of a generic mindfulness course during pregnancy and expand the field because the online mode of delivery is also promising and had not been previously examined for a pregnant sample.

That levels of general anxiety and depression did not improve significantly for active participants compared to those waiting could be due to the measure items. The PHQ-9 measures depression with items asking about physical and somatic symptoms which are generally found during and after pregnancy when low mood is not present, for instance, feeling tired, a difference in appetite and trouble concentrating. The GAD-7 as a measurement of anxiety similarly asks questions about trouble relaxing, being restless and

becoming irritable, which could be attributed to an increase in physical discomfort. The EPDS measure of depression, however, takes perinatal physicality into account and asks primarily about low mood. The change in the scores for general depression over time for all participants likely represents normal physical changes over pregnancy, as opposed to an improvement in depression. That the pregnancy-specific measure of depression was found to improve significantly more for active participants post-course supports the notion that completing the online mindfulness course is beneficial for low mood.

The difference in mood between active and control participants from pre-course to postnatal follow-up was not evident. This is not surprising given that having a new infant is liable to increase stress, fatigue and consequently, low mood and that previous research examining mindfulness courses for pregnancy is mixed where mood improvements are not always maintained postpartum (e.g. (Vieten & Astin, 2008; Zhang & Emory, 2015), see chapter one, Table 1-2,Table 1-3 and Table 1-4 for details). Studies including postnatal follow-ups are currently few and further investigation would be useful.

That mood improved for all study participants is surprising given that mood during pregnancy is purported to decline during the third trimester and while the majority of participants began the study during their second trimester, most (68%) finished during their third trimester. Chapter three examining the change in mood from the second to the third trimester in a small sample also found that anxiety and stress remained stable, although that sample had healthier mood than the current sample at baseline. Previous research examining the use of mindfulness courses during pregnancy has also found a decrease in stress for participants over time, including those in a reading control group (Guardino et al., 2013). The improvements in mood found in the current study could represent a usual incline in mood over time, especially given that the sample was highly stressed and moderately anxious, distressed and depressed at baseline. Potentially, participants were

self-selecting to participate in the study and mindfulness course because of their low mood at that time, which improved to a certain extent regardless of intervention. Otherwise, participants in the waitlist control group could have been making attempts and been successful in improving their mood by other means. Unfortunately, no data about health behaviours, coping or therapy was taken at post-course or postnatal follow-up. Anecdotally, a small number of participants provided feedback to say that they felt better because they were on maternity leave when they completed their post-course questionnaires.

That the increase in dispositional mindfulness mediated the improvement in mood and labour worry supports the results of chapters three and five which found that higher levels of dispositional mindfulness during pregnancy were related to better mood. The findings also support previous research, outlined in chapter one, finding that mindfulness courses increase dispositional mindfulness during pregnancy and that this increase mediates mood improvement.

Having children did not moderate the effect of course completion on mood. The amount of mindfulness practice completed over the course did not mediate the change in mood, although it appears that people more distressed and worried about labour at baseline did practice less and more informal practice predicted improvement in anxiety post-course. There have been mixed findings examining the amount of practice as a mediator or predictor of mood outcome with previous research examining the same mindfulness course finding no relationship with stress (Krusche et al., 2012), but chapter two finding that more practice resulted in a larger mood improvement for general stress, anxiety and depression. Most participants reported completing formal and informal practices 2-3 days per week, supporting previous rates found for pregnancy-tailored mindfulness courses (Byrne et al., 2013). Although other studies have found higher practice rates in pregnant samples (Dimidjian et al., 2014; Goodman et al., 2014), these samples were clinical (anxiety,

depression) and specifically requested participants complete as much practice as possible over the course[59]. That pregnant women did complete formal and informal practices over the course shows potential for the use of mindfulness courses delivered during pregnancy, even when the practices are not pregnancy-tailored. It also shows potential for the online delivery of courses in that participants completed practice outside of the 'sessions' without direct therapist communication. The way that practice was measured in the current study may be problematic, as suggested in chapter two, because participants are completing weekly practice questions without completing 'course weeks' in one week. Indeed, the average time to complete the course in the current study was almost eight and a half weeks, meaning that the practice items are potentially not capturing actual practice amounts. While the post-course survey practice items showed slightly different results to the weekly self-reports, being only one item for formal and informal practice means they too may not reflect accurate levels of practice over the course. This is the first study to examine the amount of practice as a mediator of mood improvement during pregnancy and it may be helpful to re-evaluate practice as a mediator in future studies to clarify the relationship, especially changing the way practice data is collected to better reflect specific course structure.

