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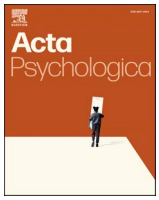

The protective value of trait mindfulness for mothers' anxiety during the perinatal period

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ABSTRACT

Objectives: Anxiety is highly prevalent in the perinatal period and can have negative consequences for the mother and the child. Extensive research has been done on risk factors for anxiety during the perinatal period, but less is known about protective factors. The current study aims to determine the relative contribution of trait mindfulness as a protective factor for anxiety.
Methods: A longitudinal study design was used, with four measurement points: 12, 22, and 32 weeks of pregnancy (T0, T1, and T2, respectively), and 6 weeks postpartum (T3). General anxiety was measured at T1, T2, and T3, pregnancy-specific distress was measured at T1 and T2, mindfulness facets (acting with awareness, non-reacting, and non-judging) and partner involvement were measured at T1, and other known risk factors for anxiety were measured at T0. Multilevel regression models were used for statistical analyses.
Results: Mindfulness facets measured at T1 were negatively associated with anxiety at T1, T2, and T3, and pregnancy-specific distress at T1 and T2. Of the mindfulness facets, non-judging was shown to have the largest protective effect against anxiety and pregnancy-specific distress. Also compared to partner-involvement and known risk factors, non-judging showed the largest effect on anxiety and pregnancy-specific distress.
Conclusions: For pregnant women who are at risk for developing or experiencing high levels of anxiety, it may be beneficial to participate in a mindfulness training with special attention for the attitudinal aspects of mindfulness.

1. Introduction

Anxiety is highly prevalent in women during the perinatal period, with estimated prevalence rates as high as 37 % (Leach et al., 2017). The estimated lifetime societal burden of combined anxiety and depression in the perinatal period for babies born in a single year is estimated to be between nine and fourteen billion US dollars (Bauer et al., 2016; Luca et al., 2020). Perinatal anxiety can negatively impact a woman's relationship with her partner, as well as her partner's wellbeing (Leach et al., 2016). The consequence of anxiety in pregnancy often extends into the postnatal period, with anxiety in pregnancy being highly predictive of anxiety and depression in the postnatal period (Norhayati et al., 2015). Anxiety during pregnancy can also have negative consequences for the infant. In particular, anxiety during pregnancy has been linked to low birthweight, younger gestational age at birth, and infant neurodevelopmental issues(Davis & Sandman, 2010; Ding et al., 2014; Schetter & Tanner, 2012). These factors can in turn lead to difficulties with a child's emotional and behavioural regulation, temperament, and social engagement, that can extend into adolescence (Schetter & Tanner, 2012). Furthermore, a mother's elevated anxiety during pregnancy is associated with infant autonomic hyperarousal and a fearful temperament in toddlerhood, factors that may predispose children to developing

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anxiety later in life (de Vente et al., 2020). Anxiety during pregnancy has broad and long-lasting negative implications for the health and well-being of parents and their children. As such, there is strong impetus to increase understanding of the risk and protective factors for anxiety during pregnancy. Knowledge of these factors would allow for early identification of women at higher risk of developing anxiety. Furthermore, this knowledge could direct attempts to interrupt the trajectory of anxiety during pregnancy by reducing risk factors and enhancing protective factors in and around the mother.

Pregnant women face worries or fears that are specific to the experience of pregnancy and the transition to becoming a mother. Staneva et al. (2015) systematically reviewed and synthesised women's qualitative accounts of depression, anxiety, and stress in pregnancy. These experiences were dominated by feelings of inadequacy and guilt of not enjoying their pregnancy, which precipitated specific concerns over their ability to nurture or care for an infant. There was frustration at not being able to function as they did pre-pregnancy, ambivalence toward the changing sense of self and identity, and a sense of having little or no control over their body and mind. Women also reported feeling trapped and unable to communicate their needs to others or had the experience that others were not offering the appropriate support. Specifically, they wanted others to accept them in a non-judgemental way and for partners to share the pregnancy meaningfully. Women reported that feeling in control and receiving meaningful and appropriate support from others were protective to their wellbeing.

The potential risk and protective factors for mother's anxiety during the perinatal period have been captured in two systematic reviews of quantitative evidence (Biaggi et al., 2016; Leach et al., 2017). Demographic and socioeconomic factors that raised the risk of perinatal anxiety included younger maternal age, lower education/literacy and socio-economic status, and living without a partner or spouse. Social and relational factors included partner relationship problems and poor social support and experiencing recent life stressors. The pregnancy birth experience was related to anxiety where there had been prior miscarriage or perinatal loss, difficulty conceiving, an unplanned pregnancy, negative or difficult birth experience (e.g. caesarean), and poor pregnancy health. Anxiety was also linked to health and lifestyle factors including smoking, weight gain, and substance misuse. Psychological factors such as low self-esteem, a history of psychiatric problems, a history of domestic violence or abuse, and negative attitudes toward the baby or parenting were all predictive of anxiety. Finally, the infant factors included a difficult infant temperament (such as excessive crying), infant health problems, and reduced breastfeeding.

