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DOI

[10.1016/j.midw.2022.103545](https://doi.org/10.1016/j.midw.2022.103545)

Publication date

2023

Document Version

Final published version

Published in

Midwifery

License

CC BY

[Link to publication](#)

Citation for published version (APA):

Van der Meulen, R. T., Veringa-Skiba, I. K., Van Steensel, F. J. A., Bögels, S. M., & De Bruin, E. I. (2023). Mindfulness-based childbirth and parenting for pregnant women with high fear of childbirth and their partners: outcomes of a randomized controlled trial assessing short- and longer-term effects on psychological well-being, birth and pregnancy experience. *Midwifery*, *116*, [103545]. <https://doi.org/10.1016/j.midw.2022.103545>

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Mindfulness-based childbirth and parenting for pregnant women with high fear of childbirth and their partners: outcomes of a randomized controlled trial assessing short- and longer-term effects on psychological well-being, birth and pregnancy experience

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ARTICLE INFO

Article history:

Received 9 May 2022

Revised 1 November 2022

Accepted 2 November 2022

Keywords:

Fear of childbirth

Mindfulness

Partners

Psychological well-being

ABSTRACT

Objectives: Mindfulness-Based Childbirth and Parenting (MBCP) reduces mothers' anticipated fear of childbirth (FOC), nonurgent obstetric interventions during childbirth and may improve childbirth outcomes in women with high FOC (Veringa-Skiba et al, 2022). The aim of this study was to examine the short- and longer-term outcomes of MBCP on psychological well-being, pregnancy and birth experience, as compared to enhanced care-as-usual (ECAU), in pregnant women with high FOC and their partners.

Design: Participants were randomly assigned to MBCP or ECAU and completed questionnaires preintervention (T1), immediately after intervention (T2), two to four weeks after childbirth (T3) and 16–20 weeks after childbirth (T4). Both intention-to-treat and per-protocol analyses were conducted.

Setting: The courses were provided by trained midwives.

Participants: Participants included 141 pregnant women and 120 partners.

Intervention: MBCP comprised a nine-weekly three-hour session mindfulness group course for pregnant couples; ECAU consisted of two 90-minute individual couple consultation sessions.

Measurements: Measures of psychological well-being included measures like stress, depression, anxiety and fatigue. Measures of pregnancy and birth experience concerned experiencing uplifts during pregnancy, experienced fear of childbirth, labour pain and satisfaction with childbirth.

Findings: No differences between MBCP and ECAU in the total group of birthing women were found. However, women with (at least an onset of) labour that participated in MBCP reported a better birth experience compared to ECAU at T3. Concerning the total partner group only one difference between MBCP and ECAU was found at T4; MBCP partners reported an increase in fatigue. However, in the partner risk group (i.e., partners with lower psychological well-being before intervention) partners experienced better psychological well-being at T2 and T3 after MBCP than ECAU.

Key conclusions: MBCP and ECAU demonstrate similar effects on psychological well-being, birth and pregnancy experience. However, MBCP appears superior to ECAU for labouring women in having a better childbirth experience and for partners at risk for psychological complaints in increasing their psychological well-being.

Implications for practice: MBCP only positively affects the childbirth experience of those who experience (onset of) natural birth. It might be advisable to include partners at risk for psychological complaints in the MBCP.

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Although pregnancy is typically being associated with positive emotions, reality is that this is not the case for all pregnant

women. Meta-analyses and systematic reviews estimate that 14% of the pregnant women suffer from tocophobia, severe fear of childbirth (O'Connell et al., 2017). Identifying prevalence rates of severe fear of childbirth – or more specifically, an unreasoning dread of childbirth – is difficult, due to several definitions in the literature

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that are used interchangeably (Jomeen et al., 2021). Severe fear of childbirth is a multi-faceted construct, that includes fear of being abandoned and alone, fear of harm to the women herself or the baby, and fear of not being able to cope with the pain (Slade et al., 2019). Furthermore, 25% of pregnant women suffer from general anxiety complaints (Dennis et al., 2017) and 13% from depression (Bennett et al., 2004). Another major reported symptom during pregnancy -and the postpartum period- is fatigue; fatigue exists in approximately 30% to 95% of the pregnant women and in 15% to 76% of the postpartum women, depending on the survey tools, survey time points and the countries studied (Cheng & Li, 2008; Cheng et al., 2015).

Anxiety, depression and/or stress in pregnant women pose substantial health risks during the perinatal period and may negatively affect the childbirth process, outcomes and satisfaction (Alder et al., 2007; Cardwell, 2013; Waldenström, 1999). Stress-induced pregnancy complications include hypertension, preterm labour and small newborns for gestational age, representing a significant cause of maternal and perinatal mortality and morbidity (Cardwell, 2013). Furthermore, research shows that if a pregnant woman suffers from depression, anxiety or stress, her child will be at a higher risk of developing emotional, behavioural and cognitive problems (Talge et al., 2007; Van den Bergh et al., 2005). Evidence for a prenatal causal component is substantial; prenatal anxiety or depression may contribute 10-15% of the attributable load for emotional and behavioural problems in infants (Glover, 2014). Interestingly, experiencing uplifts (e.g. laughter) during pregnancy seems to buffer the effects on physiological stress responses, as demonstrated by alpha-amylase and cortisol levels during a Trier Social Stress Test (Nierop et al., 2008). Despite the importance, care for the emotional well-being of pregnant women remains a neglected aspect of obstetric medicine (Glover, 2014).

Not only pregnant women, but also their partners frequently experience significant distress during pregnancy (Hanson et al., 2009; Boyce et al., 2007). Partners can experience several fears relating to the birth, with the greatest fears associated with the effects of birth on their partner's well-being, and their partner dying in childbirth (Hanson et al., 2009). Furthermore, partners often find childbirth classes not helpful to them and they would like more information and reassurance that they are supporting their partner adequately during childbirth (Hanson et al., 2009). Stressed partners are more likely to have a poorer intimate relationship with the mother during pregnancy (Boyce et al., 2007), which in turn can negatively impact maternal and infant well-being (Stapleton et al., 2012). Although paternal involvement in western countries is increasing the last decades (Finnbogadóttir et al., 2003) and father's support is proven important for the well-being of the whole family during the perinatal period, little attention is being paid to father's preparation and emotional support in their transition to parenthood (Bond, 2010).

Mindfulness-based interventions (MBIs) have consistently shown beneficial effects in reducing stress, anxiety and depressive complaints in both clinical and non-clinical populations (Chiesa & Serretti, 2009; Hofmann et al., 2010). Mindfulness training (Mindfulness-Based Stress Reduction; MBSR) was originally developed for people with a wide variety of stress, illness and physical complaints, providing participants tools to better deal with pain and help them reduce stress (Kabat-Zinn, 1982). MBIs could therefore be potentially effective particularly for the population of pregnant women; it could broaden pregnant women's repertoire of coping strategies in dealing with labour pain and the accompanying fear, and her partner's repertoire in supporting her. Furthermore, after childbirth the parents could apply their mindfulness skills to stay centred and calm facing the challenges of daily parenting situations. In line with this, Bardacke developed a mindfulness training specifically for expectant parents;

Mindfulness-Based Childbirth and Parenting (MBCP), integrating mindfulness training with childbirth and parenting education (Bardacke, 2012).

