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Mindfulness for pregnancy: A randomised controlled study of online mindfulness during pregnancy

Adele Krusche, DPhil[a,b,*], Maret Dymond, PhD[b], Susannah E. Murphy, DPhil[b], Catherine Crane, DPhil[b]

[a] Department of Psychology, University of Southampton, UK
[b] Department of Psychiatry, University of Oxford, UK

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ABSTRACT

Objective: Prenatal depression, stress and anxiety are significant predictors of postnatal depression and also have a direct negative impact on the family. Helpful psychological interventions during pregnancy are scarce and expensive, and usually only available for a small percentage of those suffering or deemed to be at risk. The aim of this study was to evaluate the potential of an online mindfulness course for expectant mothers.

Design: A randomised study was conducted to explore differences between control and active participants allocated to take an online mindfulness course, offered free to research participants, or wait.

Setting: The course provided was online and already available but given to study participants for free. Measures were also taken online using a secure site to collect the data.

Participants: 185 mothers were recruited and randomised to the online course ($n = 107$) or a waitlist control ($n = 78$), with 72 completers at post-course ($n = 22$ active, $n = 50$ control) and 48 completers at postnatal follow-up ($n = 16$ active and $n = 32$ control).

Intervention: The online mindfulness course is available at www.bemindfulonline.com and comprises a four-week, condensed version of an eight-week mindfulness course, with videos and written instructions for guided meditation and other mindfulness-based exercises.

Measurements and findings: A number of psychological well-being measurements were taken including stress, anxiety, depression and pregnancy-specific measure such as labour worry. Intention to treat analysis (baseline carried forwards) showed no group difference in stress from pre to post intervention or control.

Key conclusions: Results indicated that the course was potentially beneficial for those who completed it, but levels of drop out from the course were very high.

Implications for practice: Although outcomes for mothers completing the intervention were improved relative to a waitlist control, high rates of drop out indicate that the online course has low completion rates for pregnant women in its current format.

Perinatal maternal depression (DSM-V; American Psychiatric Association, 1994; American Psychiatric Association, 2013) is disabling and widespread (Cox et al., 1993; Cooper and Murray, 1998; Oates et al., 2004; Ramchandani et al., 2005). The prevalence rate of maternal depression during pregnancy has been estimated to be between 8.5% and 11% (Gaynes et al., 2005). Stress, anxiety and depression during pregnancy are associated with later impairments in behavioural, social and cognitive development in the child, (Ramchandani et al., 2005; Talge et al., 2007; Brand and Brennan, 2009; Deave et al., 2008).

Pregnancy-focused mindfulness-based interventions may be beneficial for clinical (Muzik et al., 2012; Dimidjian et al., 2014; Goodman et al., 2014; Miklowitz et al., 2015) and non-clinical samples (Beddoe et al., 2009; Duncan and Bardacke, 2010; Byrne et al., 2013; Woolhouse et al., 2014). However, existing studies are preliminary, with small samples, limited follow-up, and rarely include randomised controlled designs (Vieten and Astin, 2008; Dunn et al., 2012; Guardino et al., 2013; Chan, 2014; Gambrel and Piercy, 2015; Woolhouse et al., 2014; Zhang and Emory, 2015). Preliminary evidence also suggests that generic mindfulness training (i.e. mindfulness training not aimed at preparation for parenthood) may have beneficial effects on mood during and after pregnancy, see Table 1. 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). 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

* Corresponding author.
E-mail address: adele.krusche@linacre.oxfordalumni.org (A. Krusche).

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Table 1
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 & 6 m fu, 32 1 m 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 6 m An increase in mindfulness resulted in BDI decrease at all time points 21.9% relapsed by 6 m (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

al., 2013). 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).

Online interventions provide accessible mental health resources at reduced cost to health services and patients, across a range of conditions (Clarke et al., 2009; Powell et al., 2013). Such interventions may be particularly useful in the perinatal period given the accessibility issues faced by this population and because recent findings suggest that many pregnant women search the internet for health information (Drozd et al., 2015; Sayakhot & Carolan-Olah, 2016).