In addition to understanding the factors that place a woman at risk of experiencing anxiety during pregnancy, it is vital that we understand those factors that can serve to protect her. Previous research suggests that good partner support is a protective factor against perinatal anxiety (Biaggi et al., 2016; Rini et al., 2006). In particular, greater practical and emotional support from partners can lessen the difficulties experienced during pregnancy and the transition to motherhood (Biaggi et al., 2016). Greater social support can protect against the negative impact of adverse life events that in turn are risk factors for depression and anxiety (Biaggi et al., 2016). Psychological factors, including mother's self-esteem and self-efficacy, and an active coping style (e.g., seek to overcome or solve difficulties) is protective against incidence of anxiety during pregnancy (Biaggi et al., 2016). The current understanding of risk factors for anxiety during pregnancy is far greater than what is known about the potential protective factors. Pregnant women may be effectively supported by enhancing protective factors that may lower the incidence or consequences of anxiety in this period.

Trait mindfulness is a personal characteristic that has the potential to uphold psychological health and protect against the stressors associated with the perinatal period (Tomlinson et al., 2018). Mindfulness has been defined as "*the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment*" (Kabat-Zinn, 2003, p. 145). The mindfulness practices (e.g., mindfulness meditation) can in the immediate term induce a state of mindfulness that can reduce psychological arousal and when practiced repeatedly can enhance trait mindfulness(Leyland et al., 2019). Theoretically it is proposed that trait mindfulness may reduce anxiety across the perinatal period by reducing stress and preoccupation, which in turn frees up cognitive resources to enhance warmth, reduce negative reactivity, increase effective problem solving, and improve attunement with the child (Bögels et al., 2010). A cross-sectional study found a significant association between higher levels of trait mindfulness and lower levels of anxiety in the first or early second trimester of pregnancy (Mennitto et al., 2021). A longitudinal study showed that trait mindfulness during pregnancy was negatively associated with infant self-regulation difficulties and negative affectivity, and that maternal anxiety mediated the effect of mindfulness on infant self-regulation (Van den Heuvel et al., 2015). Trait mindfulness may therefore be protective against anxiety during and after pregnancy. Furthermore, trait mindfulness may be associated with reduced risk factors, for example by improving pregnancy health, reducing negative attitudes to pregnancy and parenting. Notwithstanding, to date there have been few investigations of the relative protective effect of trait mindfulness for anxiety in pregnancy.

The present study utilises data from a longitudinal prospective cohort study of women during pregnancy (Truijens et al., 2014), to determine the relative contribution of trait mindfulness as a protective factor for anxiety, while taking into account a known protective factor, namely partner support, and controlling for known risk factors. In this study, anxiety is conceptualised to include both general anxiety symptoms, and pregnancy-specific distress. Based on preliminary evidence (Mennitto et al., 2021), we hypothesised that greater trait mindfulness would offer a significant protective effect for anxiety in pregnancy. More specifically, we hypothesised that greater trait mindfulness would predict lower anxiety, and that this protective effect would still be significant when considering the protective effect of partner support, and when controlling for risk factors.

2. Materials and methods

2.1. Participants and procedures

The current study is part of the Holistic Approach to Pregnancy and the first Postpartum Year (HAPPY) study, a prospective longitudinal cohort study of pregnant women living in South-East Brabant (southern part of The Netherlands), in the Eindhoven area (Truijens et al., 2014). Pregnant women were included to participate by one of 17 participating community midwifery practices in South-East Brabant. At their first antenatal appointment with their midwife, women were invited to participate. The following exclusion criteria were used: multiple pregnancy, a severe psychiatric disorder (e.g., schizophrenia, borderline personality disorder, bipolar disorder), and/or a documented history of chronic disease (e.g., diabetes, thyroid dysfunction). After agreeing to participate, participants were asked to complete either written (via postal mail) or online questionnaires (via www.qualtrics.com). The questionnaires were sent by a researcher. Questionnaires were completed at 12 weeks (T0), 22 weeks (T1) and 32 weeks (T2) of pregnancy and 6 weeks postpartum (T3).