This study has a number limitations. First, the sample size, though larger than many of the current studies examining the potential of mindfulness courses for pregnancy, was smaller than the initial target. Some analyses may be underpowered. The total sample size was calculated as large enough to detect a moderate change in stress over time but the two group numbers were not equally distributed. The sample size is smaller than the target primarily because of the high attrition rate of course participants, with 20.5% of participants

[59] Participants were asked to practice at least six days per week in the study examining mindfulness for perinatal depression (Dimidjian et al., 2014) and were excluded from the study examining anxiety if they were unwilling to attend at least seven of eight course sessions (Goodman et al., 2014).

allocated to intervention completing the course. This high rate of attrition is a cause for concern. While the course appears helpful for those who complete it compared to a control group, the high drop-out rate suggests that there are reasons that people do not complete the course that are unavailable. Participants may not finish the course because there are elements which they do not like, a lack of communication with a therapist, pregnancy discomfort or simply that they are too busy to complete it. Qualitative data was collected post-course and at postnatal follow-up, to be published separately (see Section 6.6.10 for emerging findings; Krusche et al., in prep), and many participants stated that being unable to complete course elements on their mobiles was frustrating, which may, in part, account for high attrition. The initial recruitment drive was conducted towards the end of the year and this may have also contributed to a large number of people dropping-out, especially given that (anecdotally) the second recruitment drive during the New Year was much more successful and there were fewer drop-outs.

When comparing baseline sociodemographic and mood data for those allocated to take the course and completing or not, people who initially practiced more yoga were more likely to complete. This suggests that perhaps course completers finished the course because it was more familiar to them, especially because the course incorporates yoga and yoga classes tend to include meditation practices. It could be that people dropped-out because the course was too unfamiliar but future research will have to examine this in more detail, requesting later data from non-completers as well as completers. Unfortunately, no data was collected for people who were allocated to but did not finish the course meaning that whether there was a difference in mood over time for people who chose not to finish the course, or even whether the course increased low mood for some people taking it is unknown. In terms of all course sign-ups (outside of this study), service users who did not finish the course had slightly higher mean scores at baseline than course completers for

stress (24.01 and 22.52), anxiety (11.14 and 10.39) and depression (10.70 and 9.25 respectively). Although the attrition rate in the current study is similar to that found with general service users of the course, with an approximate attrition rate of 67% overall (the exact figure is difficult to establish due to people returning and completing the course at later dates in some cases) and internet research usually has high attrition rates (e.g. (Karyotaki et al., 2015)), it is important to explore the reasons that people do not complete the course.

Course usage data was unavailable so an exploration of how much participants actually used the course and how often they logged in was unavailable. While the course seems helpful for those who complete it, it may be that participants who complete more of the course elements benefit more and this would be a useful addition to future research. Because of the high drop-out rates, it would be important to elucidate how the course is used by both people who complete it and those who do not to explore whether this has an impact on completion.

Further, all data collected was self-report and only T1 and T2 data was collected from active participants who did complete the course. This further adds to the preliminary nature of the current study and the potentially spurious nature of claims resulting from these initial findings. It is possible that the course is not helpful for many people but without more data it is unclear. Future research should address these research gaps, using this initial investigation as a precursor for further exploration.

Intention to treat analysis was unavailable due to each randomised participant being replaced at drop-out. Participant slots were replaced in an attempt to maintain the stratified 1:1 ratio between groups, but the difference in numbers where there were more people allocated to the active group means that intention to treat analysis would be unbalanced.

Further, mood improved for all participants regardless of allocation so taking baseline mood forward for those who dropped out would be unlikely to accurately reflect the difference between groups at later times. Similarly, data was not imputed for these reasons and because of the small sample size. Potentially, the active participants who dropped out of the course could have shown the same changes over time as the control participants which would, in effect, show similar findings to those in the current analysis (that all participants improved and there were limited differences between groups). It would be useful to include these analyses in future, larger samples.

It is interesting to note that waitlist control participants with (more) children were less likely to complete post-course measures. It may be useful to examine this in future studies examining pregnant samples and to take parity into account when exploring recruitment and attrition, or designing future research.