Study aims

This pilot randomised controlled study examined the effects of participation in a generic online mindfulness course during pregnancy compared with a waitlist condition. The primary outcome was change in perceived stress from pre- to post intervention. Secondary outcomes were changes in general mood (anxiety and depression), pregnancy-related distress and labour worry. The study also considered whether any differences in mood identified were maintained postpartum. It was hypothesised that relative to the waitlist group, course completers would have improved levels of perceived stress from pre to post-course and at two months postnatal follow-up, and that a similar pattern of improvements would be observed for secondary measures.

Methods

Participants

Pregnant women were recruited online via email lists (University departments, colleges, postgraduate mailings), Facebook, Twitter, Google advertising and posts in pregnancy and new mother forums and other community sites. Posters were also sent to schools, churches, community centres and shops around Oxfordshire. Expectant mothers were invited to sign-up to the study from 12 weeks gestation. The minimum age for participants was 18 years. The exclusion criteria were completion or current attendance of a mindfulness course and current suicidal ideation.

Procedure

Recruitment took place over the course of a year. Participants were directed to a secure website, where they provided informed consent and submitted their due-date and contact details. At 12–34 weeks gestation participants were emailed and directed to a separate website for baseline data collection.

Following this participants were randomly allocated to take the online mindfulness course immediately or to wait until after their baby was born, with the aim of a 1:1 ratio. Participants were stratified by perceived stress score (high/low, with a cut point of 15 or less (low) based on population norms (Cohen and Williamson, 1988)) and previous children (yes/no). Randomisation was conducted using an online randomisation tool (www.randomization.com) by the first author who was not blind to stress and parity study data for the purposes of randomisation. Where a course participant withdrew from the study or was withdrawn having been lost to follow-up their random allocation was re-assigned to the next participant recruited to the study to maintain balance across study arms.

Participants were invited to log in to the course website regularly to follow assigned activities (see below). Those who had not logged on for more than a week were reminded (via email) to login or contact the research team. Up to three reminders were sent, the last one informing the participant they would be assumed withdrawn. Upon course completion, participants were sent the study follow-up measures via a new secure survey link in an email. Participants in the control condition were asked to complete the 'post-course' (T1) measures 45 days after baseline survey completion to match previously found approximate times for participants to complete the course (approximately six and a half weeks). Participants who were assigned to the no-intervention group were offered access to the online mindfulness course in the postnatal period.

Intervention

The 'Be Mindful Online' general mindfulness course consists of ten interactive sessions (see www.bemindfulonline.co.uk for further details) Participants learn to use formal and informal meditation practices such as body scan, mindful movement, breathing space and mindful eating, through videos and assignments. The online course follows the same class sequence as an eight-week mindfulness course, condensed to a four-week format, allowing participants to stop and start as required. See Table 2 for an outline of course content. Participants were given free course membership.

Measures

Measures were taken at baseline (T0), post-course (T1), and at eight weeks postpartum (T2, except where noted):

The Perceived Stress Scale (PSS; Cohen et al., 1983; Cohen and Williamson, 1988) measures how uncontrollable and overwhelming events are perceived to have been during the past month. Scores range from 0–40. Cronbach's α for this sample was 0.91.

The General Anxiety Disorder-7 (GAD-7; Spitzer et al., 2006) measures general anxiety over the previous two weeks. Scores range from 0–21. Cronbach's α for this sample was 0.89.

The Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987) measures levels depressive symptoms over the previous week and can be used in the prenatal and postnatal phases (Edmondson et al., 2010; Pearson et al., 2013). Scores range from 0–30 (scores > 8 indicates possible depression; > 11 likely depression). Cronbach's α for this sample was 0.88.

The Tilburg Pregnancy Distress Scale (TPDS; Pop et al., 2011) measures pregnancy-related distress for the previous 7 days and ranges from 0–48. Cronbach's α for this sample was 0.81.

The Oxford Worries about Labour Scale (OWLS; Redshaw et al., 2009) is a 10-item scale that measures worry about labour. The scale has a range of 10–40 with 10 being the highest level of worry. Cronbach's α for this sample was 0.83.

Mindfulness practice The amount of mindfulness practice completed was determined by weekly self-report. Participants were asked to complete three questions each week. 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 (each rated *'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')*. If a score was missing, no practice was assumed.

Sample size calculations for randomised study

Owing to the limited research (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 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 to recruit a sample of at least 80 participants completing the course.

