

2021

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This article was originally published as:

MacMillan, K. K., Lewis, A. J., Watson, S. J., Bourke, D., & Galbally, M. (2021). Maternal social support, depression and emotional availability in early mother-infant interaction: Findings from a pregnancy cohort. *Journal of Affective Disorders*, 292, 757-765.

Original article available here:

[10.1016/j.jad.2021.05.048](https://doi.org/10.1016/j.jad.2021.05.048)

This article is posted on ResearchOnline@ND at . For more information, please contact [researchonline@nd.edu.au](mailto:researchonline@nd.edu.au).



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This is the accepted manuscript version of an article published as:

MacMillan, K.K., Lewis, A.J., Watson, S.J., Bourke, D., & Galbally, M. (2021). Maternal social support, depression and emotional availability in early mother-infant interaction: Findings from a pregnancy cohort. *Journal of Affective Disorders*, 292, 757-765.

<https://doi.org/10.1016/j.jad.2021.05.048>

This article has been published in its final form at:

<https://doi.org/10.1016/j.jad.2021.05.048>

Maternal social support, maternal depression and emotional availability in early mother-  
infant interaction: findings from a pregnancy cohort.

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Published in the Journal of Affective Disorders: 27 May 2021

<https://doi.org/10.1016/j.jad.2021.05.048>

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## **Abstract**

### **Background**

Social support theory suggests that parental social support may influence the nature of early parenting behaviours and specifically the mother-infant relationship. This study examines whether support from a partner, friends or family is associated with differences in quality of mother-infant interactions in the context of maternal depression.

### **Methods**

210 women were followed from early pregnancy to six-months postpartum within Australian pregnancy cohort, the Mercy Pregnancy and Emotional Wellbeing Study (MPEWS). Mother-infant interactions within a standardised observation at six-months postpartum were measured by the Emotional Availability (EA) Scales using total scores of the parental scales. In early and late pregnancy and at six-months postpartum, mothers rated perceived maternal social support from a partner, family and friends using subscales of the Multidimensional Scale of Perceived Social Support. Depression was measured in early pregnancy and at six-months postpartum using the Structured Clinical Interview for the DSM-IV-TR, with repeated measurement of depressive symptoms by the Edinburgh Postnatal Depression Scale. Data was analysed using structural equation models.

### **Results**

There were significant interactions between depressive symptoms in early pregnancy, maternal emotional availability and perceived maternal support from a partner ( $B = .18$ , 95% CI = .03, .31), and perceived maternal support from family ( $B = .12$ , 95% CI = .03, .32), indicating partner and family support might moderate the association between antenatal depressive symptoms and maternal emotional availability. Postpartum support from friends showed no effect.

**Limitations**

Future studies should consider extending measurement of the mother-infant relationship beyond the EA Scales.

**Conclusion**

Maternal perception of partner and family support in the postpartum is a predictor of observer rated maternal emotional availability.

**Key words: social support; mother-infant; emotional availability; depression; perinatal**

## **Introduction**

Studies note the protective aspects of social support for the quality of parent-child interactions (Green et al., 2007; Ceballo & McLoyd, 2002) and parental efficacy (Suzuki et al., 2009). Less is known about social support and the early mother-infant relationship. Several studies suggest that the strength of maternal support can influence maternal behaviours such as maternal sensitivity (Jackson, Preston & Thomas, 2013), and maternal responsiveness (Crnic et al., 1986) during mother-infant interactions.

For women with perinatal depression, the question of maternal support is even more important, given evidence that depression may influence the quality of parenting behaviours, though that effect might be small (Lovejoy et al., 2000). Social support is a potentially modifiable factor that could insulate against any adverse effect of perinatal depression on parenting outcomes, but this requires longitudinal research to inform clinical interventions and identify the optimal time for implementation (Dadi, Miller & Mwanri, 2020).

The mother-infant relationship is an early parenting outcome negatively associated with perinatal depression (Beck et al., 1995), though research findings are mixed (Rossen et al., 2018 versus Newland et al., 2016), and the effect size when reported can be small (Bernard et al., 2018). According to our data, it is depressive symptoms in early pregnancy that is the strongest predictor of mother infant interaction quality and not either depressive symptoms in late pregnancy or the postpartum, or depression diagnosis (MacMillan et al., 2020). Given the focus on postnatal depression and the mother-infant relationship (e.g., Campbell, Cohn & Meyers, 1995; Weinberg et al., 2006; Murray, Fearon, & Cooper, 2015), evidence of any association between early pregnancy depressive symptoms and maternal emotional availability requires investigation.