Although there are study limitations, this study is the first to examine the change in mood for pregnant women taking an online mindfulness course, compared to a control group. This preliminary investigation shows potential for completing an online mindfulness course during pregnancy to improve general and pregnancy-related mood. The study also adds to existing research examining the potential of mindfulness courses for mood during pregnancy by examining the change in labour worry and pregnancy-related distress which had not been explored previously. Furthermore, general anxiety and pregnancy-related depression had not been investigated with a generic mindfulness course and there are very few pregnancy-tailored courses examining the change in mood; only one which examined the change in EPDS depression.

Although men sign-up to the course outside of the research, the course does not appear to appeal to expectant fathers, based on the low uptake in the pilot study. It appears that

while couples tend to attend courses together during pregnancy, possibly because of social norms, couples may be unlikely to complete an online mindfulness course together during pregnancy. For expectant fathers who need psychological support, a different mode of delivery may be more suitable. In future research, it may be useful to invite expectant mothers and fathers to take part individually, as opposed to the mother inviting her partner to participate. Like mothers-to-be seemingly self-selecting to participate because of low mood, the course may appeal to fathers-to-be who feel they need an intervention to improve mood and well-being. Other future recommendations are to request measures of mood for people who do not continue with the online mindfulness course, to include further follow-ups and to examine usage data of the course which was unavailable for the current study.

That the course appears to be helpful for the women who complete it during pregnancy is a valuable finding with great potential for expectant mothers, particularly if they are unable or unwilling to seek help in person. That prenatal mood scores were improved for participants taking the course is an important and promising finding, especially given the lack of interaction with a therapist and the reduced cost and length of the course. Improvements from completing the course could result in large benefits to both the family and the health service.

# THESIS CONCLUSION

The aim of this thesis was to investigate dispositional mindfulness and the usage of mindfulness courses for improving mood during pregnancy.

The literature examining the utility of mindfulness courses has expanded over the last few years and seems promising but there is work to be done to fill research gaps. Thus far, as outlined in chapter one, there have only been preliminary investigations examining mindfulness courses for use during pregnancy, be they generic or pregnancy-tailored. Studies are starting to evaluate mindfulness-based courses because of the many advantages with these types of courses, especially during pregnancy, for instance: mindfulness-based courses are known for their preventative effects for depression and general mood improvements so may be helpful to stave off prenatal and postnatal negative mood; expectant mothers' preference for stress-reduction courses over medication for low mood and a potential lack of stigma compared to other therapies; the preliminary evidence shows potential for use with prospective mothers and fathers, especially given that couples often attend antenatal courses together and fathers are largely overlooked for support routes with low mood during and after pregnancy; studies have started to investigate how mindfulness and mood relate to each other in pregnancy and emerging evidence suggests that higher levels of dispositional mindfulness negate negative mood. Now that the field has grown, the literature could benefit from investigations including further follow-ups, especially given mixed postnatal findings. Clinical status also needs to be addressed in future as this research has only recently begun. Evaluations regarding mindfulness courses and consequences of perinatal depression, such as social, cognitive and behavioural development issues in children and parenting behaviours have thus far been overlooked and require exploration.

Online courses may be more useful during pregnancy because of difficulties with class adherence, especially given pregnancy discomforts and childcare requirements. The ability to take the course at a chosen pace and at any time or location and the lack of healthcare screening and high financial cost of therapies delivered in person are also advantageous. Future investigation would be useful.

This thesis evaluated the link between dispositional mindfulness and mood during pregnancy and built upon existing evidence suggesting that higher levels of mindfulness are correlated with lower levels of negative mood. This supports the notion of delivering a mindfulness course, which feasibly increasing mindfulness, to improve mood during pregnancy. Also building on existing literature, an audit of face-to-face mindfulness courses showed benefits in mood pre to post-course for expectant mothers and fathers, even when the course was a shortened version. Finally, an online mindfulness course completed by the general population looked promising for stress, anxiety and depression in a sample of service-users and similar benefits were also found for stress and pregnancy-related distress, depression and labour worry in a sample of pregnant women, compared to a waitlist control group. This improvement in prenatal mood is an important finding and suggests the need for more research with these course types to stave off low mood during and after pregnancy. This was the first study to examine an online mindfulness course for expectant mothers and shows promise for its utility in the future. These results are especially promising given the lack of communication with a therapist and the shortened course format and cost saving. The high attrition rates should not be overlooked, however, and future research would be useful to examine the reasons why people complete and do not complete the online mindfulness course.