Only participants who were included in the HAPPY study between March and December 2013 received mindfulness assessment at 22 weeks of pregnancy. Around 1400 women were contacted to participate, with 984 women (70 %) agreeing to participate, of which 912 (93 %) completed the mindfulness assessment. Of these women, 881 (97 %) indicated they had a partner and could therefore evaluate partner involvement. Characteristics of these participating women are shown in Table 1.

Table 1
Socio-demographic and obstetrical characteristics.

	N	%
Age	881	100
M (range), SD	*30.21 (19–43)*	*3.55*
Employment status	880	99.9
Not employed	70	7.9
Employed	810	91.9
Education status	877	99.5
High school/intermediate vocational education	302	34.3
Bachelor's degree or higher	575	65.3
Depression status	879	99.8
Never experienced depression	760	86.3
Current or past experience of depression	126	13.5
Parity	875	99.3
Primiparous	449	51.0
Multiparous	426	48.4
Miscarriage/abortion	880	99.9
Never had a miscarriage/an abortion	664	75.4
Has had a miscarriage/an abortion	216	24.5
Planned pregnancy	880	99.9
No	45	5.1
Yes	835	94.8

2.2. Ethics

The study was approved by the Psychology Ethics Committee at Tilburg University (protocol number EC-2012.25) and reviewed by the Medical Ethics Committee at the Máxima Medical Centre Veldhoven in December 2012. All women provided written informed consent.

2.3. Measures

2.3.1. Symptoms of anxiety

Symptoms of anxiety were measured using three of the ten items of the Anxiety Subscale of the Dutch version of the Edinburgh (Postnatal) Depression Scale (E(*P*)DS) (Cox et al., 1987; Pop et al., 1992). Participating women completed this scale at 22 and 32 weeks of pregnancy, and 6 weeks postpartum. The subscale is validated for use in pregnancy (Eberhard-Gran et al., 2001) and the postpartum period (Tuohy & McVey, 2008). The Cronbach's α in the present sample ranged between 0.68 and 0.76. The anxiety subscale assesses an individual's unexplained anxious feelings or degree of self-blame for difficult external events. Items are scored on a four-point scale (0–3), with higher scores indicating greater levels of anxiety. The anxiety subscale is not designed to be a clinical measure of anxiety, although it has been used in previous research as an indicator or screening tool for possible difficulties with anxiety (Cox et al., 1987; Matthey, 2008).

2.3.2. Pregnancy-specific distress

At 22 and 32 weeks of pregnancy, pregnancy-specific distress was measured using the negative affect (NA) subscale of the Tilburg Pregnancy Distress Scale (TPDS; Pop et al., 2011). The TPDS-NA consists of 11 items assessing worries about pregnancy, delivery, and the postpartum period. Items were rated on a 4-point Likert-type scale (0 = very often to 3 = rarely or never). Total scores can range from 0 to 33, with higher scores reflecting higher levels of pregnancy-specific distress. The TPDS-NA is a valid and reliable instrument (Boekhorst et al., 2020; Pop et al., 2011). The Cronbach's alphas in the current study were 0.80 at 22 weeks and 0.76 at 32 weeks of pregnancy.

2.3.3. Trait mindfulness

Trait mindfulness was measured using the Three Facet Mindfulness Questionnaire – Short Form (TFMQ-SF) (Truijens et al., 2016). The TFMQ-SF is a short version of the Five Facet Mindfulness Questionnaire (Baer et al., 2006) translated into Dutch and validated for the use in pregnancy with the present sample (Truijens et al., 2016). The items are rated on a five-point Likert scale ranging from 1 (never or rarely true) to 5 (very often or always true). The 12-item TFMQ-SF includes three facets of mindfulness: acting with awareness, non-reacting, and non-judging, each measured with 4-items (Bohlmeijer et al., 2011).The Cronbach's α's in the present sample were 0.87 for acting with awareness, 0.80 for non-reacting, and 0.81 for non-judging. In the present sample, scores on the TFMQ-SF did not support a unitary construct for mindfulness (Cronbach's $\alpha = 0.59$). Therefore, we only used the separate subscales in the statistical analyses.

2.3.4. Partner involvement

Mothers reported support and involvement from partners during pregnancy at 22 weeks. Reports on level of partner support were gathered from the other subscale of the 16-item Tilburg Pregnancy Distress Scale (TPDS): partner involvement (PI, five items; Pop et al., 2011). The items from the TPDS-PI consist of statements such as "I feel supported by my partner". Responses were on a four-point Likert Scale ranging from 0 (very often) to 3 (rarely/never). Because the TPDS aims to measure pregnancy-specific distress, scores of the partner involvement subscale should be recoded so that higher scores reflect lower partner involvement. However, in the current study, partner involvement is studied as a protective factor. For interpretation purposes, scores were not recoded in the current study, so that higher scores reflected higher partner involvement. Internal validity of the partner involvement subscale of the TPDS in this sample was $\alpha = 0.81$.