Research assessing the effects of MBIs for pregnant women is scarce; the studies conducted are mainly small pilot studies and lack data concerning the post-natal period and the partners. Studies do suggest that MBIs may be beneficial in reducing anxiety, depression and stress in pregnant women, although it remains unclear whether they are more effective than care-as-usual (Dhillon et al., 2017). Lönnberg et al. (2020) did conduct an RCT assessing the effects of MBCP versus an active control condition (Lamaze childbirth classes) in a Swedish population. They found superior effects of MBCP on perinatal depressive complaints and stress in pregnant women at risk for perinatal depression. However, effects were not sustained during follow-up, possibly related to decreased home practice (Lönnberg et al., 2021). No RCT's concerning MBCP that included partners are found. A literature review concerning men with pregnant partners, showed that mindfulness training during the perinatal period seems to improve emotion and stress regulation and creates a deeper sense of connection with the pregnant partner (Jones et al., 2017).

The aim of the current study is to assess the short and longer term effects of MBCP for pregnant women with high fear of childbirth (FOC) and their partners as compared to enhanced care-as-usual (ECAU), and to evaluate the MBCP acceptability. This study is a continuation of a Dutch RCT (trial registration number: NTR4302) which included 141 pregnant women and 120 partners (for the study protocol see (Veringa et al., 2016). Veringa-Skiba et al., (2022) demonstrated that MBCP is more effective than ECAU in decreasing anticipated FOC, the use of nonurgent obstetric interventions during labour, catastrophizing the labour pain, and in increasing labour pain acceptance. Furthermore, they reported that MBCP improved childbirth outcomes. In the current study effects on psychological well-being (perinatal and general depression, anxiety, stress, and fatigue), as well as pregnancy and birth experiences (uplifts, pain, fear and satisfaction with child birth) of MBCP as compared to ECAU will be examined, in addition to evaluating the acceptability of MBCP, for both pregnant women and their partners. It is hypothesized that participants –especially participants with lower psychological well-being; the pregnant women and a partner risk group- in MBCP will have larger and longer lasting effects on psychological well-being and will have a more positive pregnancy and birth experience than in ECAU.

Methods

Participants

In the current study, 141 pregnant women with a high FOC (W-DEQ-A ≥ 66 measured with the Wijma-Delivery Expectation Questionnaire; Wijma et al., 1998) were randomly assigned to MBCP ($n = 75$) or ECAU ($n = 66$), for the flow chart see Fig. 1. A W-DEQ-A score of ≥ 66 was to represent high levels of fear of childbirth, because an Australian study ($N = 1386$) showed that a W-DEQ-A score of ≥ 66 is strongly related to mental health problems in pregnant women and their inability to adapt to childbirth (Toohill et al., 2015). Inclusion took place at 16-26 weeks gestational age. No evidence was found for a reporting bias due to being allocated to a (non)preferred condition; i.e., no significant differences in mean scores at T1 were revealed for the pregnant women who were allocated to their preferred ($n = 63$) or nonpreferred ($n = 50$) condition ($p > .50$; $n = 28$ reported no preference). Of the 141 women, 120 partners participated in one of the programs, 64 partners in MBCP and 56 in ECAU. Demographic characteristics of the participants were similar between conditions (see Table 1) and no significant differences in pretest scores between conditions

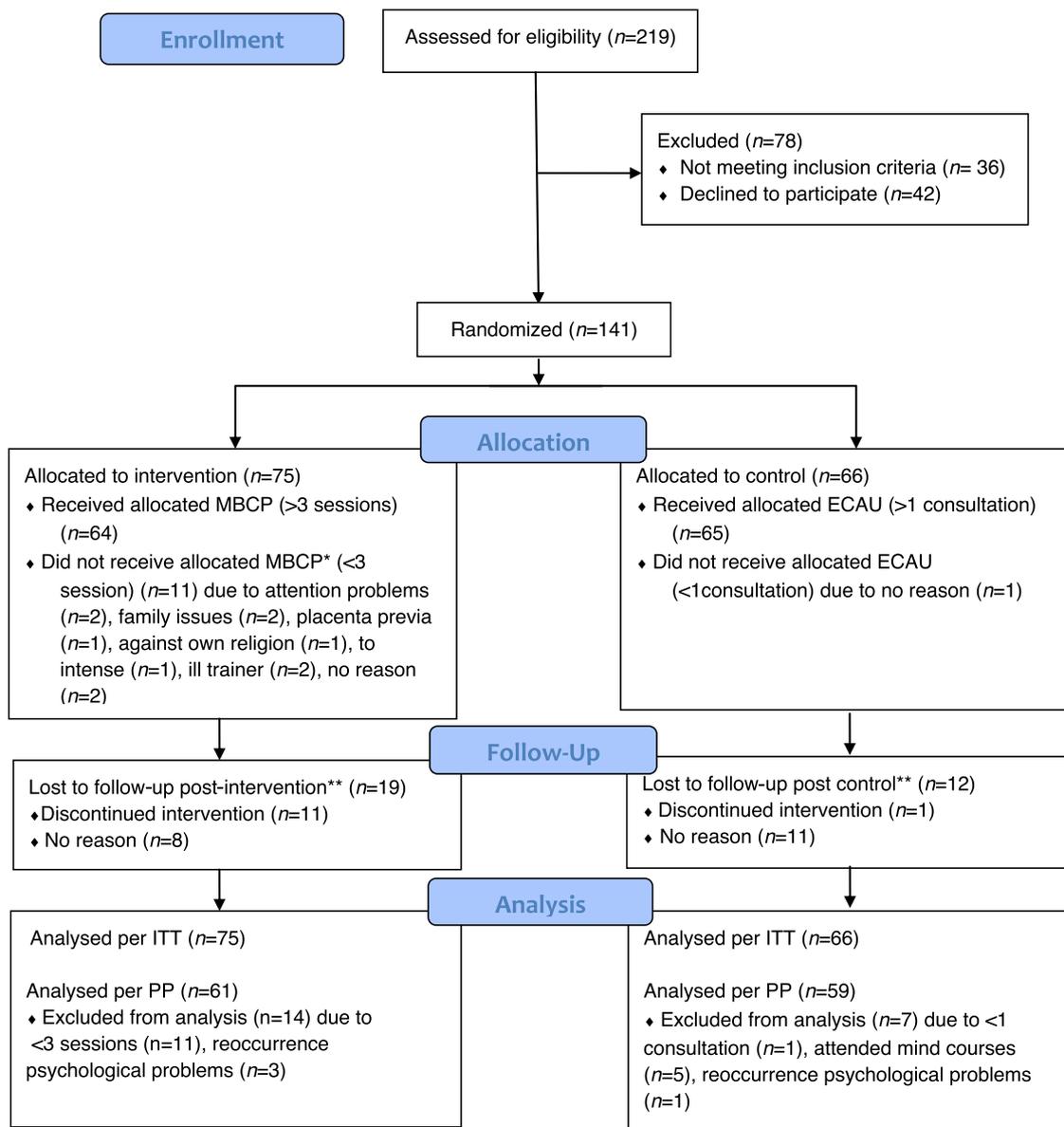


Fig. 1. CONSORT 2010 transparent reporting of trials: flow diagram. ECAU = Enhanced Care As Usual; ITT = Intention to treat; MBCP = Mindfulness-Based Childbirth and Parenting; PP = Per protocol.

