



UvA-DARE (Digital Academic Repository)

Breastfeeding intention and trait mindfulness during pregnancy

Hulsbosch, L.P.; Potharst, E.S.; Boekhorst, M.G.B.M.; Nyklíček, I.; Pop, V.J.M.

DOI

[10.1016/j.midw.2021.103064](https://doi.org/10.1016/j.midw.2021.103064)

Publication date

2021

Document Version

Final published version

Published in

Midwifery

License

CC BY

[Link to publication](#)

Citation for published version (APA):

Hulsbosch, L. P., Potharst, E. S., Boekhorst, M. G. B. M., Nyklíček, I., & Pop, V. J. M. (2021). Breastfeeding intention and trait mindfulness during pregnancy. *Midwifery*, *101*, [103064]. <https://doi.org/10.1016/j.midw.2021.103064>

General rights

It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations

If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: <https://uba.uva.nl/en/contact>, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.



Breastfeeding intention and trait mindfulness during pregnancy

Lianne P Hulsbosch^{a,*}, Eva S Potharst^{b,c}, Myrthe GBM Boekhorst^a, Ivan Nyklíček^a, Victor JM Pop^a

^a Center of Research in Psychological and Somatic disorders (CoRPS), Department of Medical and Clinical Psychology, Tilburg University, Tilburg, the Netherlands

^b UvA minds, academic outpatient (child and adolescent) treatment center of the University of Amsterdam, Amsterdam, the Netherlands

^c Research Institute of Child Development and Education, University of Amsterdam, Amsterdam, the Netherlands

ARTICLE INFO

Keywords:

Breastfeeding
Intention
Initiation
Mindfulness
Non-reacting
Pregnancy

ABSTRACT

Objective: Breastfeeding has been associated with many health benefits for both infant and mother. Trait mindfulness during pregnancy may have a beneficial impact on breastfeeding intention. The current study aimed to examine whether trait mindfulness during pregnancy was associated with antenatal breastfeeding intention.

Design, setting and participants: The current study is part of a large prospective population-based cohort study among pregnant women in the south of the Netherlands.

Measurements: A subsample of participants completed the Three Facet Mindfulness Questionnaire-Short Form at 22 weeks of pregnancy and a question on their breastfeeding intention at 32 weeks of pregnancy (N=790). Moreover, the Edinburgh Depression Scale and Tilburg Pregnancy Distress scale were completed at 32 weeks of pregnancy to assess levels of distress.

Findings: Univariate analyses showed that women with breastfeeding intention during pregnancy had significantly higher scores on the mindfulness facet non-reacting ($p < .001$, medium effect size) and significantly lower scores on acting with awareness ($p = .035$, small effect size). A subsequent multiple logistic regression analysis showed that only non-reacting remained significantly associated with antenatal breastfeeding intention (OR=1.09, 95% CI [1.03, 1.15], $p = .001$), after controlling for confounders. Women who eventually initiated breastfeeding had significantly higher non-reacting scores ($p < .001$, small to medium effect size).

Key conclusions: The mindfulness facet non-reacting was found to be associated with antenatal breastfeeding intention. More research is needed to confirm our results, since the current study is one of the first assessing the possible relation of trait mindfulness during pregnancy and breastfeeding intention.

Implications for practice: Mindfulness-based programs during pregnancy could be helpful in improving non-reacting in pregnant women, which may enhance breastfeeding intention and ultimately the initiation of breastfeeding.

Introduction

Breastfeeding is highly recommended by the World Health Organization (WHO) as it provides all essential nutrients and energy in the first months of a newborn's life to ensure its growth and development (WHO, 2020). Moreover, human milk contains many immune-related components that protect the child against infections (Hosea Blewett et al., 2008). Besides immune protection, breastfeeding has been associated with better health outcomes for preterm infants (Furman et al., 2003; Meinen-Derr et al., 2009), enhanced cognitive development (Nutrition et al., 2009), and a reduced risk of diabetes and obesity in later life (Owen et al., 2005, 2006; Rosenbauer et al., 2008). Breast-

feeding can have short- and long-term benefits for the mother as well. Due to increased oxytocin levels, breastfeeding involves a reduction in postpartum bleeding and a more rapid uterine involution after childbirth (Del Ciampo and Del Ciampo, 2018). Breastfeeding has been associated with a decrease in postpartum depression (Figueiredo et al., 2013), a reduction in blood pressure (Groer et al., 2013) and greater weight loss (Brandhagen et al., 2014; Lopez-Olmedo et al., 2016) in the postpartum period. It may also protect mothers against type 2 diabetes mellitus, breast cancer and ovarian cancer (Chowdhury et al., 2015; Ip et al., 2007).

In Europe, breastfeeding initiation rates vary between 57% (Ireland) and 99% (Finland and Norway) (Sarki et al., 2019). In the Netherlands, up to 80% of the mothers initiate breastfeeding their infant after child-

* Corresponding author.

E-mail address: l.p.hulsbosch@tilburguniversity.edu (L.P. Hulsbosch).

birth (Sarki et al., 2019). Breastfeeding initiation has been related to a high education level (Sarki et al., 2019), breastfeeding self-efficacy (Martens and Young, 1997), mother's attitude towards breastfeeding (Dungy et al., 2008; Scott et al., 2004) and breastfeeding knowledge (Dungy et al., 2008). Breastfeeding initiation after childbirth is mostly preceded by breastfeeding intention during pregnancy (Donath et al., 2003; Martens and Young, 1997). Therefore, it is important to examine whether there are maternal characteristics that may have a beneficial impact on breastfeeding intention during pregnancy. When we are able to predict and better understand a pregnant woman's breastfeeding intention, suitable support could be provided to pregnant women in order to enhance breastfeeding intention and thus initiation. Moreover, this knowledge could clarify possible effective elements of breastfeeding promotion interventions.