Analysis plan

The success of random allocation was analysed with *t*-tests for continuous data and chi-square tests for categorical data. Variables where

Table 2
Be mindful online course content.

Week number	Focus of week
0	**Introduction**
	Course preparation and orientation
	Stress, anxiety and depression assessment
1	**Stepping out of automatic pilot**
	Online sessions include: dealing with barriers
	Assignments: routine activity, mindful eating, body scan
	Emails: practicing at home, mindful meal anecdote
2	**Reconnecting with body & breath**
	Online sessions include: the physical barometer
	Assignments: mindful movement, event awareness, mindful breathing
	Emails: breathing tips, remember your intentions
3	**Working with difficulties**
	Online sessions include: on negative thoughts
	Assignments: breathing space, stress awareness, sitting meditation
	Emails: the guest house poem, 3 min breathing space
4	**Mindfulness in daily life**
	Online sessions include: mindful walking
	Assignments: activity awareness, breathing space and action step, stress strategies
	Emails: preparing for stress, fear and fearless quote
5	**Going forward**
	Online session includes: completion certificate and additional resources

significant group differences were found between participants at baseline were used as covariates for subsequent analyses. Mixed factorial repeated measures ANCOVAs were used to investigate change in mood over time (T0–T1) between and within groups comparing active and control participants, controlling for potential confounders. For the postnatal follow-up analysis, pre-course and postnatal time points were used, omitting post-course scores.

Results

Participant flow

Of the 237 participants enrolled in the study, 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 measures (39% overall completion rate), and 16 active (15%) and 32 control (41%) completed postnatal measures, see Fig. 1 for a CONSORT diagram showing the flow of participants through the study. These participants are the focus of the main study analyses. However a comparison of course completers and course drop-outs (those who withdrew or were lost to follow-up) is provided below.

Withdrawal/Drop-out and adherence

Of the 107 participants allocated to take the online mindfulness course, 4 participants withdrew due to premature delivery or miscarriage and 81 were lost to follow-up. Of these, 42% ($n = 34$) did not begin the course, 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 complete it ($n = 22$) was 8.41 weeks and the mode completion time was 6 weeks.

Comparing course completers and non-completers

Baseline data was examined comparing those allocated to the immediate course who completed it ($n = 22$) and those who did not ($n = 85$). Significantly more course completers practiced yoga (41%, $n = 9$,14% $n = 12$), [χ^2 (1) = 7.95, $p < .01$]. Course completers were also significantly older (mean age 33.59 years, *SD* 4.73,mean age 30.67 years, *SD* 4.98), [$t(105) = 2.47$, $p < .05$]. Furthermore, course completers reported significantly more perceived partner support (mean 3.05, *SD* 2.48) on the TPDS than non-completers (mean 4.93, *SD* 3.43), [$t(44.30) = -2.92$, $p < .01$] (equal variances not assumed). There were no other significant differences between the groups.

Baseline characteristics of retained participants

Sociodemographic characteristics for study participants who provided both pre and post intervention data, (or equivalent for the waitlist group) are shown in Table 3 with baseline mood in Table 4. Overall, at study entry participants' average scores showed high stress, moderate general anxiety and depression, and a TPDS score that met the cut-off for pregnancy-related 'distress' (M = 17). Participants allocated to the immediate course reported less TPDS distress, [$t(70) = -2.28$, $p < .05$] (equal variances not assumed). Subsequent analyses controlled for baseline TPDS distress.

Changes in mood T0–T1

Perceived stress

To test the hypothesis that completing the online mindfulness course would result in a reduction in PSS score post-course, relative to the waitlist control group a mixed factorial repeated measures ANCOVA was conducted. The within-subjects variable was time (T0, T1); between-subjects variable was group (active, waitlist control) and baseline TPDS distress was a covariate.

Consistent with the hypothesis, there was a significant time x group interaction, [$F(1,69) = 7.78$, $p < .01$, $\eta^2 = 0.10$]. Post-hoc comparisons examining stress over time were significant for immediate participants ($n = 22$), [$F(1,69) = 33.36$, $p < .001$, $\eta^2 = 0.33$] (mean difference −8.10) and waitlist participants ($n = 50$), [$F(1,69) = 13.39$, $p < .001$, $\eta^2 = 0.16$] (mean difference −3.36) but with a greater decrease for immediate participants. The difference in scores between groups at T1 was significant, [$F(1,69) = 4.26$, $p < .05$, $\eta^2 = 0.058$].