Note: * No statistically significant difference in the W-DEQ-A scores at T1 between participants who did receive a minimum intervention dose and those who did not ($t(139)=-0.83$; $P=0.83$). ** No statistically significant difference in lost-to-follow-up between groups ($X^2=1.05$, $P=0.31$). Missing data at random (MCAR test $X^2=12.70$, $P=0.47$). This Figure was published previously in Veringa et al. (2022).

were observed ($p > .10$). For more characteristics concerning the participants see Veringa-Skiba et al. (2022). Exclusion criteria were unwillingness to be randomized, participation in another MBI or hypno-birthing in the past year, previous acute psychosis, a psychotic or borderline personality disorder, current suicidal risk and/or substance use and dependency, and current trauma unrelated to childbirth traumatic stress disorder.

Procedure

Inclusion found place by self-selection and referral through care providers in midwifery care settings in the Netherlands. Once the research team was contacted for participation in the study, the second author contacted the potential participants for a screening, to check randomization eligibility, to provide additional information about the study, and to obtain a written informed consent. Participants were screened with the W-DEQ-A administered via an e-mail

link and with a telephone call checking exclusion criteria. The participants were then allocated to either MBCP or ECAU (see Veringa-Skiba et al., 2022 for more details, and see Veringa et al., 2016 for the study protocol and sample size calculations¹). An independent research assistant communicated the allocation and collected the data using Qualtrics Software (Qualtrics, Provo, UT, USA). Participation was completely voluntary and all participants could stop participating at any moment without having to sign anything or provide a reason for stopping. Assessments were conducted at four time-points: one-two weeks before intervention (T1), directly after

¹ In the study protocol (Veringa et al., 2016) it was stated that recruitment would continue until at least 64 participants with a W-DEQ-A score ≥ 66 had completed the study's programme in each of two study arms. It turned out that the number of women meeting the minimal intervention dose was somewhat lower in MBCP (see Figure 1 for the flowchart), and we therefore needed to include somewhat more women in MBCP.

Table 1
Baseline characteristics for the intention-to-treat population at pre-assessment (T1).

Pregnant women	MBCP (n = 75)	ECAU (n = 66)	p
Age, mean (SD)	33.11 (3.92)	32.72 (3.86)	.55
Ethnic origin, n (%)			.19
White	57 (76.0)	41 (62.1)	
Other	17 (22.7)	25 (37.9)	
Missing	1 (1.3)	-	
Education level, n (%)			.19
High	61 (81.3)	50 (75.8)	
Middle to low	11 (14.7)	16 (24.2)	
Missing	3 (4.0)	-	
Employment, n (%)			.16
Yes	64 (85.3)	51 (77.3)	
No	10 (13.3)	15 (22.7)	
Missing	1 (1.4)	-	
Parity, n (%)			.20
Nulliparous	51 (68)	38 (57.6)	
Multiparous	24 (32)	28 (42.4)	
Married/living together (yes), n (%)	68 (90.7)	65 (98.5)	.05
Partner participated in intervention (yes), n (%)	64 (85.3)	56 (84.8)	.94
Partners	MBCP (n = 64)	ECAU (n = 56)	p
Age, mean (SD)	35.77 (4.45)	34.62 (5.39)	.25
Ethnic origin, n (%)			.49
White	42 (65.6)	33 (58.9)	
Other	12 (18.8)	13 (23.2)	
Missing	10 (15.6)	10 (17.9)	
Education level, n (%)			.41
High	45 (70.3)	41 (73.2)	
Middle to low	9 (14.1)	5 (8.9)	
Missing	10 (15.6)	10 (17.9)	
Employment, n (%)			.91
Yes	53 (82.8)	45 (80.4)	
No	1 (1.6)	1 (1.8)	
Missing	10 (15.6)	10 (17.9)	

ECAU = Enhanced Care As Usual; MBCP = Mindfulness-Based Childbirth and Parenting

intervention (T2), two-four weeks after birth (T3) and 16-20 weeks following child birth (T4).

Intervention

MBCP is a group program for expectant parents that integrates mindfulness skills and practice with childbirth and parenting education (Bardacke, 2012) and is based on MBSR (Kabat-Zinn, 1990). With permission by Bardacke, adaptations of standard MBCP were made to adapt the program specifically for pregnant women with high FOC. The adapted program consisted of nine weekly three-hour sessions. Sessions consisted of meditation practices and enquiry, and education concerning pregnancy, childbirth and the postpartum family. Meditations were also practiced while experiencing intense sensations (e.g. holding ice cubes for one minute), to help pregnant women and their partners prepare in dealing with the painful contractions of labour. Partners were expected to be present in all sessions and were engaged actively in the practices both during the training and at home. They learned mindfulness skills to help stay present and centred as expectant parents as well as supporting the birthing mother. All participants were asked to practice mindfulness meditation at home for 30 minutes a day. The programs were taught by experienced midwives certified in MBCP.

Active comparison

Midwifery practice in the Netherlands do not (yet) have guidelines how to treat FOC. Therefore, it is up to a midwifery practice if/how FOC will be treated. In this trial, we have structured care as usual by adding two 90 minute consultation sessions on FOC to the usual (routine) care, and we refer to this as 'enhanced

care as usual'. The two consultations were provided by a trained midwife. The focus was on gaining insight into the variety of specific factors playing a role in the origin and manifestation of fear and stress in the perinatal period as well as developing a suitable coping plan based on the fears and stresses. The first consultation consisted of an adaptation of the Biopsychosocial Model (Gagnon & Sandall, 2007) and the second consultation consisted of discussing and making the Childbirth Plan of the Royal Dutch Organization of Midwives (Escott et al., 2009). Although writing a birth plan can also be part of the routine care (also in pregnant women without FOC), we made it compulsory for the ECAU condition with special attention paid to FOC.

Measures

Psychological well-being

Psychological stress was assessed by the 10-items version of the Perceived Stress Scale (PSS; Cohen et al., 1983). Symptoms of combined depression, anxiety, and general stress were measured by the Depression, Anxiety, and Stress scale (DASS-21) which consists of 21 statements representing three subscales: depression, anxiety, and stress (Lovibond & Lovibond, 1995). Perinatal depression symptoms were assessed by using the 10-item Edinburgh Prenatal/ Postnatal Depression Scale (EPDS; Cox et al., 1987). Fatigue was assessed by the Multidimensional Assessment of Fatigue (MAF; Belza, 1995). The MAF is a 16-item scale that measures fatigue according to four dimensions: degree and severity, distress that it causes, timing of fatigue, and its impact on various activities in daily life.