2.3.5. Covariates

Several covariates were assessed in the preliminary analyses as potential determinants of anxiety in the perinatal period based on the categories identified in Leach et al. (2017). These included demographic (maternal age, job status, and level of education), pregnancy and childbirth related (previous miscarriage or perinatal loss, worries about childbirth, planned/unplanned pregnancy), health and lifestyle factors (stressful life events), and psychological factors (historic mental health problems). Demographic data, mental health and obstetric history were gathered from mothers through self-report at 12 weeks of pregnancy. Two questions recorded incidence of depression or other mental health conditions: 1) Have you ever (in your life) experienced depression? 2) Have you ever experienced other mental health complaints (e.g., anxiety, burn-out)? These responses were coded for the presence (1) or absence (0) of any historic mental health condition.

2.4. Statistical analysis

Associations between anxiety, pregnancy-specific distress, mindfulness facets, partner involvement, age were tested using Pearson's correlations. These can be interpreted as effect sizes (0.1 small, 0.3 moderate, 0.5 large) (Cohen, 1988). Associations between anxiety, pregnancy-specific distress, mindfulness facets, partner involvement on the one hand and dichotomous covariates on the other hand were tested using *t*-tests. The show the magnitude of the effects, Cohen's *d*'s were calculated (0.2 small, 0.5 moderate, 0.8 large) (Cohen, 1988). Covariates that showed a significant association with anxiety or pregnancy-specific distress were included in the main analyses.

The hypothesis on the protective effect of mindfulness facets on anxiety and pregnancy-specific distress were tested with multilevel regression models. The structure of the multilevel models consisted of the repeated measurements of the outcomes across the measurement points (T1, T2, and for anxiety also T3; level 1) nested within the participating mothers (level 2). Measurement points were dummy coded with T1 as reference. Therefore, the results of T2 and T3 should be interpreted relative to T1. Besides the measurement points, the following variables were included in the analyses: the three separate mindfulness facets, partner involvement, interaction terms (mindfulness facets * measurement points, and partner involvement * measurement points), covariates, and a random intercept. All cases can be included in multilevel analyses, including those cases with missing data at one or

more of the measurement points (Bagiella et al., 2000). Therefore, in the current study, all participants who completed at least the T1 measurement were included in the analyses. Scores on all outcomes were standardised across assessments, so that parameter estimates can be interpreted as effect sizes. In case of continuous variables, parameter estimates can be interpreted similarly to Pearson *r* effect sizes (0.1 small, 0.3 moderate, 0.5 large) (Cohen, 1988), and in case of dichotomous variables, parameter estimates can be interpreted similarly to Cohen's *d* effect sizes (0.2 small, 0.5 moderate, 0.8 large) (Cohen, 1988).

3. Results

3.1. Preliminary analyses

Table 2 shows the descriptive statistics for anxiety, pregnancy-specific distress, the three facets of mindfulness (acting with awareness, non-reacting, non-judging, and non-reacting), and partner involvement at 22 weeks of pregnancy (T1), 32 weeks of pregnancy (T2), and/or 6 weeks postpartum (T3). Table 3 displays the associations between anxiety, pregnancy-specific distress, the facets of mindfulness, partner involvement, and covariates (demographic, pregnancy and childbirth related, health and lifestyle factors, and psychological factors).

As can be seen in Table 3, the associations between the mindfulness facet non-reacting and the outcome measures were non-significant. The correlations between the mindfulness facets non-judging and the outcomes measures ranged from 0.35 (moderate effect size) to 0.51 (large effect size). The correlations between the mindfulness facets acting with awareness and the outcomes measures ranged from 0.22 (small effect size) to 0.32 (moderate effect size). The correlations between partner involvement and the outcomes measures ranged from 0.12 to 0.27 (small effect sizes). Age only correlated significantly with pregnancy-specific distress (very small effect sizes of 0.08 and 0.09). The following dichotomous showed significant associations with the outcome variable anxiety: level of education (Cohen's *d* 0.25, small effect size), being unemployed (Cohen's *d* 0.49, small to medium effect size), having had a depression (Cohen's *d* ranging from 0.39 to 0.45, small effect sizes), parity (Cohen's *d* 0.27, small effect size), and unplanned pregnancy (Cohen's *d* 0.36, small effect size) were significantly related to anxiety at 22 weeks of pregnancy, 32 weeks of pregnancy, and/or 6 weeks postpartum. The following dichotomous showed significant associations with the outcome variable anxiety: level of education (Cohen's *d* ranging from 0.15 to 0.20, very small effect sizes), having had a depression (Cohen's *d* ranging from 0.38 to 0.47, small to almost moderate effect sizes), and parity (Cohen's *d* ranging from 0.28 to 0.36, small effect sizes) were significantly related to pregnancy-specific distress at 22 weeks and/or 32 weeks of pregnancy.