Lower levels of social support are associated with increased depressive symptoms in pregnancy (Biaggi et al., 2016; Lancaster et al., 2010). Social support might moderate any relationship between depressive symptoms in pregnancy and the mother-infant interaction. Understanding whether social support strengthens early maternal caregiving even in the presence of antenatal depressive symptoms, could be valuable for treatment of both depressive symptoms and the mother-infant dyad, with the strength of women's support systems capable of direct clinical intervention (Pilkington et al., 2017).

Social support is the interpersonal exchange between two people to enhance the wellbeing of another (Dunkel, Schetter & Brooks, 2009). Social support is generally operationalised as either perceived (i.e., subjective perception) or received (i.e., actual quantity; Eagle et al., 2019), with the two types of support only modestly correlated (Lakey et al., 2010). As perceived support has been more strongly associated with mental health (e.g., Lakey & Cronin, 2008; Uchino, 2009), we concentrated our assessment on perceived maternal support.

In this study, mother-infant relationship quality was conceptualised using the emotional availability construct. Emotional availability refers to the affective quality of the connection between a caregiver and child (Emde & Easterbrooks, 1985). The Emotional Availability Scales (EAS; Biringen, 2008) consists of six dimensions (i.e., four parental and two child scales) each with seven subscales, and it is one of the most widely used observational measures for the assessment of mother-infant interactions (Lotzin et al., 2015). The EAS is dyadic, so other studies interested in examining the parental side to the interaction, have only used the parental dimensions (e.g., Garvin et al., 2012). The focus of this study is on maternal interaction quality, so we used the parental scales. This also reflects the limited behavioural repertoire of infants at six months (e.g. Teti, Kim, Mayer, & Countermeine, 2010).

There is limited assessment of the relationship between perceived maternal support and maternal emotional availability, and the existing evidence does not support a clear conclusion. Using 20 mother-infant dyads, Porreca and colleagues (2017) recorded only one correlational association between perceived maternal support and maternal non-hostility. Similarly, Driscoll and colleagues (2007) reported no association between women's increased perception of support and sensitivity. Neither of these studies assessed perceived support in the context of perinatal depression and maternal emotional availability; this is yet to be tested using longitudinal data. Given possible adverse effects of perinatal depression on child outcomes are documented (e.g., Gelaye, Rondon, Araya & Williams, 2016), understanding if there may be a potentially modifiable factor to buffer against those effects should be a priority.

Perceived support can be protective against perinatal depression (Razurel & Kaiser, 2015). Webster et al. (2011) reported that among 901 women those with lower levels of perceived maternal support in pregnancy were more likely to have higher levels of postnatal depressive symptoms, a finding replicated by Boekhorst et al. (2019). In the context of the mother-infant relationship, perceived maternal support might moderate against any adverse effects of perinatal depression on maternal emotional availability. This proposition reflects both Folkman and Lazarus' model (1984) that social support may buffer against the negative effects of adverse life events, as well as Belsky's model (1984) that parenting outcomes can be positively affected by social support using a buffered system (Taraban et al., 2017).

This study builds on two previous studies using the same sample of women (Galbally et al., 2019; MacMillan et al., 2020), to increase our understanding of perceived maternal support, parenting outcomes and perinatal depression. First, we extend the finding that partner support can be protective against parenting stress in women with low depressive symptoms (Galbally et al., 2019), to assess the impact of different sources of support from a



partner, family or friends on another parenting outcome: maternal emotional availability, for women with depression. In doing so, we also extend our findings regarding the small but significant effect of early pregnancy depressive symptoms on maternal emotional availability (MacMillan et al., 2020), by testing whether perceived maternal support might moderate this association. We aim to examine whether perceived maternal support from a woman's partner, family, or friends measured at three time points across pregnancy and the postpartum protects against any adverse impact of maternal depression on maternal emotional availability at six-months postpartum. We use the covariate of maternal age because in this data women who were older than the average age of the sample, were more likely to have higher emotional availability (MacMillan et al., 2020). Each source of support is examined separately because of their differing effect on parenting in the context of depression (Jackson, 1992), and to provide specific information regarding what source to target in clinical intervention.