Pregnancy and birth experience

The uplifts of pregnancy were assessed by the 10-item Uplifts Subscale of the Pregnancy Experience Scale (PES-US; Dipietro et al.,

Table 2
Means, Standard Deviations and Cronbach's alpha's.

	Pre-test M (SD)			Post-test M (SD)			FU-1 M (SD)			FU-2 M (SD)		
	MBCP	ECAU	α	MBCP	ECAU	α	MBCP	ECAU	α	MBCP	ECAU	α
Women												
DASS	35.72 (17.61)	40.25 (21.03)	.88	24.67 (14.42)	32.26 (22.63)	.93	23.24 (14.80)	30.14 (25.84)	.93	21.20 (15.50)	27.33 (18.89)	.90
PSS	16.92 (6.06)	18.43 (6.75)	.84	13.90 (5.59)	15.87 (7.04)	.86	15.68 (7.14)	15.57 (8.80)	.91	15.37 (6.89)	15.19 (7.59)	.89
EPDS	8.48 (4.59)	9.87 (5.14)	.85	7.02 (4.12)	9.02 (5.68)	.86	8.09 (5.16)	8.37 (7.43)	.90	8.27 (5.16)	7.11 (6.71)	.89
MAF	26.54 (11.94)	25.92 (11.58)	.92	22.30 (13.11)	25.35 (13.02)	.94	21.48 (10.19)	24.52 (13.93)	.90	20.99 (14.00)	22.05 (13.26)	.89
PES-US	18.88 (7.52)	20.81 (6.01)	.87	19.66 (6.88)	21.26 (5.75)	.86						
W-DEQ							56.64 (30.64)	67.41 (30.60)	.96	59.83 (28.21)	64.76 (22.65)	.93
SIL							78.72 (26.66)	72.08 (30.70)	.95	73.60 (25.66)	76.81 (26.04)	.94
Partner												
DASS	16.85 (15.17)	16.11 (11.94)	.91	15.63 (9.30)	14.37 (10.49)	.84	12.87 (8.84)	15.02 (16.04)	.91	14.76 (13.25)	16.00 (12.65)	.90
PSS	13.13 (7.00)	12.71 (5.90)	.86	12.15 (5.51)	11.42 (5.53)	.81	12.22 (5.15)	12.65 (6.67)	.84	13.03 (6.35)	13.82 (7.26)	.87
MAF	15.49 (13.29)	14.13 (11.87)	.89	11.83 (12.44)	11.72 (12.52)	.87	21.98 (12.00)	17.93 (13.49)	.81	17.81 (13.29)	12.49 (14.03)	.91
SIL							89.11 (17.44)	89.73 (20.09)	.90	90.43 (15.93)	87.47 (24.09)	.92

DASS = Combined anxiety, depression, and general stress; PSS = psychological stress; EPDS = perinatal depression; MAF = fatigue; PES-US = uplifts of pregnancy, W-DEQ = fear of childbirth, SIL = satisfaction with childbirth

2008). The anticipated and experienced FOC was measured by the 33-item Wijma Delivery Expectancy/ Experience Questionnaire (W-DEQ-A and B; [Wijma et al., 2002](#)), covering several domains of FOC: general fear, negative appraisal, loneliness, lack of self-efficacy, lack of positive anticipation, and concerns about the child. The experienced labour pain was measured with one question where the women could rank their labour pain from 0 until 10. Satisfaction with childbirth was measured by the Dutch version of the Salmon's Item List (SIL; [Salmon & Drew, 1992](#)). Cronbach's alpha's of all questionnaires were good to excellent (See [Table 2](#)).

Acceptability

Acceptability was measured as intervention satisfaction in terms of responses to the evaluation questionnaire administered after the training (e.g. "How would you rate the training?" (1-10), "Did you learn anything valuable during the training?" (Open-ended question?). Also adherence and time spent on meditation practices at home was evaluated.

Statistical analyses

For an overview of the means and standard deviations, see [Table 2](#). Data was checked for normality and outliers. When outliers were found, analyses were also run without outliers. No significant differences in the amount of missing data was found between the two conditions in both the pregnant women and partner group ($p > .30$). Little's Missing Completely at Random (MCAR) analyses were performed to check whether the missing data was at random. MCAR analyses showed that the missing data of the pregnant women was not completely at random (MCAR test $\chi^2 = 206.049$, $df = 155$, $p = .004$). That is, significantly worse complaints at T1 (preintervention) on the W-DEQ-A ($p = .03$) and PSS ($p = .04$) were found for participants whose questionnaires were missing at T4 (16-20 weeks after birth). However, no statistical differences at T1 were found for participants with missing data at T2 (postintervention) or T3 (2-4 weeks after birth; $p > .10$). Furthermore, significantly smaller intervention effects were found on the EPDS ($p = .003$) in participants with missing questionnaires at T4 (but no different intervention effects were found when data was missing at T3; $p > .10$). MCAR analyses showed that the missing data of the partners was completely at random (MCAR test $\chi^2 = 133.228$, $df = 118$, $p = .61$). No differences at T1 were found between partners who did and did not complete T2, T3 and T4 measurements ($p > .40$). Because most partners did not suffer from (severe) anxiety or any other psychological complaints, a partner risk group was created. This consisted of partners (MBCP: $n = 19$,

ECAU: $n = 20$) that scored moderate to severe complaints on the depression/anxiety/stress scales (DASS; [Lovibond & Lovibond, 1995](#)) and/or were included in the 25% highest scores on perceived stress (PSS; [Cohen et al., 1983](#)) or fatigue scale (MAF; [Belza, 1995](#)) at T1. Concerning the partner risk group; t -tests showed that at T1 the MBCP partner risk group had higher scores on the PSS ($p = .02$) and DASS ($p = .048$), but not on the MAF.

Treatment effectiveness of MBCP and ECAU was examined by hierarchical linear model (HLM) analyses (for continuous dependent variables that were measured at T1, T2, T3 and T4) and by independent samples t -tests (continuous variables that were measured only at T3 and T4). The primary analyses were conducted using intention-to-treat (ITT). In addition, per-protocol (PP) analyses (MBCP ≥ 4 sessions; ECAU ≥ 1 session) and analyses without outliers were conducted. Only when outcomes differed between ITT-analyses and PP-analyses or ITT-analyses and analyses without outliers, they are reported in the results section. Hierarchical linear modeling (aka multi-level modeling) for longitudinal data (in the current study we had four repeated measures; T1 = pre-test, T2 = directly after the intervention, T3 = 2-4 weeks after birth, and T4 = 16-20 weeks after birth) is an appropriate approach to examine and compare treatment effects, and has several advantages over for example repeated measures (M)ANOVA ([O'Connell and McCoach, 2004](#); [Quené and van den Bergh, 2004](#); [Snijders & Bosker, 2012](#)). In our study, the four assessments over time (= level 1) were nested within individuals (= level 2). Thus, the first level consists of the repeated measures (T1-T2-T3-T4) which were nested in participants (second level). We examined the treatment effect by including predictors of time for which we have used T1 (pre-test) as our reference category. Thus, by entering T2, T3 and T4 as a predictor to the model, we were able to examine the change over time (main effect of T2, T3, T4). We included Condition (MBCP = 1; ECAU = 0) as a predictor to test whether MBCP differed from ECAU in general (main effect of condition), and included the interaction term between time (T2, T3, and T4)*Condition (MBCP versus ECAU) to investigate whether the change over time is different for the MBCP participants as compared to the ECAU participants. Standardized scores of the continuous variables were used (with a mean of 0 and standard deviation of 1). This way, parameter estimates can be interpreted as a measure of effect (Cohen's d). An effect size of respectively .20, .50, and .80 was considered small, medium, and large ([Cohen, 1988](#)). Fixed parameters and unstructured variance-covariance structures were used. All analyses were performed two-sided, α -level of .05, using SPSS (IBM SPSS Statistics for Windows, Version 27.0 Armonk, NY).