Furthermore, due to extreme values (which was defined as being at least 1.5 times removed from the interquartile range) for pregnancy-specific distress at one or both time points, six participants were excluded from the study. Finally, assumptions for multilevel analyses were checked (Snijders & Bosker, 2011). Results showed that for pregnancy-specific distress, the assumptions of normality of residuals were violated (i.e., the distribution was somewhat skewed to the left: skewness = 0.931, SE = 0.085). However, given the large sample size, analyses were presumed to be robust against this small violation (Field, 2009).

3.2. Multilevel analyses: anxiety

Table 4 presents the results of the multilevel analyses for anxiety over time. As can be seen in this table, the main effect of T2 was significant, meaning that relative to 22 weeks of pregnancy (T1), anxiety decreased at 32 weeks of pregnancy (T2) (a small effect size difference). The main effect of T3 was not significant (no change at 6 weeks postpartum relative to 22 weeks of pregnancy (T1)). Also, the main effects of the three aspects of mindfulness as well as of partner involvement were significant, indicating an association between these variables and anxiety, when other variables were considered (a moderate effect for mindfulness facet non-judging, and small effects for the other mindfulness facets and partner involvement). Most of the interaction effects between T2 and T3 and the mindfulness facets were not significant, indicating that the effects of mindfulness on anxiety were still present at 32 weeks of pregnancy and at 6 weeks postpartum (compared to T1). However, the interaction effect between T2 and non-judging was significant, indicating that the effect of non-judging on anxiety decreased at 32 weeks of pregnancy, compared to the effect of non-judging on anxiety at 22 weeks of pregnancy (T1) (a small effect size change, indicating that the effect of non-judging on anxiety was still moderate).

The interaction between T2 and partner involvement was not significant, indicating that the association between partner involvement and anxiety did not change between 22 (T1) and 32 (T2) weeks of pregnancy. In contrast, the interaction between T3 and partner involvement was significant, indicating that the effect of partner involvement on anxiety decreased at 6 weeks postpartum (T3), compared to the effect of partner involvement on anxiety at 22 (T1) and 32 (T2) weeks of pregnancy (a small effect size difference, indicating that the effect of partner involvement measured at 22 weeks of pregnancy on anxiety was negligible at 6 weeks postpartum).

Lastly, the main effects of the control variables employment status, level of education and parity were significant, indicating that mothers who had a paid job, obtained a college or university degree, and were multiparous, experienced less anxiety over time compared to mothers who were unemployed (small effect), had a high school or vocational education degree (negligible effect), and were primiparous (small effect).

3.3. Multilevel analyses: pregnancy-specific distress

Table 4 displays the results of the multilevel analyses for pregnancy-specific distress over time. The main effect of T2 was not significant, indicating that mothers' experience of pregnancy-specific distress remained stable over time between T1 and T2 (i.e., between 22 and 32 weeks of pregnancy). The main effects of the three aspects of

Table 2
Descriptive Statistics of independent and dependent variables.

	22 weeks of pregnancy (T1)				32 weeks of pregnancy (T2)				6 weeks postpartum (T3)			
	N	*M*	*SD*	range	*N*	*M*	*SD*	range	*N*	*M*	*SD*	range
Anxiety	876	2.49	1.96	0–9	834	2.20	1.88	0–9	701	2.31	2.15	0–9
Pregnancy-specific distress	881	6.28	4.52	0–28	839	6.38	4.35	0–30	–	–	–	–
Mindfulness: Non-reacting	881	11.62	4.19	4–20	–	–	–	–	–	–	–	–
Mindfulness: Non-judging	880	16.23	3.11	7–20	–	–	–	–	–	–	–	–
Mindfulness: Acting with awareness	881	14.60	3.14	6–20	–	–	–	–	–	–	–	–
Partner involvement	881	10.89	2.90	1–15	–	–	–	–	–	–	–	–

Note. Theoretical ranges: Anxiety = 0–9; Pregnancy-specific distress = 0–33; Mindfulness, non-reacting = 4–20; Mindfulness, non-judging = 4–20; Mindfulness, acting with awareness; = 4–20; Partner involvement = 0–15; – = data not available, since the data of concern was not collected at this specific time point.