Trait mindfulness is a person characteristic that may be related to breastfeeding intention and is defined as someone's predisposition to be mindful (Baer et al., 2006; Brown and Ryan, 2003). Being mindful means having full attention to experiences in the present moment, with a curious, open and accepting attitude (Bishop et al., 2004). Presumably, trait mindfulness remains stable over time without an intervention (Brown and Ryan, 2003). This is in contrast to state mindfulness, which is a psychological process that depends on the specific situation and varies over time (Bishop et al., 2004; Tanay and Bernstein, 2013), and can be practiced during mindfulness meditation (Kiken et al., 2015). By practicing state mindfulness during mindfulness meditation, trait mindfulness can be improved over time (Kiken et al., 2015).

Trait mindfulness has been related to various psychological health factors (Keng et al., 2011), such as higher levels of life satisfaction, self-esteem, competence, autonomy, and optimism (Brown and Ryan, 2003). It seems likely that higher levels of these psychological health factors could enhance a woman's breastfeeding self-efficacy, i.e. the confidence a pregnant woman has in her breastfeeding ability (Dennis, 1999), and increase a woman's breastfeeding attitude. Therefore, trait mindfulness may strengthen breastfeeding self-efficacy and breastfeeding attitude. Moreover, trait mindfulness has been negatively associated with depression and anxiety in general (Brown and Ryan, 2003; Cash and Whittingham, 2010) and with psychological distress during pregnancy (Truijens et al., 2016; van den Heuvel et al., 2015). Antenatal depressive symptoms and pregnancy-related anxiety have in turn been inversely related to antenatal breastfeeding intention (Fairlie et al., 2009; Insaf et al., 2011). In addition, trait mindfulness during pregnancy has been related to postpartum maternal responsiveness (Pickard et al., 2017), while maternal responsiveness has been associated with breastfeeding intention (Jones et al., 2020) and initiation (Britton et al., 2006). A possible positive association between trait mindfulness and breastfeeding intention seems therefore likely. To our knowledge, no studies have investigated the possible association of trait mindfulness during pregnancy with antenatal breastfeeding intention. Therefore, the aim of the current study was to assess whether trait mindfulness during pregnancy was associated with antenatal breastfeeding intention after adjusting for relevant demographic, pregnancy-related and psychological covariates.

Methods

Procedure

The current study is part of a large prospective population-based cohort study, the Holistic Approach to Pregnancy and the first Postpartum Year (HAPPY) study, following 2269 pregnant women from their first trimester of pregnancy onwards (Truijens et al., 2014). The final assessment was at one week postpartum. From January 2013 to September 2014, recruitment took place at 17 primary care midwife practices in the south of the Netherlands. Dutch-speaking women from 18 years and older were invited to participate at their first antenatal visit. Exclusion criteria were multiple pregnancy, severe psychiatric disorder

(e.g. schizophrenia, borderline personality disorder and bipolar disorder) and/or a documented history of chronic disease (e.g. diabetes and thyroid dysfunction). Informed consent was obtained from all participants. The HAPPY study was approved by the local ethical committee (protocol number EV-2012.25) and reviewed by the Medical Ethics Committee of the Máxima Medical Centre Veldhoven.

Participants

Only the women who were included in the HAPPY study between March 2013 and December 2013, were asked to fill out a questionnaire assessing trait mindfulness at 22 weeks of pregnancy (N=991). A total of 2037 women in the HAPPY cohort completed a question on their breastfeeding intention at 32 weeks of pregnancy. The 81 women that answered "I don't know yet", were excluded from the analyses. Of the remaining 1956 women, a total of 815 also completed the questionnaire measuring trait mindfulness. Twenty-five women had missing data on covariates such as depression earlier in life (N=14), childbirth education class (N=2), pregnancy-specific distress (N=2), parity (N=10) and level of education (N=15), and were therefore excluded from analyses. This resulted in a final sample of 790 women in the current study.

Measures

Trait mindfulness during pregnancy

At 22 weeks of pregnancy, women completed the Dutch version of the 12-item Three Facet Mindfulness Questionnaire-Short Form (TFMQ-SF) to assess trait mindfulness during pregnancy (Truijens et al., 2016). This measure was derived from the short form of the Five Facet Mindfulness Questionnaire (FFMQ) (Baer et al., 2006; Bohlmeijer et al., 2011) and consists of three subscales. Each subscale assesses a different facet of mindfulness: (1) *acting with awareness*, the opposite of acting on automatic pilot, (2) *non-judging* of inner experience and (3) *non-reacting* to inner experience. For each subscale, the total score ranges from 4 to 20, with higher scores reflecting greater levels of mindfulness. The TFMQ-SF has been validated in Dutch pregnant women, showing adequate psychometric properties with Cronbach's alpha's of .87 (acting with awareness), .84 (non-judging) and .81 (non-reacting) (Truijens et al., 2016). In the current study the Cronbach's alpha's per subscale were .86, .80 and .81, respectively.

Breastfeeding intention

The intention for breastfeeding was measured at 32 weeks of pregnancy. Women were asked whether they intended to initiate breastfeeding after childbirth, with the following answer possibilities: yes, only human milk / yes, both human milk and formula / no, only formula. The breastfeeding intention was then dichotomized into yes/no, with 'yes' involving human milk and both human milk and formula, and 'no' including formula feeding exclusively.

Antenatal depressive symptoms

Antenatal depressive symptoms were assessed at 32 weeks of pregnancy using the Dutch version of the 10-item Edinburgh Depression Scale (EDS) (Cox et al., 1987). Total EDS scores range from 0 to 30, and higher scores indicate more symptoms of depression. The validity of the EDS is established in Dutch pregnant women, with a Cronbach's alpha of .84 in the third trimester of pregnancy (Bergink et al., 2011). The Cronbach's alpha in the current study was .82.

Pregnancy-specific distress

At 32 weeks of pregnancy, pregnancy-specific distress was measured using the Tilburg Pregnancy Distress Scale (TPDS) (Pop et al., 2011). The TPDS consists of two subscales: *negative affect* (TPDS-NA, 11 items) and *partner involvement* (TPDS-PI, 5 items). Total TPDS-NA scores range from

Table 1
Characteristics of the participating women (N=790).