Table 3

Hierarchical multi-level analyses of the outcomes for the birthing women intent-to-treat population with time (T2, T3 or T4 vs T1), condition (MBCP versus ECAU) and the interaction (time*condition) as predictors.

	Parameter Estimate (Standard error)	p	Parameter Estimate (Standard error)	p	Parameter Estimate (Standard error)	p	Parameter Estimate (Standard error)	p
	DASS		PSS		EPDS		MAF	
Intercept	0.48*** (0.13)	.001	0.34** (0.12)	.006	0.30* (0.12)	.02	0.14 (0.12)	.25
T2	-0.40*** (0.11)	.001	-0.34** (0.12)	.005	-0.20 (0.12) ¹	.10	-0.10 (0.16)	.52
T3	-0.53** (0.17)	.002	-0.38 (0.21)	.07	-0.30 (0.19) ¹	.13	-0.14 (0.18)	.45
T4	-0.53** (0.17)	.003	-0.22 (0.20)	.27	-0.24 (0.22)	.28	-0.29 (0.24)	.23
Condition	-0.24 (0.18)	.18	-0.22 (0.17)	.19	-0.29 (0.17)	.09	-0.05 (0.17)	.75
T2*Condition	-0.12 (0.16)	.45	-0.07 (0.17)	.67	-0.04 (0.16)	.80	-0.26 (0.22)	.24
T3*Condition	-0.08 (0.22)	.73	0.22 (0.28)	.44	0.31 (0.26)	.23	-0.27 (0.24)	.27
T4*Condition	-0.17 (0.23)	.47	0.12 (0.26)	.65	0.33 (0.28)	.26	-0.15 (0.32)	.64

DASS = combined anxiety, depression and general stress; PSS = psychological stress; EPDS = perinatal depression; MAF = fatigue.

¹ Analyses without outliers demonstrate a decrease on the EPDS from T1 - T2 (estimate -0.27, p = .02) and T1 - T3 (estimate -0.40, p = .03). Note: Outcome variables are standardized and as such parameter estimates can be interpreted as an effect size (Cohen's d).

Table 4

Hierarchical multi-level analyses of the outcomes for the partners intent-to-treat population with time (T2, T3 or T4 vs T1), condition (MBCP versus ECAU) and the interaction (time*condition) as predictors.

	Parameter Estimate (Standard error)	p	Parameter Estimate (Standard error)	p	Parameter Estimate (Standard error)	p	Parameter Estimate (Standard error)	p	Parameter Estimate (Standard error)	p	Parameter Estimate (Standard error)	p
	DASS Total group		PSS Total group		MAF Total group		DASS Risk group		PSS Risk group		MAF Risk group	
Intercept	0.05 (0.15)	.73	-0.01 (0.14)	.97	-0.09 (0.13)	.50	0.67* (0.25)	.011	0.79*** (0.17)	.001	0.61*** (0.17)	.001
T2	-0.16 (0.14)	.26	-0.18 (0.15)	.23	-0.20 (0.14)	.15	-0.34 (0.25)	.18	-0.47* (0.20)	.02	-0.32 (0.23)	.17
T3	-0.09 (0.14) ¹	.52	-0.02 (0.14)	.90	0.26 (0.15)	.08	0.06 (0.25)	.81	-0.25 (0.23)	.30	-0.12 (0.18)	.49
T4	-0.06 (0.16)	.70	0.21 (0.18)	.25	-0.24 (0.18)	.18	-0.16 (0.27)	.54	-0.30 (0.25)	.24	-0.83** (0.27)	.006
Condition	0.11 (0.21)	.61	0.12 (0.20)	.53	0.10 (0.18)	.58	0.75* (0.36) ²	.04	0.59* (0.24)	.02	0.40 (0.24)	.11
T2*Condition	0.05 (0.20)	.81	-0.06 (0.21)	.78	-0.09 (0.19)	.62	-0.68 (0.37)	.07	-0.54 (0.29) ²	.07	-0.69* (0.34)	.05
T3*Condition	-0.22 (0.20)	.29	-0.20 (0.20)	.34	0.21 (0.21)	.32	-1.23** (0.37)	.002	-0.80* (0.34)	.03	0.01 (0.26)	.97
T4*Condition	-0.01 (0.23)	.95	-0.24 (0.25)	.34	0.52* (0.24)	.035	-0.63 (0.41)	.13	-0.61 (0.37)	.11	0.46 (0.43)	.30

DASS = Combined anxiety, depression and general stress; PSS = psychological stress; MAF = fatigue.

¹ Analyses without outliers demonstrate a decrease on the DASS from T1 - T3 (estimate -0.26, p = .04) in the total group.

² In the PP-analyses the risk conditions had equal DASS scores (estimate 0.69, p = .08) and a PSS interaction effect was found from T1-T2 (estimate -0.63, p = .04). Note: Outcome variables are standardized and as such parameter estimates can be interpreted as an effect size (Cohen's d).

Results

Psychological well-being pregnant women

Multilevel analyses (Table 3) showed a significant effect over time; The combined score of depression, anxiety and general stress (DASS) was significantly lower after the intervention, as well as 2-4 weeks after birth and 16-20 weeks after birth, compared to pre-intervention (T2, T3 and T4 vs T1). Psychological stress (PSS) also decreased significantly from T1 to T2, however, effects did not remain at T3 and T4. Perinatal depression symptoms (EPDS) and fatigue (MAF) in the birthing women did not change significantly over time. For all psychological outcome measures, no significant interaction effect was found indicating that the effects over time did not differ between MBCP and ECAU. Furthermore, analyses without outliers demonstrated a decrease in perinatal depression from T1 to T2 and T1 to T3 in both conditions.

Psychological well-being partners

Multilevel analyses (Table 4) showed no significant effects over time on combined depression, anxiety and general stress (DASS) and psychological stress (PSS). Concerning fatigue (MAF) only one (unexpected) interaction effect occurred; fatigue increased more from T1 to T4 in the MBCP group than in the ECAU group. Removing the outliers, there was a significant reduction of combined depression, anxiety and general stress (DASS) from T1 to T3 in both conditions.