This is the first time that a study has used longitudinal data regarding perceived maternal support from pregnancy to the postpartum and tested its association to an observational measure of mother-infant interaction quality. We predicted a significant negative association between antenatal depressive symptoms and maternal emotional availability for women with low or reducing perceived support. This is done using structural equation models with data from longitudinal pregnancy cohort study, the Mercy Pregnancy and Emotional Wellbeing Study.

### **INSERT FIGURE ONE HERE**

To address the aim we tested whether the data fit our hypothesized moderation model set out at Figure 1 by simultaneously assessing the relationships between perceived maternal support from a partner, family and friends, and depressive symptoms in early pregnancy, and modelling their predictive pathways to latent variable maternal emotional availability. Based on the existing research, we hypothesized a direct positive effect of postpartum perceived

maternal support from a partner, friends and family on maternal emotional availability. Second, based on previous findings (MacMillan et al., 2020), we hypothesized an adverse association between early pregnancy maternal depressive symptoms and postpartum perceived maternal support. Finally, given perceived support can be protective against adverse consequences of poor mental health (Schury et al., 2017), we hypothesized that perceived support in the postpartum from a partner, family and friends would moderate the relationship between maternal depressive symptoms in early pregnancy and maternal emotional availability at six-months postpartum, after adjusting for the effects of covariate maternal age on maternal emotional availability.

### **Method**

Data used in this study were drawn from the Mercy Pregnancy and Emotional Well-being Study (MPEWS), a prospective pregnancy cohort study based in Melbourne, Australia (Galbally et al., 2017). Recruitment of women was at less than 20 weeks of pregnancy and initially occurred through antenatal bookings with a letter of invitation to participate in MPEWS included in the welcome pack sent out to all women who were to deliver at Mercy Hospital for Women. The Mercy Health Human Research Ethics Committee approved the study with participants providing their written informed consent prior to participation.

### **Participants**

MPEWS is a selected cohort design with three groups of women recruited: (1) women diagnosed with depression (past or current); (2) women on antidepressant medication in pregnancy; and (3) women that did not have depression. For this study, the sample comprised of 211 mother-infant dyads (78.4% of the full cohort). This represented only those who completed the mother-infant interaction task at six-months postpartum. No significant differences in baseline demographics (i.e., maternal demographics and birth outcomes) were observed between the original sample and those included in this study.

The data used were collected at three Waves: early pregnancy (less than 20 weeks), third trimester, and six-months postpartum. There were 210 women because one woman had twins and was recorded twice for separate dyads, so the total was 211 ( $N = 211$ ). This separate analysis of each twin is supported by evidence of non-concordance in the emotional availability of mothers with twin pairs (Robinson & Little, 1990; Biringen & Robinson, 1991). Inclusion required English proficiency and participants being under 20 weeks pregnant, with women who experienced complications in pregnancy remaining eligible. The study was undertaken with ethics approval through Mercy Health and all participants provided written informed consent. Further details of the study protocol are published (Galbally et al., 2017).

### **Mother-Infant Interaction Procedure**

At six-months postpartum mothers and their infants attended Mercy Hospital for Women in Melbourne, Australia to be recorded in a 40 to 60-minute interaction. All mother-infant interactions comprised of semi-structured free-play (10 minutes), followed by unstructured play (30 minutes). For the semi-structured play, mothers were instructed to place their infant on a baby beanbag and to engage in face to face interaction with them, “just as they would do at home”. A basket of toys was brought in for the unstructured play. The interaction was recorded from three angles: enface to the infant and the mother, as well as behind a one-way screen which captured both parties.