There were limitations with the studies, particularly small sample sizes for the course evaluations. That prospective parents attended the courses delivered in person and good

rates of adherence were reported is promising for course feasibility, but further investigations would benefit from larger samples for sufficient power to detect change in mood. Furthermore, no control group was included in the face-to-face course analysis and that would be a useful next step in the research. The sample size for the online mindfulness randomised study was smaller than the initial target and mainly due to poor course adherence with active participants tending to drop out in the first couple of weeks of the course. That participants were more likely to complete the course if they already practiced yoga is interesting and would suggest that mindfulness courses are more familiar to people who practice yoga, perhaps being less off-putting as a result. Future research would benefit from evaluating participants who drop-out from the courses to explore whether later low mood is a reason for incompletion. Qualitative data was taken during chapter six and this will be analysed with regard to what participants thought of the courses and the reasons they completed the course, with any barriers to engagement (in prep), with a view to understanding some of the reasons why people do and do not complete the course. Currently, the online course does seem beneficial for those who complete it but going forward it would be important to elucidate who is most likely to proceed with the course and benefit from doing so. This thesis is a first step in evaluating mindfulness courses delivered online to pregnant women and shows promise for their utility, adding to this expanding field of literature.

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# APPENDICES

## Measures

## Perceived Stress Scale

The questions in this scale ask you about your feelings and thoughts during THE LAST MONTH. In each case, please indicate your response by selecting the circle representing HOW OFTEN you felt or thought a certain way.

1. In the last month, how often have you been upset because of something that happened unexpectedly?
2. In the last month, how often have you felt that you were unable to control the important things in your life?
3. In the last month, how often have you felt nervous and "stressed"?
4. In the last month, how often have you felt confident about your ability to handle your personal problems?
5. In the last month, how often have you felt that things were going your way?
6. In the last month, how often have you found that you could not cope with all the things that you had to do?
7. In the last month, how often have you been able to control irritations in your life?
8. In the last month, how often have you felt that you were on top of things?
9. In the last month, how often have you been angered because of things that were outside your control?
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

| | |
|---|---|
| *Never* | *0* |
| *Almost never* | *1* |
| *Sometimes* | *2* |
| *Fairly often* | *3* |
| *Very often* | *4* |

## Generalised Anxiety Scale-7

Over the last 2 weeks, how often have you been bothered by any of the following problems?

**1** Feeling nervous, anxious or on edge

**2** Not being able to stop or control worrying

**3** Worrying too much about different things

**4** Trouble relaxing

**5** Being so restless that it is hard to sit still

**6** Becoming easily annoyed or irritable

**7** Feeling afraid as if something awful might happen

| | |
|---|---|
| *Not at all* | *0* |
| *Several days* | *1* |
| *More than half the days* | *2* |
| *Nearly every day* | *3* |

## Oxford Worries about Labour Scale

Before you went into labour or had your baby did you have any particular worries about the labour and birth?

**8** Needing a caesarean

**9** Getting effective pain relief

**10** Embarrassment

**11** Having a forceps or ventouse delivery

**12** Getting to the hospital in time

**13** Having to be induced

**14** Having a long labour

**15** Not knowing how long labour would take

**16** Not knowing when I would go into labour

**17** Pain and discomfort of labour

*1----------2----------3----------4*

*Very worried* *Not worried at all*

## Five Facet Mindfulness Questionnaire (FFMQ)

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

1. When I'm walking, I deliberately notice the sensations of my body moving.
2. I'm good at finding words to describe my feelings.
3. I criticize myself for having irrational or inappropriate emotions.
4. I perceive my feelings and emotions without having to react to them.
5. When I do things, my mind wanders off and I'm easily distracted.
6. When I take a shower or bath, I stay alert to the sensations of water on my body.
7. I can easily put my beliefs, opinions, and expectations into words.
8. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.
9. I watch my feelings without getting lost in them.
10. I tell myself I shouldn't be feeling the way I'm feeling.
11. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.
12. It's hard for me to find the words to describe what I'm thinking.
13. I am easily distracted.
14. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.
15. I pay attention to sensations, such as the wind in my hair or sun on my face.
16. I have trouble thinking of the right words to express how I feel about things.
17. I make judgments about whether my thoughts are good or bad.
18. I find it difficult to stay focused on what's happening in the present.
19. When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.
20. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.
21. In difficult situations, I can pause without immediately reacting.
22. When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words.
23. It seems I am "running on automatic" without much awareness of what I'm doing.
24. When I have distressing thoughts or images, I feel calm soon after.
25. I tell myself that I shouldn't be thinking the way I'm thinking.
26. I notice the smells and aromas of things.
27. Even when I'm feeling terribly upset, I can find a way to put it into words.