Anxiety

A mixed factorial ANCOVA was conducted examining GAD-7 anxiety over time, controlling for TPDS distress. There was no effect of time, group or interaction, [$F(1,69) = 2.26$, $p > .05$].

Pairwise comparisons showed a decrease in anxiety for immediate, [$F(1,69) = 18.42$, $p < .001$), $\eta^2 = 0.21$] (mean difference −3.88) and waitlist participants, [$F(1,69) = 14.27$, $p < .001$, $\eta^2 = 0.17$] (mean difference −2.23). There was a trend for immediate participants to have lower anxiety at T1 compared to waitlist controls, [$F(1,69) = 3.15$, $p = .08$, $\eta^2 = 0.04$]. *Depression*

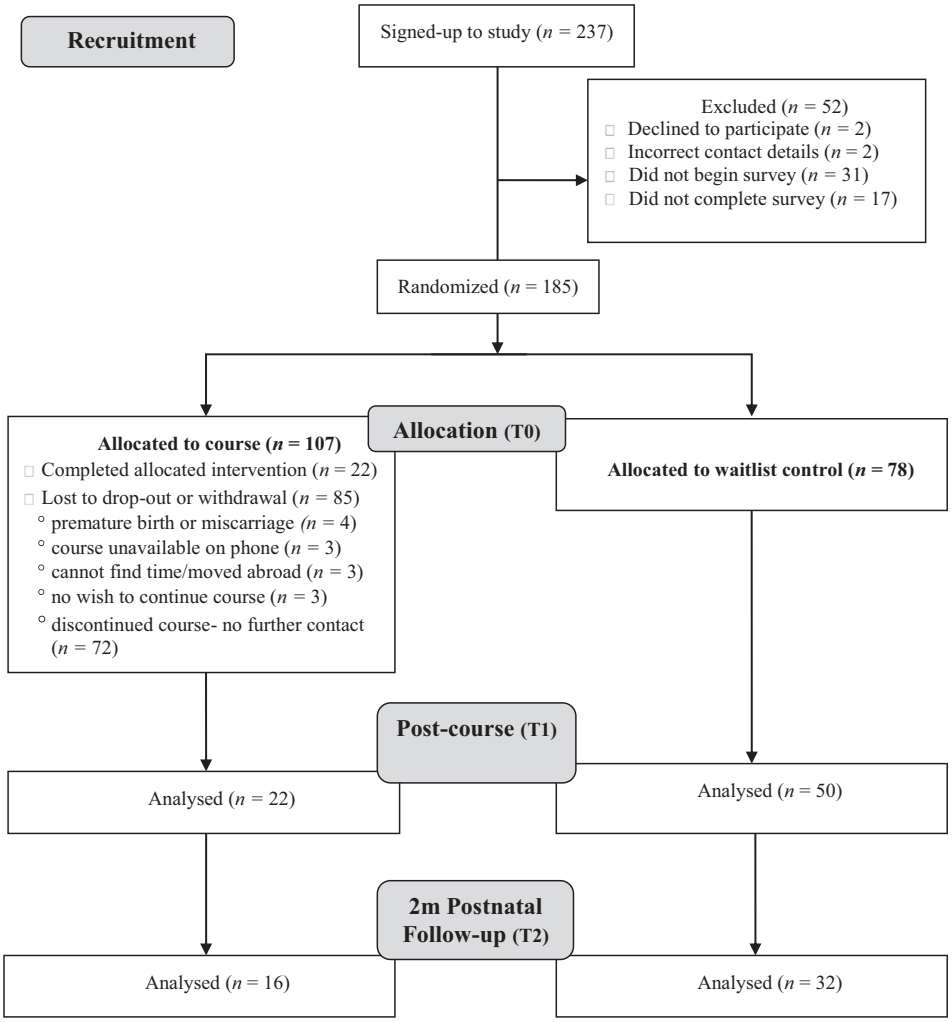

Fig. 1. CONSORT diagram of participant flow through study.

Table 3
Participant characteristics for those with pre and post intervention data ($n = 72$).