### **Measures**

#### **Maternal Emotional Availability**

The EAS is scored on observed specific behaviours of the dyad captured by the seven subscales of the six dimensions. We used the total scores to represent each of the EAS dimensions. Recorded mother-infant interactions were scored using the EAS by one of the two MPEWS researchers certified as reliable by Professor Biringen following completion of

the formal training program. The coders were blind to the mother's mental health history at the time of coding. Reliability for the total scores of the maternal scales used in this study for the subsample of recordings was calculated using ICC two-way random effects model with absolute agreement (McGraw & Wong, 1996): sensitivity = .84, structuring = .76, non-hostility = .84, and non-intrusiveness = .87. Disagreements in scoring were minor (i.e., direct scores within 1.5 points of each other), and resolved by the coders' joint-viewing of the interaction.

### **Maternal Depression**

**Diagnosis.** The Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV, American Psychiatric Association, 2008; SCID-IV-TR, First et al., 1997), was administered to assess past or present diagnosis of a depressive disorder (i.e., Major Depressive Disorder; MDD; or Dysthymia) at recruitment and to screen for bipolar disorder. A modified version was re-administered at six-months postpartum to capture new episodes of depression. The SCID-IV has been validated in the perinatal period (Gibson et al., 2009). The women who met the DSM-IV criteria for MDD or Dysthymia irrespective of antidepressant use at recruitment or six-months postpartum were coded as 1 (*depressed*;  $n = 59$ ), and all other women were coded as 0 (*not depressed*;  $n = 152$ ). In this study, we used a composite variable that included women diagnosed with depression at recruitment as well as women that were only diagnosed at six-months postpartum to capture all women who experienced a major depressive episode in the perinatal period.

**Depressive symptoms.** Depressive symptoms were measured at in early and late pregnancy and at six-months postpartum using the EPDS. The EPDS is a ten item self-report screening measure used to assess depressive symptoms. Symptoms are rated on a 4-point (0 - 3) scale, with higher scores indicating increased symptom severity, and a total score between

0 and 30. The EPDS is validated for use in the perinatal period with Australian women (Boyce et al., 1993).

### **Perceived Maternal Support**

Perceived maternal support was measured using the Multidimensional Scale on Perceived Social Support (MSPSS) (Zimet et al., 1990) measured at three time points: early pregnancy, late pregnancy and at six months postpartum. The MSPSS is a 12 item self-report measure that assesses perceived social support from significant others, friends and family. The MSPSS has good internal and test-retest reliability, as well as good construct validity and reliability with pregnancy women (Zimet et al., 1990). Respondents were asked to rate support on a seven-point Likert scale, with a higher rating indicating endorsement (1 = *Very Strongly Disagree*, 7 = *Very Strongly Agree*). With a three-factor structure (i.e., family, significant others and friends), results were analysed using the average of the four items from each domain. Given the items related to the support of the significant others refer to a “special person” (e.g., “there is a special person with whom I can share my joys and sorrows”), this domain is referred to as *partner support* as the items capture the presence of support from a significant other.

**Covariates.** We included maternal age at recruitment as a covariate of maternal emotional availability.

### **Statistical Analyses**

We conducted an exploratory analysis using SPSS version 24 (SPSS; IBM Corp., 2016). Spearman correlations ( $r$  and  $p$  values) were used to examine bivariate associations between observed study variables. In our preliminary data analysis, a measurement model for the EAS was conducted. The model fit indices were adequate to support a one factor model:  $\chi^2 (df = 2) = 2.92, p = .23$ ; CFI = .99, TLI = .98, SRMR = .01, RMSEA = .05 [95% CI = .00 - .15]). The standardised structural loadings ranged between .77 and .94, and

collectively the model accounted for 74% of the variance. We used this measurement model of maternal emotional availability as a latent outcome in the structural equation model.

We also assessed the sample means and variances in participant ratings of support from a partner, family or friends from early pregnancy, third trimester and at six-months postpartum, to determine if and how women's perception of support varied across the perinatal period. To do this, we fit latent growth curve models for each support source. Observed support for each source and across repeated measurements indicated stable, but high, average support reported by women. Consequently, we fit an intercept and linear slope model for each source of support. For each model, the linear slopes and variances around the slopes were not significant; however, there were significant variance around the intercept estimates. The same significant intercept variance estimates were observed when we refit the models centering time at third trimester and again at six-months postpartum. These results suggested the stability of the support measures over time, with significant variation only observed within measurement at each of the three Waves. Rather than operationalising changes in perceived support from each source over time to include in the modelling, we use the univariate measures of support at each Wave in the the final models.