28. I rush through activities without being really attentive to them.
29. When I have distressing thoughts or images, I am able just to notice them without reacting.
30. I think some of my emotions are bad or inappropriate and I shouldn't feel them.
31. I notice visual elements in art or nature, such as colours, shapes, textures, or patterns of light and shadow.
32. My natural tendency is to put my experiences into words.
33. When I have distressing thoughts or images, I just notice them and let them go.
34. I do jobs or tasks automatically without being aware of what I'm doing.
35. When I have distressing thoughts or images, I judge myself as good or bad depending what the thought or image is about.
36. I pay attention to how my emotions affect my thoughts and behaviour.
37. I can usually describe how I feel at the moment in considerable detail.
38. I find myself doing things without paying attention.
39. I disapprove of myself when I have irrational ideas.

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

## Five Facet Mindfulness Questionnaire: Short Form (ffmq-sf)

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.

1. I'm good at finding the words to describe my feelings
2. I can easily put my beliefs, opinions, and expectations into words
3. I watch my feelings without getting carried away by them
4. I tell myself that I shouldn't be feeling the way I'm feeling
5. It's hard for me to find the words to describe what I'm thinking
6. I pay attention to physical experiences, such as the wind in my hair or sun on my face
7. I make judgments about whether my thoughts are good or bad.
8. I find it difficult to stay focused on what's happening in the present moment
9. When I have distressing thoughts or images, I don't let myself be carried away by them
10. Generally, I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing
11. When I feel something in my body, it's hard for me to find the right words to describe it
12. It seems I am "running on automatic" without much awareness of what I'm doing
13. When I have distressing thoughts or images, I feel calm soon after
14. I tell myself I shouldn't be thinking the way I'm thinking
15. I notice the smells and aromas of things
16. Even when I'm feeling terribly upset, I can find a way to put it into words
17. I rush through activities without being really attentive to them
18. Usually when I have distressing thoughts or images I can just notice them without reacting
19. I think some of my emotions are bad or inappropriate and I shouldn't feel them
20. I notice visual elements in art or nature, such as colours, shapes, textures, or patterns of light and shadow
21. When I have distressing thoughts or images, I just notice them and let them go
22. I do jobs or tasks automatically without being aware of what I'm doing
23. I find myself doing things without paying attention
24. I disapprove of myself when I have illogical ideas

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

## Five Facet Mindfulness Questionnaire-15

Please rate each of the following statements using the scale provided. Write the number in the blank that best describes your own opinion of what has been true for you this week.

1. When I take a shower or a bath, I stay alert to the sensations of water on my body.
2. I'm good at finding words to describe my feelings.
3. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.
4. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.
5. When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.
6. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.
7. I have trouble thinking of the right words to express how I feel about things.
8. I do jobs or tasks automatically without being aware of what I'm doing.
9. I think some of my emotions are bad or inappropriate and I shouldn't feel them.
10. When I have distressing thoughts or images I am able just to notice them without reacting.
11. I pay attention to sensations, such as the wind in my hair or sun on my face.
12. Even when I'm feeling terribly upset I can find a way to put it into words.
13. I find myself doing things without paying attention.
14. I tell myself I shouldn't be feeling the way I'm feeling.
15. When I have distressing thoughts or images I just notice them and let them go.

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

## Tilburg Pregnancy Distress Scale

The following questions relate to the way you perceive your pregnancy. Circle the box that best reflects how you felt during the last 7 days.

1. I am enjoying my pregnancy
2. I feel like my partner and I are enjoying the pregnancy together
3. I worry about the pregnancy
4. The pregnancy has brought my partner and I closer together
5. I worry about the delivery
6. I worry about the health of my baby
7. I worry about my job once the baby is born
8. I feel supported by my partner
9. I worry about our financial situation after childbirth
10. I am afraid I will lose self-control during delivery
11. I often think about choices concerning the delivery
12. The delivery is troubling me
13. I get very tense hearing stories about deliveries
14. I am concerned that the physical discomforts of pregnancy might persist after childbirth
15. I can really share my feelings with my partner
16. I worry about gaining too much weight

| | |
|---|---|
| *Very often* | *0* |
| *Fairly often* | *1* |
| *Now and then* | *2* |
| *Rarely or never* | *3* |

Key to calculate scores

Item : 3, 5, 6, 7, 9, 10, 11, 12, 13, 14 and 16 should be recoded (3=0, 2=1, 1=2, 0=3).