Table 3
Associations Between Anxiety and Pregnancy-specific distress at the Different Time Points, the Independent Variables (i.e., the Three Aspects of Mindfulness and Partner Involvement), and the Covariates.

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Anxiety: T1									
2. Anxiety: T2	0.61**								
3. Anxiety: T3	0.45**	0.52**							
4. Pregnancy-specific distress: T1	0.43**	0.41**	0.38**						
5. Pregnancy-specific distress T2	0.42**	0.47**	0.43**	0.80**					
6. Mindfulness: Non-reacting	0.00	−0.03	−0.04	0.01	−0.03				
7. Mindfulness: Non-judging	−0.51**	−0.42**	−0.38**	−0.39**	−0.35**	−0.27**			
8. Mindfulness: Acting with awareness	−0.32**	−0.29**	−0.22**	−0.32**	−0.29**	−0.30**	0.46**		
9. Partner involvement	−0.27**	−0.22**	−0.15**	−0.12**	−0.13**	0.07*	0.25**	0.26**	
10. Age	−0.04	−0.04	−0.06	−0.09**	−0.08*	0.13**	0.01	−0.08*	−0.10**
11. Unemployed	4.03**	1.18	1.94	1.38	1.85	−0.61	1.71	0.68	2.18*
12. Level of education	−1.83	−3.40**	−1.52	−2.83**	−2.13*	11.11**	−1.27	−3.75**	−0.93
13. Depression	4.67**	4.06**	3.49**	3.98**	4.75**	1.57	−5.49**	−1.65	2.99**
14. Parity (nullipara)	1.40	1.00	3.53**	5.31**	4.03**	0.02	−0.95	0.86	−7.52**
15. Miscarriage/Abortion	1.22	0.06	−0.60	0.26	0.16	−0.61	0.13	0.67	2.52*
16. Unplanned pregnancy	−0.85	−1.67	−2.06*	−1.48	−1.12	−0.55	2.46*	0.44	−2.84**

Note. Associations between two continuous variables were analysed using Pearson's correlations (presented in the table using a Pearson's *r*-statistic), and associations between dichotomous variables and continuous variables were analysed using t-tests (presented in the table using a *t*-statistic). * $p < .05$; ** $p < .01$. T1: 22 weeks of pregnancy; T2: 32 weeks of pregnancy; T3: 6 weeks postpartum.

Table 4
Results (Effect Sizes, Standard Errors and Significance-Levels) of the Multilevel Analyses for Anxiety and Pregnancy-specific distress.

	Anxiety				Pregnancy-specific distress			
	β	*SE*	*t*	*p*	*β*	*SE*	*t*	*p*
Main effects								
T2 (32 weeks of pregnancy)	−0.14	0.03	−4.29	<0.001	0.03	0.02	1.41	0.160
T3 (6 weeks postpartum)	−0.07	0.04	−1.98	0.048	–	–	–	–
Mindfulness: Non-reacting	−0.12	0.03	−3.55	<0.001	−0.11	0.03	−3.28	0.001
Mindfulness: Non-judging	−0.44	0.03	−12.76	<0.001	−0.31	0.04	−8.67	<0.001
Mindfulness: Acting with awareness	−0.13	0.03	−3.78	<0.001	−0.20	0.04	−5.59	<0.001
Partner involvement	−0.14	0.03	−4.28	<0.001	0.02	0.03	0.62	0.538
Interaction effects								
T2 * Mindfulness: Non-reacting	−0.02	0.04	−0.48	0.629	−0.02	0.02	−0.95	0.342
T2 * Mindfulness: Non-judging	0.11	0.04	2.82	0.005	0.05	0.03	1.86	0.063
T2 * Mindfulness: Acting with awareness	−0.02	0.04	−0.62	0.535	0.01	0.03	0.52	0.606
T2 * Partner involvement	−0.04	0.04	−1.00	0.319	0.01	0.02	0.30	0.766
T3 * Mindfulness: Non-reacting	−0.01	0.04	−0.23	0.815	–	–	–	–
T3 * Mindfulness: Non-judging	0.06	0.04	1.35	0.179	–	–	–	–
T3 * Mindfulness: Acting with awareness	0.02	0.04	0.51	0.607	–	–	–	–
T3 * Partner involvement	−0.10	0.04	2.51	0.012	–	–	–	–
Main effects of control variables								
Age	NA	NA	NA	NA	−0.05	0.03	−1.66	0.098
Unemployed	0.22	0.08	2.55	0.011	NA	NA	NA	NA
Level of education	−0.11	0.05	−2.19	0.029	−0.10	0.06	−1.50	0.134
Depression	0.13	0.07	1.88	0.061	0.26	0.08	3.15	0.002
Parity (nullipara)	0.16	0.05	3.44	<0.001	0.27	0.06	4.48	<0.001
Unplanned pregnancy	−0.00	0.10	−0.03	0.975	NA	NA	NA	NA