	N	%	Mean (SD)	Range
<i>Demographics</i>				
Age			30.2 (3.5)	19-43
High level of education	520	65.8		
Paid job	725	92.8		
Living with partner	781	98.9		
<i>Pregnancy related</i>				
Multiparity	377	47.7		
Childbirth education class	392	49.6		
Breastfeeding intention at 32 weeks				
Exclusive breastfeeding	592	74.9		
Both breastfeeding and formula feeding	51	6.5		
Breastfeeding initiation after childbirth				
Exclusive breastfeeding	569	72.0		
Both breastfeeding and formula feeding	29	3.7		
<i>Psychological features</i>				
Depression earlier in life	113	14.3		
EDS at 32 weeks			4.9 (4.0)	0-22
TPDS at 32 weeks				
Negative affect			6.6 (4.5)	0-26
Partner involvement			4.4 (2.9)	0-14
TFMQ-SF at 22 weeks				
Acting with awareness			14.5 (3.1)	6-20
Non-judging			16.2 (3.1)	5-20
Non-reacting			11.8 (4.2)	4-20

Note: SD, standard deviation; high level of education, Bachelor's or Master's degree; EDS, Edinburgh Depression Scale; TPDS, Tilburg Pregnancy Distress Scale; TFMQ-SF, Three Facet Mindfulness Questionnaire - Short Form.

0 to 33 and total TPDS-PI scores from 0 to 15, with higher scores indicating more pregnancy-specific distress. Both subscales show good validity and reliability in Dutch third trimester pregnant women with Cronbach's alpha's being .77 (TPDS-NA) and .81 (TPDS-PI) (Boekhorst et al., 2020). In the current study the Cronbach's alpha's were .75 and .81, respectively. A review evaluated the internal consistency and structural validity of the TPDS as excellent (Evans et al., 2015).

Descriptive characteristics

At 12 weeks of pregnancy, the following baseline demographic characteristics were obtained: *age*, *level of education* (low or medium/high (high=Bachelor's or Master's degree)), *having a paid job* (yes/no), *living with partner* (yes/no), *depression earlier in life* (yes/no) and *parity* (primiparous/multiparous). At 32 weeks of pregnancy, women were asked whether they took part in a *childbirth education class* (yes/no).

Breastfeeding initiation

During the first postpartum week, women were asked whether they initiated breastfeeding or not after giving birth with the following answer possibilities: yes, only human milk / yes, both human milk and formula / no, only formula. Breastfeeding initiation was then dichotomized into yes/no, with 'yes' involving human milk and both human milk and formula, and 'no' including formula feeding exclusively.

Statistical analysis

Analyses were completed using R (version 3.6.3). First, women were divided into a group with breastfeeding intention and a group without breastfeeding intention. Differences between these two groups of women were analyzed at a univariate level with two sample *t*-tests and chi-square tests. For the two sample *t*-tests, effect sizes were assessed by calculating Cohen's *d* (.20=small, .50=medium, and .80=large), and for the chi-square tests phi coefficient was considered (.10=small, .30=medium, and .50=large) (Cohen, 1988).

Second, a multiple logistic regression analysis was performed to assess a possible association between the facets of trait mindfulness (predictors) and breastfeeding intention (outcome variable). Only those

facets of mindfulness that were significantly related ($p < .05$) to breastfeeding intention at a univariate level were included in the model. The model was adjusted for the covariates that were significantly associated ($p < .05$), at a univariate level, with breastfeeding intention. In addition, we performed a sensitivity analysis excluding women who intended to give both breastfeeding and formula feeding.

Finally, we analyzed differences in facets of trait mindfulness between women who eventually initiated breastfeeding after childbirth and women who started with formula by using two sample *t*-tests. In addition, we performed several sensitivity analyses. First by excluding women who intended to give both breastfeeding and formula feeding, and second by excluding women with a preterm birth and/or infant that was admitted to the hospital after childbirth.

Findings

The characteristics of the participating women are shown in Table 1. Compared to the women who did not complete assessment of trait mindfulness or the question on breastfeeding intention (N=1479), the current sample (N=790) was more often highly educated ($\chi^2(1)=4.07, p=.044$) and included more primiparous women ($\chi^2(1)=4.28, p=.039$), but these differences showed small effect sizes. There were no sample differences in age, paid job, living with partner, depression earlier in life, childbirth education class, breastfeeding intention, antenatal depressive symptoms and pregnancy-specific distress.

Of the 790 women in the current study, 643 (81.4%) reported the intention to breastfeed at 32 weeks of pregnancy. These women scored significantly higher on the mindfulness facet non-reacting (Mean (SD)=12.2 (4.1)) compared to the 147 women (18.6%) without breastfeeding intention (Mean (SD)=9.9 (4.2), $t(788)=6.09, p < .001$, Cohen's $d=.55$) with medium effect size. Women with breastfeeding intention had a significantly lower score on the mindfulness facet acting with awareness (Mean (SD)=14.4 (3.1)) than women without breastfeeding intention (Mean (SD)=15.0 (3.3), $t(788)=2.11, p=.035$, Cohen's $d=.19$) with small effect size. For the mindfulness facet non-judging, no significant difference was found between women with breastfeeding intention (Mean (SD)=16.1 (3.1)) and women without breastfeeding inten-

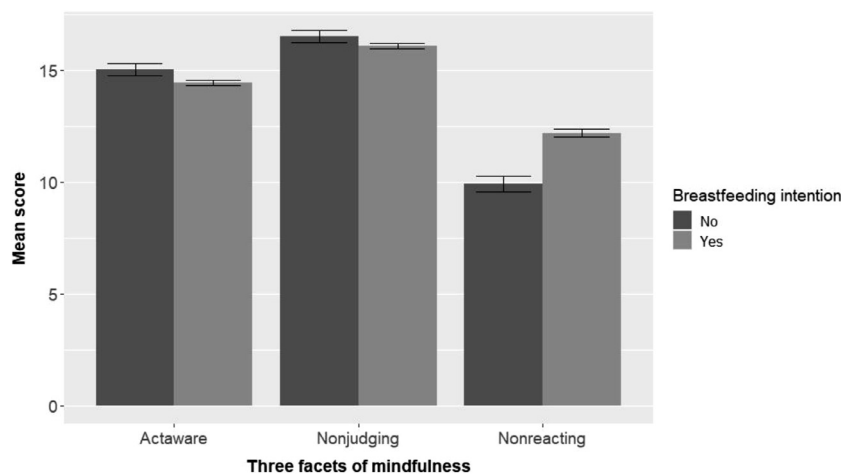


Fig. 1. Differences in mean scores of *acting with awareness* ($p=.035$), *non-judging* ($p=.135$) and *non-reacting* ($p<.001$) between women without breastfeeding intention (N=147) and women with breastfeeding intention (N=643) at 32 weeks of pregnancy.