## Revised Prenatal Distress Questionnaire Items

Are you feeling bothered, upset, or worried at this point in your pregnancy:

*Repeated at each timepoint:*

1. . . .about the effect of ongoing health problems such as high blood pressure or diabetes on your pregnancy?
2. . . .about feeling tired and having low energy during your pregnancy?
3. . . .about paying for your medical care during pregnancy?
4. . . .about changes in your weight and body shape during pregnancy?
5. . . .about whether you might have an unhealthy baby?
6. . . .about physical symptoms of pregnancy such as vomiting, swollen feet, or backaches?
7. . . .about the quality of your medical care during pregnancy?
8. . . .about working or caring for your family during your pregnancy?
9. . . .about whether the baby might be affected by alcohol, cigarettes, or drugs that you have taken?

*Added at second and third timepoint:*

10. . . .about whether the baby might come too early?
11. . . .about changes in your relationships with other people due to having a baby?
12. . . .about paying for the baby's clothes, food, or medical care?

*Added at third timepoint:*

13. . . .about taking care of a newborn baby?
14. . . .about pain during labour and delivery?
15. . . .about what will happen during labour and delivery?
16. . . .about working at a job after the baby comes?
17. . . .about getting day care, babysitters, or other help to watch the baby after it comes?

*Response scale is:*

| | |
|---|---|
| *Not at all* | *0* |
| *Somewhat* | *1* |
| *Very much* | *2* |

## EPDS

As you are expecting or have recently had a baby, we would like to know how you are feeling now. Please choose the answer that comes closest to how you have felt IN THE PAST WEEK, not just how you feel today.

1. In the past week 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*

2. In the past week 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*

3. In the past week I have blamed myself unnecessarily when things went wrong:
   *Yes, most of the time*
   *Yes, some of the time*
   *Not very often*
   *No, never*

4. In the past week I have been anxious or worried for no good reason:
   *No, not at all*
   *Hardly ever*
   *Yes, sometimes*
   *Yes, very often*

5. In the last week I have felt scared or panicky for no very good reason:
   *Yes, quite a lot*
   *Yes, sometimes*
   *No, not much*
   *No, not at all*

6. In the past week 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*

7. In the past week I have been so unhappy that I have difficulty sleeping:
   *Yes, most of the time*
   *Yes, sometimes*
   *Not very often*
   *No, not at all*

8. In the past week I have felt sad or miserable:
   *Yes, most of the time*

*Yes, quite often*
*Not very often*
*No, not at all*

9. In the past week I have been so unhappy that I have been crying:
*Yes, most of the time*
*Yes, quite often*
*Only occasionally*
*No, never*

10. In the past week the thought of harming myself has occured to me:
*Yes, quite often*
*Sometimes*
*Hardly ever*
*Never*

*QUESTIONS 1, 2, & 4*

*Are scored 0, 1, 2 or 3 with top box scored as 0 and the bottom box scored as 3.*

*QUESTIONS 3, 510*

*Are reverse scored, with the top box scored as a 3 and the bottom box scored as 0.*

*Maximum score: 30*

*Possible Depression: 10 or greater*

## Scale for pregnancy-related discomforts

Have you experienced any of the following symptoms during the past week?

Circle the appropriate answer in each case, ranging from “never” to “constantly”(0-5).

*<First Trimester>*

**Group 1. Morning sickness and associated symptoms Subtotal: /25 points**

(a) Nausea (feeling sick)

(b) Oversensitivity to smells

(c) Lack of appetite

(d) Feeling that your food preferences and sense of taste have changed

(e) Feeling pressure on your stomach

**Group 2. Constipation-related symptoms Subtotal: /15 points**

(a) Difficulty in passing stools

(b) Reduced frequency or volume of stools

(c) Feeling of abdominal tension or distension due to stools or intestinal gas

**Group 3. Symptoms related to daily life Subtotal: /35 points**

(a) Overwhelming sleepiness

(b) Irritability

(c) Easily tired or always tired

(d) Physical heaviness or lethargy

(e) Bothered by constricting clothing (belts, elastic, etc.)