Note. - = not available, since the concerning data was not collected at T3; NA = not applicable: The main effect of the concerning control variable was not included in the multilevel model because the correlation between this control variable and the dependent variable was not significant. T1: 20 weeks of pregnancy; T2: 32 weeks of pregnancy; T3: 6 weeks postpartum.

mindfulness were significant, meaning that these were related to pregnancy-specific distress (a moderate effect for mindfulness facet non-judging, and small effects for the other mindfulness facets). The main effect of partner involvement was not significant, indicating that when all other variables were considered, there was no effect of partner involvement on pregnancy-specific distress.

The interaction effects between T2 and the mindfulness facets were not significant, indicating that the effects of acting with awareness, non-judging, and non-reacting were still present at 32 weeks of pregnancy (T2). Finally, main effects of the control variables depression status and parity were significant, indicating that mothers who (previously) experienced depression and were pregnant with their first child experienced more pregnancy-specific distress over time compared to mothers who never experienced depression and had (a) child(ren) before (both small effects).

4. Discussion

The aim of the present study was to determine the relative contribution of trait mindfulness as a protective factor for anxiety during pregnancy and in the postpartum period while considering the protective effect of partner involvement and controlling for other known risk and protective factors. Mindfulness facets as measured at 22 weeks of pregnancy were not only negatively associated with levels of general anxiety and pregnancy-specific distress at the same measurement point, but also predicted lower general anxiety and pregnancy-specific distress at 32 weeks of pregnancy, and lower general anxiety at 6 weeks postpartum. The most relevant mindfulness facet was shown to be non-judging, which had a moderate effect size. The other mindfulness facets, partner involvement, and covariates were either non-significant or had a negligible or small effect.

4.1. Mindfulness facets and anxiety

The three mindfulness facets (acting with awareness, non-reacting, non-judging) that were shown to be significantly and negatively related to general anxiety and pregnancy-specific distress in the current study, were also shown to be negatively associated with anxiety in a large meta-analysis including a wide range of samples (Carpenter et al., 2019). In this meta-analysis, however, both non-judging and acting with awareness showed the strongest correlations with anxiety (also when only the community samples were included in the analysis), while in the current study, the effect of both acting with awareness and non-reacting was only small. Thus, the results of the current study suggests only non-judging seems to be relevant in relation to anxiety during pregnancy and early motherhood. In their systematic review of qualitative accounts of emotional problems in pregnancy, Staneva et al. (2015) concluded that pregnant women's worries and fears are dominated by feelings of inadequacy and concerns over their abilities to be a good mother for their baby. Sockol et al. (2014) investigated the association between problematic beliefs about motherhood and emotional problems. The authors reported that problematic beliefs often concerned the mothers' thoughts, feelings, or needs that the mothers believed were wrong and were associated with reported emotional problems, even after controlling for interpersonal factors (Sockol et al., 2014). The results of the current study are consistent with this research, which also showed that the intrapersonal factor of non-judging had a larger effect on anxiety than other factors, including partner involvement.

The mindfulness facets non-reacting and acting with awareness only had small protective effects against anxiety and pregnancy-specific distress in the current study, while in the before mentioned meta-analysis that included a wide range of samples, the mean correlations with anxiety were of moderate and large effect size, respectively (Carpenter et al., 2019). Possibly, the studies that were included in the meta-analysis of Carpenter et al. (2019) used other measures of anxiety with more items and possibly a higher reliability than the measure that was used for the current study. An alternative explanation of the difference in results between before mentioned meta-analysis and the current study may be that non-reacting and acting with awareness are less important or relevant to anxiety during pregnancy and the postpartum period than in other periods of life. However, a study on mindfulness during pregnancy and the perception of childbirth in the postpartum period showed that exactly these facets were predictive of a more positive childbirth experience (Hulsbosch, Boekhorst, et al., 2021). Non-spontaneous delivery was associated with a more negative perception of childbirth, but not for the mothers scoring high on non-reacting and acting with awareness (Hulsbosch, Boekhorst, et al., 2021). Also, a study on trait mindfulness and breastfeeding intention showed that non-reacting was the only mindfulness facet that predicted breastfeeding intention in pregnant women and breastfeeding initiation in postpartum women (Hulsbosch, Potharst, et al., 2021). The combination of these studies suggests that general trait mindfulness is not only associated with more adaptive coping in demanding situations (Weinstein et al., 2009), but also that different facets of mindfulness may have distinctive effects on adaptive coping relating to motherhood.