Table 2
Comparison between women with breastfeeding intention (N=643) and without breastfeeding intention (N=147) at 32 weeks of pregnancy.

	Breastfeeding intention +		Breastfeeding intention -		p-value	
	N (%)	Mean (SD)	N (%)	Mean (SD)	X ²	T
Age		30.2 (3.4)		29.9 (3.9)		.426
High level of education	457 (71.1)		63 (42.9)		<.001	
Paid job	593 (92.2)		132 (89.8)		.424	
Living with partner	637 (99.1)		144 (98.0)		.477	
Multiparity	283 (44.0)		94 (63.9)		<.001	
Childbirth education class	356 (55.4)		36 (24.5)		<.001	
Depression earlier in life	90 (86.0)		23 (84.4)		.700	
EDS at 32 weeks		4.9 (4.0)		5.1 (4.3)		.621
TPDS at 32 weeks						
Negative affect		6.4 (4.3)		7.5 (5.1)		.015
Partner involvement		4.2 (2.9)		5.0 (3.0)		.005

Note: SD, standard deviation; high level of education, Bachelor’s or Master’s degree; EDS, Edinburgh Depression Scale; TPDS, Tilburg Pregnancy Distress Scale; X², chi-square test; T, two sample t-test. **Bold:** significance as defined by $p<.05$.

tion (Mean (SD)=16.5 (3.3), $p=.135$). The difference between women with and without breastfeeding intention for each facet of mindfulness is shown in Fig. 1.

As shown in Table 2, several other characteristics were significantly different when comparing women with and without breastfeeding intention. Women with breastfeeding intention were more often highly educated ($\chi^2(1)=41.10$, $p<.001$, phi coefficient=.23), were less often multiparous women ($\chi^2(1)=18.27$, $p<.001$, phi coefficient=-.16) and participated in a childbirth education class more frequently ($\chi^2(1)=44.40$, $p<.001$, phi coefficient=.24), all with small effect sizes. In addition, women with breastfeeding intention scored significantly lower on pregnancy-specific negative affect ($t(195)=2.45$, $p=.015$, Cohen’s $d=.24$) and partner involvement during pregnancy ($t(788)=2.80$, $p=.005$, Cohen’s $d=.25$) with small effect sizes. No differences were found in age, paid job, living with partner, depression earlier in life and antenatal depressive symptoms.

For the logistic regression analysis, only the significantly related variables at univariate level were included: two facets of mindfulness and five covariates. Therefore, the full model included seven predictors (acting with awareness, non-reacting, level of education, parity, childbirth education class, pregnancy-specific negative affect and partner involvement). Each categorical variable (breastfeeding intention, high level of education, multiparity and childbirth education class) was re-coded to 0=no and 1=yes. The full model was statistically significant, $\chi^2(7)=102.37$, $p<.001$. This means that the model was able to distinguish between women with and without breastfeeding intention. The total model explained between 12.2% (Cox and Snell R Square) and

Table 3
Multiple logistic regression: dependent variable breastfeeding intention at 32 weeks of pregnancy (N=790).

	OR	95% CI	p-value
TFMQ-SF: Acting with awareness	.98	[.91, 1.05]	.549
TFMQ-SF: Non-reacting	1.09	[1.03, 1.15]	.001
High level of education	2.15	[1.42, 3.25]	<.001
Multiparity	.54	[.35, .83]	.005
Childbirth education class	2.41	[1.54, 3.78]	<.001
TPDS: Negative affect	.94	[.90, .98]	.005
TPDS: Partner involvement	.98	[.91, 1.05]	.251

Note: TFMQ-SF, Three Facet Mindfulness Questionnaire - Short Form; TPDS, Tilburg Pregnancy Distress Scale; OR, Odds Ratio; CI, Confidence Interval.

Bold: significance as defined by $p<.05$.

19.7% (Nagelkerke R Square) of the variance in breastfeeding intention. The contribution of each predictor to the model is shown in Table 3. Non-reacting was significantly and independently associated with breastfeeding intention (OR=1.09, 95% CI [1.03, 1.15], $p=.001$). The odds ratio indicates that per unit increase in non-reacting it was 9% more likely that, at 32 weeks of pregnancy, a woman reported the intention to breastfeed her baby, controlled for all other variables in the model. Other determinants that were significantly associated with the intention to breastfeed were a high level of education (OR=2.15, 95% CI [1.42, 3.25], $p<.001$), multiparity (OR=.54, 95% CI [.35, .83],

$p=.005$), participating in a childbirth education class ($OR=2.41$, 95% CI [1.54, 3.78], $p<.001$) and pregnancy-specific negative affect ($OR=.94$, 95% CI [.90, .98], $p=.005$). A sensitivity analysis on women who intended to give only breastfeeding or only formula feeding (excluding 51 women who intended to give both) resulted in similar results. In this sample ($N=739$), non-reacting remained to be significantly associated with breastfeeding intention after adjusting for covariates ($OR=1.09$, 95% CI [1.04, 1.15], $p=.001$).

Of the 643 women who reported the intention for breastfeeding at 32 weeks of pregnancy, 594 (96.0%) women eventually initiated breastfeeding after childbirth, while four (2.9%) women without breastfeeding intention initiated breastfeeding. The women who initiated breastfeeding had a significantly higher non-reacting score (Mean (SD)=12.2 (4.1)) compared to the women who started with formula feeding (Mean (SD)=10.3 (4.2); $t(754)=5.10$, $p<.001$, Cohen's $d=.46$) with small to medium effect size. No significant differences were found for the facets acting with awareness and non-judging. Similar results were found in sensitivity analyses excluding women who initiated both breastfeeding and formula feeding ($N=29$). These analyses showed that women who initiated exclusive breastfeeding had higher non-reacting scores (Mean (SD)=12.2 (4.1)) than women who started with exclusive formula feeding ($t(725)=5.12$, $p<.001$, Cohen's $d=.46$) with small to medium effect size. Moreover, when we excluded 44 women (of the 790 women in the total sample) with a preterm birth and/or an infant that was admitted to the hospital after childbirth, we found similar results regarding non-reacting scores (Breastfeeding, Mean (SD)=12.3 (4.1); Formula feeding, Mean (SD)=10.2 (4.2); $t(717)=5.42$, $p<.001$, Cohen's $d=.51$, medium effect size).