(f) Depression

(g) Stiff shoulders

*<Second Trimester>*

Have you experienced any of the following symptoms during the past week?

**Group 1. Symptoms due to fetal growth Subtotal: /30 points**

(a) Pelvic or pubic pain

(b) Bothered by constricting clothing (belts, elastic, etc.)

(c) Feeling tension or a pinching-type pain in your abdomen due to abdominal enlargement

(d) Feeling pressure on your stomach

(e) Pain in your upper or lower back (around waist) when bending forward or twisting your upper body

(f) Oversensitivity to smells

**Group 2. Psychological symptoms Subtotal: /20 points**

(a) Irritability

(b) Depression

(c) Easily tired or always tired

(d) Physical heaviness or lethargy

**Group 3. Symptoms related to constipation Subtotal: /15 points**

(a) Difficulty in passing stools

(b) Reduced frequency or volume of stools

(c) Feeling of abdominal tension or distension due to stools or intestinal gas

*<Third Trimester>*

Have you experienced any of the following symptoms during the past week?

**Group 1. Symptoms affecting your lifestyle Subtotal: /45 points**

(a) Physical heaviness or lethargy

(b) Easily tired or always tired

(c) Light sleeping

(d) Depression

(e) Irritability

(f) Difficulty falling sleep

(g) Bothered by constricting clothing (belts, elastic, etc.)

(h) Overwhelming sleepiness

(i) Feeling pressure on your stomach

**Group 2. Muscular or skeletal symptoms Subtotal: /20 points**

(a) Cramping or pain in your hip joint

(b) Pelvic or pubic pain

(c) Cramps (in the sole of your foot, thighs, calves, or buttocks)

(d) Pain in your upper or lower back (around waist) when bending forward or twisting upper body around

| | |
|---|---|
| *Constantly* | *5* |
| *Almost Constantly* | *4* |
| *Frequently* | *3* |
| *Sometimes* | *2* |
| *Seldom* | *1* |
| *Never* | *0* |

## Pregnancy Experience Scale

Below are 10 items that you may consider to be uplifting aspects of your pregnancy and 10 items that may be less appealing. Please circle the degree to which each item affects you now.

**How much have each of the following made you feel happy, positive, or uplifted?**

1. How much the baby is moving
2. Discussions with spouse about baby names
3. Comments from others about your pregnancy/appearance
4. Making or thinking about nursery arrangements
5. Feelings about being pregnant at this time
6. Visits to obstetrician/midwife
7. Spiritual feelings about being pregnant
8. Courtesy/assistance from others because you are pregnant
9. Thinking about the baby's appearance
10. Discussions with spouse about pregnancy/childbirth issues

**How much have each of the following made you feel unhappy, negative, or upset?**

1. Getting enough sleep
2. Physical intimacy
3. Normal discomforts of pregnancy (heartburn, incontinence)
4. Your weight
5. Body changes due to pregnancy
6. Thoughts about whether the baby is normal
7. Thinking about your labour and delivery
8. Ability to do physical tasks/chores
9. Concerns about physical symptoms (pain, spotting, etc.)
10. Clothes/shoes don't fit

| | |
|---|---|
| *Not at all* | *0* |
| *Somewhat* | *1* |
| *Quite a bit* | *2* |
| *A great deal* | *3* |

## IMPORTANT NOTICE SHOWN TO PARTICIPANTS DURING THE INTRODUCTION TO THE BE MINDFUL ONLINE COURSE

**Is this course right for you?**

Mindfulness encourages us to relate to things as they are, rather than how we want or expect them to be. This may involve relating with difficult feelings and issues.

It is not a good time for you to do this course:

- If you are currently suffering from severe depression.
- If you are going through major changes or upheavals eg. job loss, bereavement, moving house, relationship break-up. It is best to do the course at a time when your life is relatively stable.
- If you are too busy to engage with the course fully. During this course you will be asked to practice mindfulness in your daily life. It will only be of benefit if you are able to put in some time and commitment over the next four weeks.

This online course should not be considered a treatment for serious psychological conditions. You participate in the online course entirely at your own risk. You are entirely responsible for any risks relative to the utilization, results or performance of the course.