In the partner risk group a significant interaction effect (T3*condition) was found as well as a main effect for condition concerning combined depression, anxiety and general stress (DASS) (Table 4). These findings demonstrate that only the MBCP partner risk group reported significant reductions on depression, anxiety and general stress from T1 to T3, but also that the MBCP partner risk group had significantly higher DASS scores across time points than the ECAU risk group. A main effect over time (T2) and for condition was found, as well as an interaction effect (T3*condition) on psychological stress (PSS). This indicates that psychological stress decreased directly after the intervention, that the MBCP partner risk group scored higher on the PSS across time points than the ECAU risk group and that only in the MBCP partner risk group a decrease was found from preintervention to 2-4 weeks after birth. Concerning fatigue (MAF) a main effect of time (T4) and an interaction effect (T2*condition) was found, indicating a decrease of fatigue from preintervention to 16-20 weeks after birth and only in the MBCP partner risk condition from preintervention to postintervention. Results from the PP-analyses showed two differences: both risk conditions had equal DASS scores (though the interaction effect in favour of the MBCP risk group remained) and an interaction effect concerning the PSS in favour of the MBCP was not only found at T3 but also at T2.

Pregnancy and birth experience

The uplifts of pregnancy (PES-US) in the pregnant women did not change from T1 to T2 (estimate 0.04, p = .74) and there were no significant condition effects (estimate -0.34, p = 0.09) or in-

Table 5
Independent t-test analyses of the birth related outcomes for the women and partners intent-to-treat population.

	T3 M (SD)	M (SD)	t	p	T4 M (SD)	M (SD)	t	p
Woman	MBCP (n = 37)	ECAU (n = 28)			MBCP (n = 30)	ECAU (n = 21)		
WDEQ-B	56.64 (30.64)	67.41 (30.60)	1.38	.17	59.83 (28.21)	64.76 (22.65)	0.66	.51
VAS	7.89 (2.40)	7.18 (3.31)	-.96	.34				
SIL	78.50 (27.00)	73.15 (30.76)	-.73	.47	73.60 (25.66)	76.81 (26.04)	0.44	.66
Women with (onset of labor)	MBCP (n = 34)	ECAU (n = 22)			MBCP (n = 28)	ECAU (n = 19)		
WDEQ-B	53.06 (26.97)	72.95 (29.78)	2.59*	.012	55.96 (24.68)	65.63 (22.25)	1.37	.18
VAS	8.26 (1.85)	8.48 (1.75)	0.45	.65				
SIL	81.00 (25.37)	66.91 (29.73)	-	.06	76.64 (23.54)	75.00 (26.10)	-0.22	.83
			1.90 [†]					
Partners	MBCP (n = 46)	ECAU (n = 41)			MBCP (n = 37)	ECAU (n = 34)		
Total group								
SIL	89.11 (17.44)	89.73 (20.09)	0.16	.88	90.43 (15.93)	87.47 (24.09)	-.62	.54
Partners Risk group	MBCP (n = 14)	ECAU (n = 16)			MBCP (n = 9)	ECAU (n = 13)		
SIL	91.14 (21.48)	85.00 (16.34)	-.88	.38	94.78 (15.90)	84.15 (18.22)	-1.41	.17

WDEQ-B = Experienced fear of childbirth; VAS = Labour pain intensity; SIL = Satisfaction with birth.

[†] In the PP-analyses MBCP had a higher birth satisfaction than ECAU ($t = -2.23$, $p = .03$) in women without planned caesarean at T3.

teraction effects (estimate 0.19, $p = .26$). T-tests showed no differences after birth (T3 and T4) for women in the MBCP and ECAU condition on experienced FOC (W-DEQ-B), labour pain or birth satisfaction (SIL) (Table 5). Because MBCP is largely focused on dealing with the pain and accompanying fear of labour, separate analyses were conducted in the group of women without a previous planned caesarean, in other words, women with at least an onset of natural labour. These results showed that at T3 women in the MBCP condition reported less experienced FOC (W-DEQ-B) than in the ECAU condition while there were no differences in experienced labour pain and in birth satisfaction. In the group of women without previous planned caesarean the PP-analyses showed, aside from less experienced FOC, higher satisfaction of birth in the MBCP group at T3. Concerning both the partner total and partner risk group, no significant differences between conditions were found in satisfaction with birth.

Acceptability MBCP

Concerning the acceptability, 63.8 % of the pregnant women and 40% of the partners filled in the evaluation questionnaires. On a 1-10 scale pregnant women rated MBCP with an 8.4 (SD = 1.0; range = 3–10) and the trainers an 8.7 (SD = 1.1; range = 7–10). Partners rated MBCP with an 8.0 (SD = 1.0; range = 5–10) and the trainers with a 8.3 (SD = 1.1; range = 5–10). Participants reported several positive changes as a result of the training including experiencing hope and trust in the birth and in being a parent. See Tables 6 and 7 for more evaluative results.

Pregnant women practiced on average 85 minutes (SD = 59.0, range 0 - 205) and partners 41 minutes (SD = 37.6, range 0 - 161) meditation at home per week during the training. Adherence of the pregnant women was on average 6.8 sessions (SD = 2.8, range 0-9) and partners 6.7 sessions (SD = 2.5, range 1-9). The amount of time practicing meditation at home did not influence the results of the pregnant women ($p > .10$). However, partners who practiced more meditation at home during the training had significantly larger reductions of psychological stress at T3 (estimate -0.37, $p = .002$) and T4 (estimate -0.41, $p = .05$) and a larger reduction of combined depression, anxiety and general stress at T3 (estimate -0.39, $p = .002$). Note however that the partners who practiced more meditation at home, also had significantly higher PSS and MAF scores across time points (estimate 0.35, $p = .019$; estimate 0.34, $p = .01$). Consistent with these findings, we found

that partners in the risk group practiced significantly more than other partners ($t = -2.36$, $p = .027$).