To address our hypotheses, we conducted a structural equation model (SEM) using *Mplus* version 8 (Muthén & Muthén, 2019), we used depressive symptoms in early pregnancy, depression diagnosis, and perceived support from a partner, family and friends as predictors of the latent maternal emotional availability. Into a separate block we added the interaction terms separately between depressive symptoms in early pregnancy and time-varying perceived support from each source of support. Each block tested the interaction terms for perceived support from partner (Interaction 1), from family (Interaction 2), and from friends (Interaction 3), with depressive symptoms in early pregnancy, depression diagnosis, and the other perceived support variables included as the predictors of the latent

maternal emotional availability. For accurate interpretation of model intercept values, we grand mean centred both continuous variables prior to computing the interaction term. Where the interaction term was a significant predictor of maternal emotional availability, we probed the pattern of the interaction by estimating simple effects of maternal antenatal depressive symptoms on maternal emotional availability at meaningful values of perceived support. Given the skew of the support variables, simple effect estimates were calculated at one standard deviation about the mean, the mean, and one and two standard deviations below the mean of the relevant perceived support measure.

Modelling was conducted using *Mplus*. Model fit tests and indices were applied to determine how well the specified models fit the data. The overall fit of a model is supported by a non-significant ( $p > .05$ ) chi-square goodness-of-fit test. Acceptable model fit can be further supported by fit indices: the standardised root mean square residual (SRMR  $< .08$ ), root mean square error of approximation (RMSEA  $< .08$ ), comparative fit index and Tucker-Lewis index (CFI and TLI  $> .95$ ; Hu & Bentler, 1999). The regression coefficients of the pathways indicated the degree of change estimated by the predictors in the outcome variable ( $B$  values), with the  $p$ -value indicating the probability that the size of the estimated coefficient differs significantly from zero. Models were estimated using maximum likelihood with robust standard errors, and missing data were handled using full information maximum likelihood.

## Results

### Sample socio-demographic and key characteristics

At recruitment women were, on average, 31.50 years ( $SD = 4.67$ ), and infant ( $n = 114$ ; 54.0% male) mean age at six-months postpartum was 6.76 months ( $SD = 1.08$ ; range: 4.75 – 11.25). Further participant demographics are presented in Table 1.

**TABLE 1 HERE**

### **Ratings of perceived maternal support from pregnancy to the postpartum**

In early pregnancy, 90.3% ( $n = 186$ ) of women rated partner support as present or higher, with over half of the sample, 59.7% ( $n = 123$ ), nominating the highest levels of support. There was minimal variation in women's perception of partner support from pregnancy to the postpartum (see, Table 2). Friedman's ANOVA revealed a significant difference between women's ratings of partner support in early pregnancy, late pregnancy and the postpartum ( $\chi^2(2) = 7.46, p = .024$ ), with Wilcoxon Signed Rank Tests indicating the only significant difference in women's ratings was between early pregnancy and six-months postpartum ( $Z = -.240, p = .016$ ). The median for partner support was the same at each time point, and the inquitile range showed limited variation.

Similarly, 63.6% ( $n = 136$ ) of women rated family support as present or higher in early pregnancy, with one quarter of women, 25.7% ( $n = 53$ ), endorsing the highest levels of support. There was minimal variation in women's perception of family support from pregnancy to the postpartum (see, Table 2). Friedman's ANOVA revealed no significant differences between women's ratings of family support in early pregnancy, late pregnancy and the postpartum ( $\chi^2(2) = 2.94, p = .230$ ).

Finally, 68.4% ( $n = 65$ ) of women rated friend support as present or higher, with one quarter of women, 25.7% ( $n = 53$ ), endorsing the highest levels of support from their friends. There was minimal variation in women's perception of friend support from pregnancy to the postpartum (see, Table 2). Friedman's ANOVA revealed no significant differences between women's ratings of friend support in early pregnancy, late pregnancy and the postpartum ( $\chi^2(2) = 1.99, p = .370$ ).

Based on the limited variation in women's ratings of support across the time points, we used the ratings of support at six-months postpartum only in our final models. This also represents the support at the time of the interaction.