Although mindfulness is studied as a trait in the current study, it is important to mention that mindfulness is amenable to change. Mindfulness can be practised in mindfulness meditation and is taught in mindfulness-based interventions (Sockol et al., 2014). Meta-analyses on the effect of mindfulness training in the perinatal period indicated that trait mindfulness improved, as well as reported anxiety, stress, and depression (Dhillon et al., 2017; Lever Taylor et al., 2016). The current study underscores the importance of giving much attention to the attitudinal foundations of mindfulness, that include the acceptance and non-judging of thoughts and feelings, for women who experience anxiety or pregnancy-specific distress. Goodman et al. (2016) developed a mindfulness-based cognitive therapeutic programme for perinatal anxiety called Coping with Anxiety through Living Mindfully (CALM), which included elements of self-compassion. Results showed an improvement in trait mindfulness and self-compassion after the programme, and a reduction in anxiety, worry, and depression.

4.2. Partner involvement and anxiety

The association we found between partner involvement at 22 weeks of pregnancy and general anxiety at 22 and 32 weeks of pregnancy is in line with two systematic reviews on risk factors for antenatal anxiety and depression, that identified social support in general, partner involvement, and partner support as crucially important protective factors (Biaggi et al., 2016; Leach et al., 2017). Based on qualitative studies on prenatal anxiety, distress, and depression, Staneva et al. (2015) concluded that in the transitional period of pregnancy, it was very important for pregnant women to receive reassurance that their feelings were validated and accepted. This reassurance increased the women's confidence, which enabled them to cope with difficult feelings in a proactive way. Staneva et al. (2015) explicitly noted that women not only reported reassurance from others, but also within themselves, and that the acceptance and acknowledgement of their feelings by others and themselves was the most important factor to minimise their distress. It may be that mothers scoring high on non-judging may be able to fulfil (part of their) need for reassurance and acceptance by themselves. The current study suggests that the non-judgmental acceptance of their own feelings may even have a larger effect for pregnant women than the support of a partner.

Partner involvement at 22 weeks was not associated with anxiety at 6 weeks postpartum, which may suggest that partner support becomes a less important factor after the birth of a baby. It may also be that partner involvement is not stable through pregnancy and the postpartum period. In a previous study, it was found that also during pregnancy, partner involvement was not stable for women with increased levels of prenatal depressive symptoms (Boekhorst et al., 2019). Therefore, postpartum measurements of partner support are needed to study the effects on postpartum anxiety. In the current study, only a marginal univariate association between partner support and pregnancy-specific distress was found, and this association was not confirmed in the multivariate analyses. This is in line with an earlier study that only found a marginal correlation between pregnancy-specific distress and partner involvement (Pop et al., 2011).

4.3. Strengths, limitations, and future research

The current study had several strengths and limitations. Strengths were the large sample size, making the results more reliable, and longitudinal data that allowed us to assess the change in pregnancy-specific distress symptoms over time. Another strength was that we differentiated between the mindfulness facets which made clear that especially one mindfulness facet seems to be a protective factor for anxiety. A first limitation was that the participants in the study sample were relatively highly educated, which is important to note, as we found associations between level of education and anxiety, pregnancy-specific distress, and mindfulness facets. Future studies could include more participants from more diverse backgrounds than the current study. A second limitation was that, although the outcomes of this study were measured at several measurement occasions, the other factors, including trait mindfulness were measured at a single time point. Although considered to be relatively stable over time, trait mindfulness is amenable to change, and the present study does not capture the changes that may have occurred from 22 weeks pregnancy to 6 weeks postpartum. This limited the possibility of studying a possible bidirectional effect between mindfulness on the one hand and general anxiety and pregnancy-specific distress on the other hand. A third limitation was that women from the general population were included in the current study, and that we only used self-report measures of symptoms of anxiety. This did allow us to gain knowledge about protective factors with a sample from the general

population, which is important for early identification, and development of early supports. Our results can however not be generalised to clinically anxious women. Future research could also consider the same relationships in a group of clinically anxious women. Also, future research could evaluate mindfulness interventions for women with high levels of anxiety and could investigate the mindfulness facets and specifically non-judging as mechanisms for change in symptoms of anxiety.

4.4. Conclusions

In conclusion, in this study, it was shown that the mindfulness aspect of non-judging may be a protective factor for anxiety and pregnancy-specific distress in the perinatal period. For pregnant women who are at risk of or who already experience high levels of anxiety, it may be beneficial to offer mindfulness training with special attention for the attitudinal aspect of non-judging.

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Declaration of competing interest

The authors declare that they do not have any conflicting interests.

Data availability

Data will be made available on request.

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