Discussion

The aim of this RCT study was to examine the short and longer term outcomes of MBCP on psychological well-being, pregnancy and birth experience, as compared to ECAU, and the acceptability of MBCP, in pregnant women with high FOC and their partners. Contrary to expectation, as described in the study protocol (Veringa et al., 2016), the total group of pregnant women in the MBCP condition did not show larger effects on all measures of psychological well-being, birth and pregnancy experience, compared to women that participated in ECAU. Not finding superior MBCP effects on psychological well-being is somewhat surprising and not in line with the findings of Lönnberg et al. (2020), that found superior (short-term) effects of MBCP versus an active control condition on stress and perinatal depression. This might be explained by the inclusion procedure; while the current study focused on including women with high levels of FOC, Lönnberg et al.'s study included women at risk of perinatal depression. Comparing the means of both selected groups before MBCP intervention, both perinatal depression (small effect; Cohen's $d = 0.31$) and stress (large effect; Cohen's $d = 1.50$) are higher in the group of Lönnberg et al. (2020) in comparison to ours, therefore leaving more room for improvement. Furthermore, it might be that MBCP works better on outcomes, which are initially the objectives of the training and might stay a focus point during the training. Our training explicitly focused on supporting women with high FOC and showed superior effects on this measure in comparison with the control condition (Veringa-Skiba et al., 2022), while the training of Lönnberg et al. (2020) focused on supporting women at risk of perinatal depression. However, considering that MBCP focuses on developing skills to deal not only with childbirth, but also with stressful (parenting) situations after, and ECAU focuses solely on childbirth, it is surprising that no superior effects in favour of MBCP were found once the baby was born. This finding might indicate that it is (too) difficult to apply previously learned skills to the new family situation or that it might be difficult to keep on meditating once the training is finished and the baby is born, as is also hypothesized by Lönnberg et al. (2021). Especially for participants with elevated levels of anxiety, stress or depression, it might be helpful to extend MBCP with a mindful parenting training after birth or to follow part of MBCP (focusing on the birth)

Table 6
Evaluative overview of the women (n = 90).

Questions	Responses			
	Yes	No		
Does the following apply as a result of the training, n (%):				
• Learning something valuable	77 (85.6%)	13 (14.4%)		
• Adaptions in living, your pregnancy, thoughts about the delivery or taking care of your child?	64 (71.1%)	26 (28.9%)		
• More consciousness of having a baby	51 (56.7%)	39 (43.3%)		
• Transformations in how you relate to your thoughts and feelings concerning the pregnancy, delivery and parenthood	70 (77.8%)	20 (22.2%)		
	A negative change	No change	A slightly positive change	A positive change
Did the following change as a result of the training, n (%):				
• Knowing how I can take better care of myself	0 (0%)	31 (34.4%)	41 (45.6%)	18 (20.0%)
• Taking better care of myself	0 (0%)	42 (46.7%)	31 (34.4%)	17 (18.9%)
• Periods of anxiety and/ or stress	0 (0%)	27 (30.0%)	45 (50.0%)	18 (20.0%)
• The intensity of anxiety and/ or stress	0 (0%)	28 (31.1%)	39 (43.3%)	23 (25.6%)
• Believing that I can handle the delivery and parenthood	0 (0%)	22 (24.4%)	39 (43.3%)	29 (32.2%)
• Trusting myself in giving labor and being a parent	0 (0%)	20 (22.2%)	46 (51.1%)	24 (26.7%)
• Experiencing hope in giving labor and being a parent	0 (0%)	30 (33.3%)	40 (44.4%)	20 (22.2%)
• Dealing with emotions during pregnancy, delivery and being a parent (anger, sadness, anxiety)	0 (0%)	27 (30.0%)	46 (51.1%)	17 (18.9%)
• Being aware of stressors in my life	0 (0%)	35 (38.9%)	39 (43.3%)	16 (17.8%)
• Being aware of stressful situations during my pregnancy, delivery and parenthood, while they occur	0 (0%)	30 (33.3%)	45 (50.0%)	15 (16.7%)
• Being able to handle appropriately during these stressful situations	0 (0%)	29 (32.2%)	43 (47.8%)	18 (20.0%)

Table 7
Evaluative overview of the partners (n = 48).

Questions	Responses			
	Yes	No		
Does the following apply as a result of the training, n (%):				
• Learning something valuable	47 (97.9%)	1 (2.1%)		
• Adaptions in living, the pregnancy, thoughts about the delivery or taking care of your child?	39 (81.3%)	9 (18.8%)		
• More consciousness of having a baby	37 (77.1%)	11 (22.9%)		
• Transformations in how you relate to your thoughts and feelings concerning the pregnancy, delivery and parenthood	37 (77.1%)	11 (22.9%)		
	A negative change	No change	A slightly positive change	A positive change
Did the following change as a result of the training, n (%):				
• Knowing how I can take better care of myself	0 (0%)	16 (33.3%)	27 (56.3%)	5 (10.4%)
• Taking better care of myself	0 (0%)	25 (52.1%)	22 (45.8%)	1 (2.1%)
• Periods of anxiety and/ or stress	0 (0%)	19 (39.6%)	25 (52.1%)	4 (8.3%)
• The intensity of anxiety and/ or stress	0 (0%)	20 (41.7%)	21 (43.8%)	7 (14.6%)
• Believing that I can handle the delivery and parenthood	0 (0%)	18 (37.5%)	25 (52.1%)	5 (10.4%)
• Trusting my partner in giving labor and myself in being a parent	0 (0%)	9 (18.8%)	24 (50.0%)	15 (31.3%)
• Experiencing hope in my partner giving labor and myself in being a parent	0 (0%)	11 (22.9%)	26 (54.2%)	11 (22.9%)
• Dealing with emotions during pregnancy, delivery and being a parent (anger, sadness, anxiety)	0 (0%)	11 (22.9%)	28 (58.3%)	9 (18.8%)
• Being aware of stressors in my life	0 (0%)	12 (25.0%)	30 (62.5%)	6 (12.5%)
• Being aware of stressful situations during the pregnancy, delivery and parenthood, while they occur	0 (0%)	13 (27.1%)	29 (60.4%)	6 (12.5%)
• Being able to handle appropriately during these stressful situations	0 (0%)	9 (18.8%)	32 (66.7%)	7 (14.6%)

before childbirth and the other part (focusing on parenting) after (Pottharst et al., in preparation). Future interventions and research could aim on supporting vulnerable pregnant women and/or their partners during the entire perinatal period, instead of only during the prenatal period, and assess what is needed and effective.

Not finding superior effects of MBCP on birth experience (fear, pain, satisfaction) might be explained by the fact that women in the ECAU group used significantly more pain medication and had more planned caesarean births. Women with high FOC are usually afraid of the pain of labour and the unpredictability of the labour process; pain catastrophizing and intolerance of uncertainty are found to be the most evident predictors of fear of childbirth (Rondung et al., 2019). Accordingly, they often request caesarean section as a perceived solution (O’Connell et al., 2015). Not hav-

ing to go through labour (avoidance), and knowing exactly where and when to have the baby might give a sense of relief and control during the birthing process. Furthermore, using epidurals and other pain medication obviously reduces the experienced pain and therefore might also reduce fear of childbirth and increase the satisfaction of birth in this population. Concerning the acceptability of the MBCP it can be stated that generally the training was highly rated (8.4 on a 1-10 scale) and considered valuable to the pregnant women; among other things, after MBCP they reported to experience more trust and confidence in the process of birthing and being a parent.