**INSERT TABLE 2 HERE****Predicting maternal emotional availability at six months postpartum**

Table 3 includes the descriptive statistics and bivariate correlations for the variables included in the modelling. These associations provide evidence for predictors in the final model. Parity was not significantly correlated with the parental EAS dimensions, so was not controlled for in the analyses.

**Postpartum partner support.** The model fit indices supported a good fit of the model to the data:  $\chi^2 (df = 23) = 26.74, p = .27$ ; CFI = .99, TLI = .99, SRMR = .02, RMSEA = .03 [90% CI = .00, .07]. Table 4 shows the results for the regression model with the interaction between postpartum partner support and early pregnancy depressive symptoms predicting maternal emotional availability at six-months postpartum. Neither perceived support from a partner, family or friends, or depression diagnosis were significant predictors. Covariate maternal age at recruitment was a significant predictor with women who were one standard deviation older ( $SD = 4.67$ ) than the average age in the sample ( $M = 31.50$ ) scored, on average, .24 of one standard deviation higher on the latent maternal emotional availability factor ( $p = .000$ ).

There was a significant interaction between depressive symptoms in early pregnancy, maternal emotional availability and support from a partner ( $\beta = .17, p = .018$ ). For women with depression who reported one standard deviation above the average support from a partner, there was no association between early depressive symptoms and maternal emotional availability ( $\beta = -.04, p = .637$ ). For women with depression who reported the mean partner support, there was no significant association between early depressive symptoms and maternal emotional availability ( $\beta = -.14, p = .069$ ). For women with depression who reported one standard deviation below the average support from a partner, there was a negative and significant association between early depressive symptoms and maternal emotional

availability ( $\beta = -.28, p = .001$ ). This effect was at its strongest for women who reported three standard deviations below the average support from a partner ( $\beta = -.55, p = .001$ ). Overall, this model explained 12.9% of the variance in maternal emotional availability.

**Postpartum family support.** The model fit indices supported a good fit of the model to the data:  $\chi^2 (df = 23) = 25.25, p = .34$ ; CFI = .99, TLI = .99, SRMR = .02, RMSEA = .02 [90% CI = .00 - .06]. Table 4 shows the results of the regression model with the interaction between postpartum family support and early pregnancy depressive symptoms predicting maternal emotional availability at six-months postpartum. Again, neither perceived support from a partner, family or friends, or depression diagnosis were significant predictors of maternal emotional availability. Covariate maternal age was a significant predictor with women who were one standard deviation older (SD = 4.67) than the average age in the sample ( $M = 31.50$ ) scored, on average, .24 of one standard deviation higher on the latent maternal emotional availability factor ( $p = .000$ ).

There was a significant interaction between depressive symptoms in early pregnancy, maternal emotional availability and support from family ( $\beta = .18, p = .015$ ). For women with depression who reported one standard deviation above the average support, there was no association between early depressive symptoms and maternal emotional availability ( $\beta = .012, p = .909$ ). For women with depressive symptoms who reported the mean support, there was no significant association between early depressive symptoms and maternal emotional availability ( $\beta = -.14, p = .064$ ). For women with depressive symptoms who reported one standard deviation below the average support, there was a negative and significant association between early depressive symptoms and maternal emotional availability ( $\beta = -.29, p = .001$ ). This effect was at its strongest for women who reported two standard deviations below the average support from family ( $\beta = -.44, p = .001$ ). Overall, this model explained 13.6% of the variance in maternal emotional availability.

**Postpartum friend support.** The model fit indices supported a good fit of the model to the data:  $\chi^2 (df = 23) = 23.39, p = .44$ ; CFI = TLI = .99, SRMR = .02, RMSEA = .009 [90% CI = .00 - .06]. Table 4 shows the results of the regression model with the interaction between postpartum friend support and early pregnancy depressive symptoms predicting maternal emotional availability at six-months postpartum. Neither perceived support from a partner, family or friends, or depression diagnosis were significant predictors of maternal emotional availability. Covariate maternal age was also a significant predictor with women who were one standard deviation older ( $SD = 4.67$ ) than the average age in the sample ( $M = 31.50$ ) scored, on average, .25 of one standard deviation higher on the latent maternal emotional availability factor ( $p < .001$ ). There was no interaction between depressive symptoms in early pregnancy, maternal emotional availability and support from friends ( $\beta = .12, p = .076$ ). Overall, this model explained 12% of the variance in maternal emotional availability. None of the interactions between perceived maternal support during early and late pregnancy, early pregnancy depressive symptoms, and maternal emotional availability at six-months postpartum, were significant.