Participant characteristics	%	*n*
Age (range 22–40 years)	Mean: 32.7 years, mode: 34 years	
UK residents	90.3%	65
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	
Educated to high school/college level[1]	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[2]	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

Note: [1]One participant is missing education data due to survey glitch; two participants stated 'other' education: 'Vocational' and 'HND'. [2]One participant was expecting twins; the rest of the sample had singleton pregnancies.

Table 4
Baseline mood for those with pre and post intervention data ($n = 72$).

Measure	Mean	*SD*	Research norms
PSS stress	21.65	8.02	11.9–14.7[1]
GAD-7 anxiety	9.10	5.56	2.7–3.8[2]
EPDS pregnancy depression	12.33	6.48	7.6[3]
TPDS pregnancy distress	21.85	8.97	10.67[4]
OWLS labour worry	27.31	7.13	25.15[5]
FFMQ mindfulness	115.04	22.50	119.64–121.55[6]

Note: [1]Cohen and Williamson (1988), [2]Löwe et al. (2008), [3]Cox et al. (1987) and Cox et al. (1993) 9/10 potential need for further screening; 12/13 possible depression, [4] Pop et al. (2011), [5]Redshaw et al. (2009) Non-clinical sample of new mothers using the scale retrospectively, [6]Guardino et al. (2013) and Woolhouse et al. (2014).

A mixed factorial ANCOVA showed a significant time x group effect for EPDS depression pre-post controlling for TPDS distress, [$F(1,69) = 11.25$, $p < .005$, $\eta^2 = 0.14$]. Pairwise comparisons showed that immediate participants decreased in depression, [$F(1,69) = 28.64$, $p < .001$, $\eta^2 = 0.29$] (mean difference −5.97) with a trend for waitlist participants, [$F(1,69) = 3.85$, $p = .054$, $\eta^2 = 0.05$] (mean difference −1.43). There was a significant difference in scores at T1 between groups, [$F(1,69) = 10.06$, $p < .005$, $\eta^2 = 0.13$].

Pregnancy distress and labour worry

A mixed factorial ANCOVA examining the change in TPDS distress over time showed a time x group interaction, [$F(1,70) = 4.27$, $p < .05$, $\eta^2 = 0.057$].

Pairwise comparisons showed a difference over time for immediate participants, [$F(1,70) = 19.36$, $p < .001$), $\eta^2 = 0.22$] (mean difference −5.64) and waitlist participants, [$F(1,70) = 8.38$, $p < .01$, $\eta^2 = 0.11$] (mean difference −2.46). Immediate participants had significantly lower distress scores at T1 than waitlists, [$F(1,70) = 5.19$, $p < .05$, $\eta^2 = 0.17$].

A mixed factorial ANCOVA was conducted for (reverse scored) labour worry from T0 to T1, controlling for baseline TPDS distress. There was a trend towards a significant time x group interaction, [$F(1,69) = 3.73$, $p = .058$, $\eta^2 = 0.051$].

Pairwise comparisons showed a significant difference in labour worry over time with waitlist participants showing no improvement, [$F(1,69) = 0.00$, $p > .05$] (mean difference −0.02) and immediate participants improving, [$F(1,69) = 5.42$, $p < .05$, $\eta^2 = 0.07$], (mean difference 3.14). At T1, the difference between waitlist and immediate groups showed a trend, [$F(1,69) = 3.53$, $p = .065$, $\eta^2 = 0.05$].

Changes in perceived stress T0–T2(postnatal follow-up)

Comparing levels of perceived stress in immediate ($n = 16$) and waitlist ($n = 32$) participants from T0 to T2, the time x group interaction was not present, [$F(1,45) = 0.70$, $p > .05$]. Immediate, [$F(1,45) = 10.57$, $p < .005$, $\eta^2 = 0.19$], and waitlist, [$F(1,45) = 10.06$, $p < .005$, $\eta^2 = 0.18$], participants both decreased in PSS from T0 to T2. There were no significant time by group interactions for any of the secondary outcomes from T0 to T2 and given the very low sample sizes at T2 these data are not reported further.