Regarding the group of women with at least an onset of labour (without planned caesarean), superior effects of MBCP were found on experienced FOC. This suggests that MBCP is more effective

than ECAU in supporting women with high FOC, who actually have to deal with contractions, labour and the unpredictability of the labour process. Considering that women in the MBCP group requested less medical interventions (Veringa-Skiba et al., 2022) and reported less FOC, it seems they felt more empowered and able to cope with the labour process in comparison to women in the ECAU group. Interestingly, although women in the MBCP group used significantly less (self-requested) epidurals and medication (Veringa-Skiba et al., 2022), their experience of pain was the same as the women in ECAU. This might mean that women in the MBCP condition were less overwhelmed with the labour pain and could accept it more, which corresponds with the findings of Veringa-Skiba et al., (2022), demonstrating more labour pain acceptance in women participating in MBCP compared to ECAU. Furthermore, the pregnant women with onset of labour that participated in at least four sessions of MBCP (per protocol analysis) also showed higher satisfaction of birth in comparison with ECAU. The superior effects of MBCP on experienced FOC and satisfaction of birth in the group of labouring women, were only found two to four weeks after birth, not 16-20 weeks after birth. This might be explained by a lack of power (more data missing at T4). In addition, note that T4 data was not completely missing at random and therefore careful interpretation of T4 results is needed. Furthermore, some months after birth women might have had a less clear picture of their birth experience and/or they might have already processed the (negative) birth experiences.

Contrary to expectation, in the total partner group no superior effects of MBCP versus ECAU were found on all psychological well-being measures and satisfaction with birth. This is surprising considering that MBIs are known to reduce depression, anxiety, stress and fatigue in various, also in non-clinical populations (Chiesa & Serretti, 2009; Hofmann et al., 2010). The partners that filled in the evaluation questionnaires, however, did generally evaluate MBCP positively (8.0 on a 1-10 scale) and reported it was valuable to them, for example in experiencing hope and trust concerning their partner's labour and in themselves in being a parent. It might be that the training was valuable to them in aspects not measured with the current questionnaires; like in supporting their partner during labour and responding more consciously to stressful parent situations. Future research could include more relational outcomes, like how connected the pregnant women feel with their partner and how supported they feel during labour. Another explanation might be that MBCP had a larger focus on supporting the pregnant women, and partners felt they were participating to support the women instead of being there also to profit themselves. It might be that having separate partner sessions for example, would give more room for the difficulties partners encounter, leading to more focus on supporting the partners. A last explanation for not finding superior effects of MBCP on psychological well-being might be that partner's levels of depression, anxiety, stress and fatigue were generally already so low, that for most of them there was little to gain. Note however that practice did matter; partners that meditated more during the training, felt less stressed/ depressed/ anxious when the baby was born and also less stressed 16-20 weeks after childbirth. Partners that meditated more during the training were also more stressed and tired in general, which might have given them more incentive to practice meditation at home.

Surprisingly, a significant effect was found in favour of ECAU concerning fatigue 16-20 weeks after birth, indicating that partners of the MBCP group were feeling *more* tired than partners that participated in ECAU. The MBCP condition did require more dedication (more sessions and home practice) of the partner than ECAU. It might be that these partners were more involved in the caretaking of the baby (also at night), leading to more fatigue in this group. In addition, current analyses of the cost-effectiveness study (van Steensel et al., submitted) showed that women in MBCP requested

less support from family and friends than women in ECAU. It might be that MBCP, investing more in tools leading to self-competence in both labour and parenting compared to ECAU, had the (unintended) effect of letting the couples handle the situations with the newborn all by themselves and asking little help from family and friends, leading to relatively more tasks for the partners and subsequently more fatigue.

As expected, superior effects of MBCP versus ECAU were found in the partner group with more problematic scores at start of the training, the partner risk group. Only in the MBCP group, partners at risk experienced less fatigue after the training and the partners at risk that participated in at least four sessions of MBCP also reported less psychological stress after the training. Furthermore, a decrease of psychological stress and combined depression, anxiety and general stress after birth was reported only in the MBCP condition. Partially the findings might be explained by differences between the risk groups; the MBCP risk group reported higher scores on combined depression, anxiety and general stress, and on psychological stress (but not on fatigue) before start of the training and therefore, there was more room for improvement. More research is needed to conclude whether MBCP might be a preferable intervention for couples when the partner has stress-related complaints.

Strengths and limitations

Strengths of the current study are the inclusion of partners, having an active control group, using both short- and longer term assessments, the use of a study protocol, blinded outcome assessors and conducting both ITT and PP analyses. Mean scores before intervention of both women and partners did not differ between MBCP and ECAU, which indicates successful randomization. The only exception is the partner risk group, which had different mean scores before intervention, and therefore caution is needed when interpreting these results.

A limitation is that the missing data of the birthing women is not completely at random; women with more complaints at start were less likely to fill in questionnaires 16-20 weeks after birth, making the data at this time point less trustable. Another limitation is the large amount of missing data in the evaluation questionnaires, especially of the partners.

Furthermore, it cannot be ruled out that MBCP (9 sessions) had superior effects in the pregnant women and partners at risk compared to ECAU (2 sessions), due to a dose difference or due to a group versus individual difference. It should, however, be mentioned that significantly more participants in ECAU (41%) than in MBCP (9%) followed supplementary prenatal courses, which may have compensated for this difference (Veringa-Skiba et al., 2022). Lastly, providing an intensive MBCP training is a high resource for midwives and requires much from participants as well, compared to ECAU, especially considering that there were no major differences in most results in the currently used measures.

Conclusion

Although effective in reducing anticipated FOC, MBCP does not show larger effects on psychological well-being, and pregnancy and birth experiences in the total group pregnant women with high fear of childbirth and their partners, compared to ECAU. However, MBCP does show larger effects for women who went through (part of) labour, that is, they experienced less FOC and, if they participated in at least four sessions (per protocol analyses), also more satisfaction with birth. Furthermore, partners at risk profit from MBCP in reducing fatigue, and depression, anxiety and/or stress at T2 or T3, while this was not the case in ECAU. However it should be noted that at pretest the MBCP partner risk group had

higher depression, anxiety and stress scores, therefore there was more to gain in the MBCP group and results should be interpreted with caution. Acceptability of MBCP seems high for both pregnant women and partners. The applicability of MBCP and its (long-term) effectiveness for expectant couples deserves further study.

Ethical Approval

The trial was approved on 23 June 2013 (certificate number 2013-CDE-3064) by the Ethics Review Board of the Faculty of Social and Behavioral Sciences at the University of Amsterdam. The study was exempted from the approval by the Medical Ethical Committee of the Academic Medical Centre (certificate number NL44033.018.13).

Funding sources

This study was funded by the Netherlands Health Insurance Association—Zilveren Kruis Achmea and the Research Institute Child Development and Education (RICDE) at the University of Amsterdam, the Netherlands. The funding sources had no role in the study design or in collecting, analyzing or interpreting the data, nor in writing or publishing the article.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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R.T. Van der Meulen: Writing – original draft, Writing – review & editing, Formal analysis. **I.K. Veringa-Skiba:** Conceptualization, Project administration, Data curation, Writing – review & editing. **F.J.A. Van Steensel:** Supervision, Writing – review & editing. **S.M. Bögels:** Supervision, Conceptualization, Writing – review & editing. **E.I. De Bruin:** Supervision, Conceptualization, Writing – review & editing.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.midw.2022.103545](https://doi.org/10.1016/j.midw.2022.103545).

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