Discussion

In the current study, we aimed to investigate the relationship between trait mindfulness during pregnancy and antenatal breastfeeding intention. Women with breastfeeding intention scored significantly higher on the mindfulness facet non-reacting and lower on acting with awareness. Non-reacting was significantly associated with breastfeeding intention after adjusting for level of education, parity, childbirth education class, pregnancy-specific negative affect and partner involvement (even after exclusion of women who intended to give both breastfeeding and formula feeding). Women who indeed initiated breastfeeding after giving birth showed significantly higher non-reacting scores (even after excluding women who initiated both breastfeeding and formula feeding or after exclusion of women with a preterm birth and/or infant that was admitted to the hospital after childbirth).

Our findings with regard to the mindfulness facet non-reacting could be explained as follows. Breastfeeding intention has been associated with breastfeeding self-efficacy (Martens and Young, 1997). Feasibly, the confidence pregnant women have in their capability to breastfeed their baby is related to their intention to initiate breastfeeding. When pregnant women feel less confident about their breastfeeding ability, they may experience negative thoughts about breastfeeding and the reasons that make them doubt their breastfeeding capability. Moreover, pregnant women could have concerns regarding pain, milk supply, their ability to latch their baby, embarrassment to feed with other people around and lack of freedom (Andrew and Harvey, 2011; McFadden and Toole, 2006; Stewart-Knox et al., 2003). Possibly, being able to let thoughts about these matters come and go without becoming preoccupied by them, defined as non-reacting (Baer et al., 2006; Bohlmeijer et al., 2011), could help women to deal with their breastfeeding concerns in an effective way. It may help them to continue to see the positive aspects of breastfeeding, such as better health outcomes for their infant and themselves and a better mother-child bonding (Chowdhury et al., 2015; WHO, 2013). Eventually, it could support them in their decision to initiate breastfeeding their infant instead of bottle-feeding with formula. Future research should address both trait mindfulness and breastfeeding self-efficacy, and possible interaction ef-

fects between these variables in their association with breastfeeding intention.

For the mindfulness facet acting with awareness, that involves attentiveness to current activities in the here-and-now (Brown and Ryan, 2003), it was found that women with breastfeeding intention had lower scores, however with small effect size. It must be noted that acting with awareness was not found to be a significant predictor of breastfeeding intention in the multiple logistic regression model and that women who initiated breastfeeding after childbirth did not differ in acting with awareness scores compared to women who started with formula. Also, no significant associations with breastfeeding intention were found for the mindfulness facet non-judging, which refers to non-judgmental acceptance of thoughts and feelings (Baer et al., 2006). It may be speculated that both acting with awareness and non-judging could be more valuable when a mother is already breastfeeding her child. A breastfeeding mother may be able to be more present in that special contact with her child (acting with awareness) and therefore find more joy in breastfeeding, and she may be less self-critical when she encounters breastfeeding problems (non-judging).

Our findings showed that pregnant women with the intention to breastfeed scored lower on pregnancy-specific negative affect and reported better partner involvement at 32 weeks of pregnancy (indicated by a lower score) compared to pregnant women who intended to give formula. In addition, pregnancy-specific negative affect was significantly and negatively associated with breastfeeding intention. Since trait mindfulness has been inversely related to psychological distress during pregnancy (Truijens et al., 2016; van den Heuvel et al., 2015), the association between non-reacting and breastfeeding intention that we found in the current study may also be explained by lower pregnancy-specific negative affect scores. No significant differences were found in antenatal depressive symptom scores. Partner support has previously been described to be associated with a pregnant woman's intention to breastfeed (Ballesta-Castillejos et al., 2020; Sherriff et al., 2014). Previous studies reported mixed results on antenatal depression and anxiety in relation to breastfeeding intention. Some studies found a negative association of antenatal depression and anxiety with the intention to breastfeed (Fairlie et al., 2009; Insaf et al., 2011) and other studies found no association (Adedinsowo et al., 2014; Bogen et al., 2010).

The current study has strengths and limitations. The large sample size and longitudinal design are strengths. The participants were mostly Dutch, white and more often highly educated women with a paid job, which was a limitation since it restricts the generalizability of our findings. Especially since our results showed high education level to be associated with breastfeeding intention, an association that was reported before (Sarki et al., 2019), future research should examine whether our results can be confirmed in less educated women. In addition, future research should assess the relation between trait mindfulness and breastfeeding intention in women with other ethnic backgrounds and in women who experience socioeconomic deprivation. Another limitation included the use of self-report assessment to measure trait mindfulness during pregnancy, antenatal depressive symptoms and pregnancy-specific distress. Personal values and social desirability could cause bias in self-report assessment, in particular in assessment of mindfulness (Bergomi et al., 2013). In addition, it must be noted that the current study examined breastfeeding intention and initiation only, while the continuation of breastfeeding in the postpartum period also presents a key challenge in breastfeeding practice. Therefore, it is important that future research focusses on the possible association of trait mindfulness and continuation of breastfeeding during the postpartum period as well.