**FURTHER CONDITIONS OF PARTICIPATION**

**Personal information and privacy**

You give your consent for us to store your personal information about your participation in the online course. Information you enter during the course may be aggregated and used for research purposes. We will not make any personally identifiable information about you, available to any other party unless we are required to do so by law.

At any time, you can opt-out of receiving emails or any other communication from us. In addition you can have us delete your personal information from our database.

Your personal information is held on a server situated in the United Kingdom and complies with UK data protection laws. We have security measures in place to protect our databases and access to these are restricted internally.

**Intellectual Property**

You acknowledge that all copyright, trademarks, and other intellectual property rights in and relating to Be Mindful Online are owned by Wellmind Media and the Mental Health Foundation and you may only use them with their consent.

[ ] Please tick this box to agree to these conditions of participation.

## CUREC form for Chapter Six study (randomised study for online mindfulness)

Perinatal depression is a prevalent and disabling condition and there are many associated adverse effects such as disturbances in the child's social, behavioural, cognitive and physical development and negative health behaviours by the mother. Maternal stress alone during this period is associated with similar behavioural and cognitive development issues in the child. There is a large amount of research into therapies to decrease depression, anxiety and stress symptoms in mothers throughout pregnancy, such as counselling and CBT but more research is needed for interventions to act as a preventative.

The purpose of this research is to evaluate the effects of using an online course during pregnancy; to examine change in mood (incorporating perceived stress, anxiety and depression and distress). The primary outcome of interest is whether there is a difference in mood between women taking part in an online mindfulness course in their second trimester of pregnancy, compared with waitlist controls, immediately after completing the course and two months after giving birth.

Eighty participants will be recruited and asked to complete questionnaires (enclosed) at 3-7 months of pregnancy before being randomly allocated to either participate in an online mindfulness course or waitlist control group. The course is already available and can be found at www.bemindful.com. During the course participants are asked to practice a variety of mindfulness meditations, such as 'mindful eating' and '10 minute meditation' where they are guided to pay attention to their thoughts, feelings and bodily sensations. They are given information about different ways to think about stressors and look after themselves and asked to complete small homework assignments asking them to notice life events for two weeks and how they responded to them. Participants will be given a free login to take part in the course.

Participants will be followed up after the course, as will the waitlist control group who have not completed the course (which will last 4 weeks) and then again at eight weeks postpartum. The waitlist group will be offered the online course after this time. The sample is non-clinical; responses to the questionnaires are expected to vary within the normal range. The minimum age for participants will be 18 years.

The methods used to recruit will be online advertising, such as Facebook, Twitter and online forums and posters advertised in local shops, community centres and baby groups. Potential participants who express an interest in a study will be directed to a secure website with the study participant information (enclosed). If participants are willing to take part, they will indicate this by button click and then they will be asked to complete an online consent form (enclosed) and a questionnaire to gather contact information and due-date. Participants will then be contacted with a link to complete the baseline questionnaire measures using the same secure service. A thank you page with support information (enclosed) will be shown at the end of all surveys.

Most questionnaires will be completed online using the Bristol Online Survey website and the data will be kept securely and confidentially using this service. The University of Oxford Psychiatry Department uses this service currently as it is user-friendly and adheres to security guidelines. The self-report practice logs, GAD-7, PSS and PHQ-9 are already present for completion when participating in the online course and so these will be completed and the data downloaded securely and anonymously from there before and after the course. All data with contact information and measure responses will be kept separately.

Participants will be asked if they would also like to participate in informal interviews, once after they have completed the online course and once 8 weeks after their due-date, to gather qualitative data about the course experience. Recruitment for this part of the study will be conducted by asking participants via email if they would like to participate (participation in this part of the study is optional).

It is hoped that 5-10 participants will take part in the interviews. The interviews will be conducted on site at the University Department of Psychiatry, or else the home of the participant or a mutually agreed location, such as a meeting room in a University college. Interviews should last between 1-2 hours and will be audibly recorded for transcription. All personal details (names, names of places or care-providers) will be changed in the transcripts, identifiable only be the participant ID number already allocated. The data will be kept separately.

If responses indicate risk the participant will be advised to discuss their seeking further support from their GP, or else the researcher will offer to call their GP on their behalf. If responses indicate immediate substantial risk to themselves or others, the research team and/or emergency services will be contacted. This is unlikely as the sample recruited are non-clinical and have already supplied their survey responses

(so will already have been vetted for any risk.) No questions are asked about sensitive topics, only about course and pregnancy experience.