Intention to treat analysis

Because of the significant and differential drop out from the immediate and waitlist control arms of the study we repeated the above analysis including all randomised participants and carrying forward baseline data where the participant did not provide follow-up data due to drop out. Analysis of the primary outcome of perceived stress ($n = 107$ Active and $n = 78$ Control) showed no significant effect of group on stress $F(1, 182) = 0.3$, $p > 0.05$ and no significant time x group interaction effect, $F(1,182) = 0.80$, $p > .05$.

Discussion

This study examined the impact of participation in an online mindfulness course, compared to waitlist control, on perceived stress and mood during pregnancy. The main finding of the study is that the course had very low rates of completion, only 21% of participants randomised to the course completed it, and intention to treat analysis showed no benefit of allocation to immediate course access relative to a waitlist control condition on the primary outcome of perceived stress.

Although the reasons for non-completion are not fully understood, these findings suggest that relatively few women allocated to receive a generic online mindfulness course during pregnancy find it sufficiently engaging to continue to participate in online sessions. The drop-out rates observed are consistent with other research evaluating online courses, which tend to have particular difficulties with retention (van Ballegooijen et al., 2014; Karyotaki et al., 2015), although other studies examining face-to-face mindfulness courses for pregnancy have demonstrated good levels of retention (e.g. Dimidjian et al., 2014, who report an 86% completion in a sample of 49 women enrolled in an open trial of MBCT for depression prevention in pregnancy). Features of the online delivery of the mindfulness course including the absence of an instructor to consult about difficulties, low levels of contact with the researchers, a lack of social support from other participants, and the fact that the course did not require any financial commitment on the part of participants may all have contributed to lower levels of motivation. General service users of the be Mindful Online course show 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), so whilst the 79% attrition rate observed in this study is higher, the broader findings suggest that it is important to explore the reasons that people do not complete the online mindfulness course, and how these might be addressed to increase potential benefit. It might be valuable in future to conduct mixed methods research to address some of these open questions such that participants could be asked about the time intensity of the course, the mode of delivery or specific course elements which may prove off-putting and whether this had any bearing on completion. It would also be interesting to evaluate further demographics such as whether working part-time, full-time, in or outside of the home makes a difference, which could feasibly have a bearing on completion.

Data obtained from those participants who did complete the course and provided T1 data suggested these participants had a significant improvement in general stress compared with their waitlist peers. Similarly course completers reported greater improvements in mood, from T0 to T1, including reduced depression, pregnancy-related distress and labour worry, compared to waitlist controls. Whether these findings can be attributed to the course itself, or to other variables that might relate both to course adherence and changes in mood state (e.g. social circumstances, the progress of the pregnancy, conscientious attendance at other pregnancy preparation activities) is unclear. There were no differences between course completers and non-completers in baseline mood, although those who went on to complete the course were older, reported more partner support and had greater prior experience of yoga, which suggests that they may have been both more familiar with the general approach of the course, and more supported in their pregnancy. Interestingly all participants who provided baseline and post-intervention (ore equivalent) data reported improved functioning over time, with the exception of labour worry, which only diminished in course completers. Unfortunately the high rates of attrition from the online course, combined with the very low rates of follow-up data at the postnatal assessment make it difficult to draw any conclusions about any sustained effects of course completion. However previous research suggests that benefits of mindfulness programmes in this population are not always maintained postpartum (e.g. Vieten and Astin, 2008; Zhang and Emory, 2015) and this is certainly an area for future enquiry.

One significant limitation of this study was the failure to obtain follow-up data from participants who discontinued the course prior to

its completion. Such data would have provided a much clearer picture of any potential benefits of the course in pregnancy, as well as the reasons participants had for dropping out. In particular, 33 people partially completed the course and previous studies of mindfulness based programmes have often considered those people who have completed at least 50% of sessions as having completed an adequate minimum amount of the course. However, despite this limitation, the study does provide useful information, suggesting that although those who successfully complete an online mindfulness course report better mood than those allocated to a waitlist condition, feasibility/acceptability is poor. As a precursor to future studies, the analyses here do show promise and the necessity for future investigation for this sample to ascertain the most practical way of implementing a course to improve mood in pregnant women Thus, whilst an online course may provide a valuable opportunity for expectant mothers to access mindfulness training, particularly if they are unable or unwilling to access such a course in person, significant further research needs to be carried out to understand more about the barriers to course completion, and the outcomes for women who discontinue such courses mid intervention.

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