In conclusion, our study is among the first showing that trait mindfulness during pregnancy, i.e. the facet non-reacting, was associated with antenatal breastfeeding intention, and that women who eventually initiated breastfeeding after childbearing showed higher scores on non-reacting. Our results are important for practice, given the many health benefits of breastfeeding for infant and mother. Knowing that trait mindfulness could have a beneficial impact on breastfeeding intention and

initiation offers opportunities in providing suitable support during pregnancy to improve the intention and initiation of breastfeeding. Interventions may help in two ways: by increasing the number of women initiating breastfeeding, but also and perhaps more importantly, by increasing the number of women continuing breastfeeding after childbirth. Practicing state mindfulness during mindfulness meditation, can improve trait mindfulness over time (Kiken et al., 2015). This means that mindfulness-based programs during pregnancy could be helpful in improving non-reacting in pregnant women and thus enhance breastfeeding intention and ultimately the initiation of breastfeeding. Pregnant women could partake in a general Mindfulness-Based Stress Reduction (MBSR) program (Segal et al., 2013), a Mindfulness-Based Childbirth and Parenting (MBCP) program (Duncan and Bardacke, 2010) or a Mindfulness-Based Childbirth Education (MBCE) program (Hauck et al., 2016). Especially MBCE programs may be suitable in enhancing breastfeeding intention since these programs could be effective in two ways: by enhancing the mindfulness facet non-reacting and by increasing breastfeeding self-efficacy, as childbirth education has been shown to be related to higher levels of breastfeeding self-efficacy (Citak Bilgin et al., 2020). To our knowledge, no studies have reported on mindfulness-based programs and breastfeeding intention or initiation yet. Future research should examine whether antenatal mindfulness-based programs could be effective in enhancing breastfeeding intention and initiation. When mindfulness-based interventions show to be effective, midwives could facilitate such programs during pregnancy and/or advise pregnant women to partake in a mindfulness-based intervention during the course of pregnancy.

Ethical approval

The HAPPY study was approved by the ethical committee of Tilburg University on 11 November 2012 (protocol number EV-2012.25) and reviewed by the Medical Ethics Committee of the Máxima Medical Centre Veldhoven.

Funding sources

None declared.

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.

CRediT authorship contribution statement

Lianne P Hulsbosch: Conceptualization, Methodology, Formal analysis, Writing – original draft. **Eva S Potharst:** Methodology, Validation, Writing – review & editing. **Myrthe GBM Boekhorst:** Writing – review & editing. **Ivan Nyklíček:** Writing – review & editing. **Victor JM Pop:** Conceptualization, Methodology, Investigation, Writing – review & editing, Supervision.

Acknowledgments

We would like to thank the 17 primary care midwife practices for the recruitment of participants and all participating women for their collaboration.

References

Adedinsewo, D.A., Fleming, A.S., Steiner, M., Meaney, M.J., Girard, A.W., team, M., 2014. Maternal anxiety and breastfeeding: findings from the MAVAN (maternal adversity, vulnerability and neurodevelopment) study. *J. Hum. Lact.* 30 (1), 102–109. doi:10.1177/0890334413504244.

Andrew, N., Harvey, K., 2011. Infant feeding choices: experience, self-identity and lifestyle. *Matern. Child Nutr.* 7 (1), 48–60. doi:10.1111/j.1740-8709.2009.00222.x.

Baer, R.A., Smith, G.T., Hopkins, J., Krietemeyer, J., Toney, L., 2006. Using self-report assessment methods to explore facets of mindfulness. *Assessment* 13 (1), 27–45. doi:10.1177/1073191105283504.

Ballesta-Castillejos, A., Gomez-Salgado, J., Rodriguez-Almagro, J., Ortiz-Esquinas, I., Hernandez-Martinez, A., 2020. Factors that influence mothers' prenatal decision to breastfeed in Spain. *Int. Breastfeed J.* 15 (1), 97. doi:10.1186/s13006-020-00341-5.

Bergink, V., Kooistra, L., Lambregtse-van den Berg, M.P., Wijnen, H., Bunevicius, R., van Baar, A., Pop, V., 2011. Validation of the Edinburgh Depression Scale during pregnancy. *J. Psychosom. Res.* 70 (4), 385–389. doi:10.1016/j.jpsychores.2010.07.008.

Bergomi, C., Tschacher, W., Kupper, Z., 2013. The assessment of mindfulness with self-report measures: existing scales and open issues. *Mindfulness* 4 (3), 191–202. doi:10.1007/s12671-012-0110-9.

Bishop, S.R., Lau, M., Shapiro, S., Carlson, L., Anderson, N.D., Carmody, J., Segal, Z.V., Abbey, S., Speca, M., Velting, D., Devins, G., 2004. Mindfulness: a proposed operational definition. *Clin. Psychol. Sci. Pr.* 11 (3), 230–241. doi:10.1093/clipsy/bph077.

Boekhorst, M., Beerthuis, A., Van Son, M., Bergink, V., Pop, V.J.M., 2020. Psychometric aspects of the Tilburg pregnancy distress scale: data from the HAPPY study. *Arch. Womens Ment. Health* 23 (2), 215–219. doi:10.1007/s00737-019-00974-4.

Bogen, D.L., Hanusa, B.H., Moses-Kolko, E., Wisner, K.L., 2010. Are maternal depression or symptom severity associated with breastfeeding intention or outcomes? *J. Clin. Psychiatry* 71 (8), 1069–1078. doi:10.4088/JCP.09m05383blu.

Bohlmeijer, E., ten Klooster, P.M., Fledderus, M., Veehof, M., Baer, R., 2011. Psychometric properties of the five facet mindfulness questionnaire in depressed adults and development of a short form. *Assessment* 18 (3), 308–320. doi:10.1177/1073191111408231.

Brandhagen, M., Lissner, L., Brantsaeter, A.L., Meltzer, H.M., Haggkvist, A.P., Haugen, M., Winkvist, A., 2014. Breast-feeding in relation to weight retention up to 36 months postpartum in the Norwegian Mother and Child Cohort Study: modification by socio-economic status? *Public Health Nutr.* 17 (7), 1514–1523. doi:10.1017/S1368980013001869.

Britton, J.R., Britton, H.L., Gronwaldt, V., 2006. Breastfeeding, sensitivity, and attachment. *Pediatrics* 118 (5), e1436–e1443. doi:10.1542/peds.2005-2916.

Brown, K.W., Ryan, R.M., 2003. The benefits of being present: mindfulness and its role in psychological well-being. *J. Pers. Soc. Psychol.* 84 (4), 822–848. doi:10.1037/0022-3514.84.4.822.

Cash, M., Whittingham, K., 2010. What facets of mindfulness contribute to psychological well-being and depressive, anxious, and stress-related symptomatology? *Mindfulness* 1 (3), 177–182. doi:10.1007/s12671-010-0023-4.

Chowdhury, R., Sinha, B., Sankar, M.J., Taneja, S., Bhandari, N., Rollins, N., Bahl, R., Martines, J., 2015. Breastfeeding and maternal health outcomes: a systematic review and meta-analysis. *Acta Paediatr.* 104, 96–113. doi:10.1111/apa.13102.

Citak Bilgin, N., Ak, B., Ayhan, F., Kocyigit, F., Yorgun, S., Topcuoglu, M.A., 2020. Effect of childbirth education on the perceptions of childbirth and breastfeeding self-efficacy and the obstetric outcomes of nulliparous women(*, **, **). *Health Care Women Int.* 41 (2), 188–204. doi:10.1080/07399332.2019.1672171.

Cohen, J., 1988. *Statistical Power Analysis for the Behavioral Sciences*. Lawrence Erlbaum Associates, Hillsdale.

Cox, J.L., Holden, J.M., Sagovsky, R., 1987. Detection of postnatal depression. Development of the 10-item Edinburgh Postnatal Depression Scale. *Br. J. Psychiatry* 150, 782–786. doi:10.1192/bjp.150.6.782.

Del Ciampo, L.A., Del Ciampo, I.R.L., 2018. Breastfeeding and the Benefits of Lactation for Women's Health. *Rev Bras Ginecol Obs* 40 (6), 354–359. doi:10.1055/s-0038-1657766.

Dennis, C.L., 1999. Theoretical underpinnings of breastfeeding confidence: a self-efficacy framework. *J. Hum. Lact.* 15 (3), 195–201. doi:10.1177/089033449901500303.

Donath, S.M., Amir, L.H., Team, A.S., 2003. Relationship between prenatal infant feeding intention and initiation and duration of breastfeeding: a cohort study. *Acta Paediatr.* 92 (3), 352–356 <Go to ISI >://WOS:000182236800016.

Duncan, L.G., Bardacke, N., 2010. Mindfulness-based childbirth and parenting education: promoting family mindfulness during the perinatal period. *J. Child Fam. Stud.* 19 (2), 190–202. doi:10.1007/s10826-009-9313-7.

Dungy, C.I., McInnes, R.J., Tappin, D.M., Wallis, A.B., Oprescu, F., 2008. Infant feeding attitudes and knowledge among socioeconomically disadvantaged women in Glasgow. *Matern. Child Health J.* 12 (3), 313–322. doi:10.1007/s10995-007-0253-9.

Evans, K., Spiby, H., Morrell, C.J., 2015. A psychometric systematic review of self-report instruments to identify anxiety in pregnancy. *J. Adv. Nurs.* 71 (9), 1986–2001. doi:10.1111/jan.12649.

Fairlie, T.G., Gillman, M.W., Rich-Edwards, J., 2009. High pregnancy-related anxiety and prenatal depressive symptoms as predictors of intention to breastfeed and breastfeeding initiation. *J. Womens Health* 18 (7), 945–953. doi:10.1089/jwh.2008.0998.

Figueiredo, B., Dias, C.C., Brandao, S., Canario, C., Nunes-Costa, R., 2013. Breastfeeding and postpartum depression: state of the art review. *J. Pediatr. (Rio J)* 89 (4), 332–338. doi:10.1016/j.jped.2012.12.002.

Furman, L., Taylor, G., Minich, N., Hack, M., 2003. The effect of maternal milk on neonatal morbidity of very low-birth-weight infants. *Arch. Pediat. Adol. Med.* 157 (1), 66–71. doi:10.1001/archpedi.157.1.66.

Groer, M.W., Jevitt, C.M., Sahebzamani, F., Beckstead, J.W., Keefe, D.L., 2013. Breastfeeding status and maternal cardiovascular variables across the postpartum. *J. Womens Health (Larchmt)* 22 (5), 453–459. doi:10.1089/jwh.2012.3981.

Hauck, Y., Fisher, C., Byrne, J., Bayes, S., 2016. Mindfulness-based childbirth education: incorporating adult and experiential learning with mindfulness-based stress reduction in childbirth education. *J. Perinat. Educ.* 25 (3), 162–173. doi:10.1891/1058-1243.25.3.162.

Hosea Blewett, H.J., Cicalo, M.C., Holland, C.D., Field, C.J., 2008. The immunological components of human milk. *Adv. Food. Nutr. Res.* 54, 45–80. doi:10.1016/S1043-4526(07)00002-2.

- Insaf, T.Z., Fortner, R.T., Pekow, P., Dole, N., Markenson, G., Chasan-Taber, L., 2011. Prenatal stress, anxiety, and depressive symptoms as predictors of intention to breastfeed among hispanic women. *J. Womens Health* 20 (8), 1183–1192. doi:10.1089/jwh.2010.2276.
- Ip, S., Chung, M., Raman, G., Chew, P., Magula, N., DeVine, D., Trikalinos, T., Lau, J., 2007. Breastfeeding and maternal and infant health outcomes in developed countries. *Evid. Rep. Technol. Assess (Full Rep)* 1–186. <https://www.ncbi.nlm.nih.gov/pubmed/17764214>. (153).
- Jones, C.L., Culpin, I., Evans, J., Pearson, R.M., 2020. Relative effects of breastfeeding intention and practice on maternal responsiveness. *Infant. Ment. Health J.* 41 (1), 82–93. doi:10.1002/imhj.21832.
- Keng, S.L., Smoski, M.J., Robins, C.J., 2011. Effects of mindfulness on psychological health: a review of empirical studies. *Clin. Psychol. Rev.* 31 (6), 1041–1056. doi:10.1016/j.cpr.2011.04.006.
- Kiken, L.G., Garland, E.L., Bluth, K., Palssson, O.S., Gaylord, S.A., 2015. A state to a trait: Trajectories of state mindfulness in meditation during intervention predict changes in trait mindfulness. *Personal. Individual Diff.* 81, 41–46. doi:10.1016/j.paid.2014.12.044.
- Lopez-Olmedo, N., Hernandez-Cordero, S., Neufeld, L.M., Garcia-Guerra, A., Mejia-Rodriguez, F., Mendez Gomez-Humaran, I., 2016. The associations of maternal weight change with breastfeeding, diet and physical activity during the postpartum period. *Matern. Child Health J.* 20 (2), 270–280. doi:10.1007/s10995-015-1826-7.
- Martens, P.J., Young, T.K., 1997. Determinants of breastfeeding in four Canadian Ojibwa communities: a decision-making model. *Am. J. Hum. Biol.* 9 (5), 579–593. doi:10.1002/(SICI)1520-6300(1997)9:5<579::AID-AJHB6>3.0.CO;2-P.
- McFadden, A., Toole, G., 2006. Exploring women's views of breastfeeding: a focus group study within an area with high levels of socio-economic deprivation. *Maternal Child Nutr.* 2 (3), 156–168. doi:10.1111/j.1740-8709.2006.00054.x.
- Meinzen-Derr, J., Poindexter, B., Wrage, L., Morrow, A.L., Stoll, B., Donovan, E.F., 2009. Role of human milk in extremely low birth weight infants' risk of necrotizing enterocolitis or death. *J. Perinatol.* 29 (1), 57–62. doi:10.1038/jp.2008.117.
- Nutrition, E.C.O., Agostoni, C., Braegger, C., Decsi, T., Kolacek, S., Koletzko, B., Michaelsen, K.F., Mihatsch, W., Moreno, L.A., Puntis, J., Shamir, R., Szajewska, H., Turck, D., van Goudoever, J., 2009. Breast-feeding: a commentary by the ESPGHAN Committee on Nutrition. *J. Pediatr. Gastroenterol. Nutr.* 49 (1), 112–125. doi:10.1097/MPG.0b013e31819f1e05.
- Owen, C.G., Martin, R.M., Whincup, P.H., Smith, G.D., Cook, D.G., 2005. Effect of infant feeding on the risk of obesity across the life course: a quantitative review of published evidence. *Pediatrics* 115 (5), 1367–1377. doi:10.1542/peds.2004-1176.
- Owen, C.G., Martin, R.M., Whincup, P.H., Smith, G.D., Cook, D.G., 2006. Does breastfeeding influence risk of type 2 diabetes in later life? A quantitative analysis of published evidence. *Am. J. Clin. Nutr.* 84 (5), 1043–1054 <Go to ISI>://WOS:000241937700015.
- Pickard, J.A., Townsend, M., Caputi, P., Grenyer, B.F.S., 2017. Observing the Influence of Mindfulness and Attachment Styles through Mother and Infant Interaction: a Longitudinal Study. *Infant Mental Health J.* 38 (3), 343–350. doi:10.1002/imhj.21645.
- Pop, V.J., Pommer, A.M., Pop-Purceleanu, M., Wijnen, H.A., Bergink, V., Pouwer, F., 2011. Development of the Tilburg Pregnancy Distress Scale: the TPDS. *BMC Pregnancy Childbirth* 11, 80. doi:10.1186/1471-2393-11-80.
- Rosenbauer, J., Herzig, P., Giani, G., 2008. Early infant feeding and risk of type 1 diabetes mellitus - a nationwide population-based case-control study in pre-school children. *Diabetes-Metab Res.* 24 (3), 211–222. doi:10.1002/dmrr.791.
- Sarki, M., Parlesak, A., Robertson, A., 2019. Comparison of national cross-sectional breastfeeding surveys by maternal education in Europe (2006-2016). *Public Health Nutr.* 22 (5), 848–861. doi:10.1017/S1368980018002999.
- Scott, J.A., Shaker, I., Reid, M., 2004. Parental attitudes toward breastfeeding: Their association with feeding outcome at hospital discharge. *Birth-Iss Perinat C* 31 (2), 125–131. doi:10.1111/j.0730-7659.2004.00290.x.
- Segal, Z.V., Williams, J.M., Teasdale, J.D., 2013. *Mindfulness-Based Cognitive Therapy for Depression: Second edition.* The Guilford Press, New York.
- Sherriff, N., Hall, V., Panton, C., 2014. Engaging and supporting fathers to promote breast feeding: a concept analysis. *Midwifery* 30 (6), 667–677. doi:10.1016/j.midw.2013.07.014.
- Stewart-Knox, B., Gardiner, K., Wright, M., 2003. What is the problem with breast-feeding? A qualitative analysis of infant feeding perceptions. *J. Hum. Nutr. Diet.* 16 (4), 265–273. doi:10.1046/j.1365-277X.2003.00446.x.
- Tanay, G., Bernstein, A., 2013. State mindfulness scale (SMS): development and initial validation. *Psychol. Assessment* 25 (4), 1286–1299. doi:10.1037/a0034044.
- Truijens, S.E., Meems, M., Kuppens, S.M., Broeren, M.A., Nabbe, K.C., Wijnen, H.A., Oei, S.G., van Son, M.J., Pop, V.J., 2014. The HAPPY study (Holistic Approach to Pregnancy and the first Postpartum Year): design of a large prospective cohort study. *BMC Pregnancy Childbirth* 14, 312. doi:10.1186/1471-2393-14-312.
- Truijens, S.E.M., Nyklíček, I., van Son, J., Pop, V.J.M., 2016. Validation of a short form three facet mindfulness questionnaire (TFMQ-SF) in pregnant women. *Personal. Individual Diff.* 93, 118–124. doi:10.1016/j.paid.2015.06.037.
- van den Heuvel, M.I., Johannes, M.A., Henrichs, J., Van den Bergh, B.R., 2015. Maternal mindfulness during pregnancy and infant socio-emotional development and temperament: the mediating role of maternal anxiety. *Early Hum. Dev.* 91 (2), 103–108. doi:10.1016/j.earlhumdev.2014.12.003.
- WHO, 2013. Counselling for maternal and newborn health care: a handbook for building skills. https://www.who.int/maternal_child_adolescent/documents/9789241547628/en/. (Accessed 18 November 2020).
- WHO, 2020. Infant and young child feeding. <https://www.who.int/en/news-room/factsheets/detail/infant-and-young-child-feeding>. (Accessed 12 August 2020).