### Discussion

This study is the first to provide evidence that perceived maternal support from a partner and family can be protective against any adverse effect of depressive symptoms in early pregnancy on maternal emotional availability at six months postpartum. The results build on our previous findings from two other studies to extend our understanding of support beyond parenting stress (i.e., Galbally et al., 2019) to the mother-infant interaction, and to understand whether perceived maternal support might be protective against the small but significant effect of early antenatal depressive symptoms on maternal emotional availability (i.e., MacMillan et al., 2020). This study is therefore distinct as it comprehensively tests the

buffering potential of perceived maternal support against antenatal depressive symptoms and maternal emotional availability.

Findings indicate that for women with depressive symptoms in pregnancy, unless they perceive their partner support to be high, their emotional availability at six-months postpartum might be compromised. Similarly, support from family that is perceived as anything less than consistent, is also more likely to result in reduced emotional availability. Interestingly, at six-months postpartum, we did not observe a direct relationship between perceived friend support and maternal emotional availability, nor did we see an effect of perceived friend support on maternal emotional availability for women with depressive symptoms. This suggests that perceived partner and family support may be the most protective source of maternal support for the early mother-infant relationship. This finding has clinical significance given perceived support may be capable of intervention (Hogan, Linden & Najarian, 2002), thereby optimising the possibility for positive child outcomes (Jian & Teti, 2016; Volling et al., 2002; Pressman et al., 1999).

We observed that depressive symptoms only have an effect on maternal emotional availability when women score below the average rating for partner support. Given the average rating endorsed by women was of strongly perceived partner support, this suggests that women who experience antenatal depressive symptoms and perceive partner support as neutral, may be vulnerable to reduced emotional availability. This may be because it is harder to buffer the effects of depressive symptoms against the capacity to be emotionally available, when the mother perceives partner support to be anything less than high (Taraban et al., 2017).

Although the relationship between partner support and postpartum depression is documented (Jonsdottir et al., 2017; Hildingsson et al., 2008), less was known about the relationship between antenatal depressive symptoms and perceived partner support, and their

impact on maternal emotional availability. Specific partner factors (i.e., relationship satisfaction, emotional closeness, communication, instrumental and emotional support, conflict; Pilkington et al., 2015) could be targeted to enhance maternal perception of partner support, thereby improving mother-infant relationship outcomes.

Our results also indicate that support from family may be protective against the potentially adverse effect of early pregnancy depressive symptoms on maternal emotional availability. With evidence of the role of adult attachment styles on help seeking behaviours (e.g., Cozzarelli et al., 2003), women who perceive their family as supportive may also be more likely to show increased quality of relationships, with this extending to emotional availability with their infant (Rini et al., 2006).

To assess whether perceived maternal support from a partner or family is more influential on any association between early depressive symptoms and maternal emotional availability, we note the size of the standardised coefficient for the interaction term is largest for family support. However, with a .001 of 1 SD difference compared to the size of the standardised coefficient for the interaction for partner support, the difference is negligible. This indicates a larger relative standardised effect between models.

Whilst we observed the impact of perceived partner and family support on antenatal depressive symptoms and maternal emotional availability, we did not see an association between perceived friend support. The centrality of a woman's partner and family in this study might reflect the uniqueness of social support in the perinatal period, with the experience of becoming a mother different to any other stressor an individual might experience. This is echoed in related research that focuses on investigating the association between perceived low maternal family and partner support (i.e., not peer support) and postpartum depression (e.g., Tarka & Paunonen, 1996). This is why antenatal assessment of women's social support resources is advocated (Buultjens, Murphy, Robinson & Milgrom,

2013), though the focus of support resources may differ for single mothers where partner support is not available (Jackson, 2000).

The lack of variation in women's ratings of support from pregnancy to the postpartum can inform the optimal timing for intervention. Given depression can adversely impact on maternal perceptions of support (Rini et al., 2006), women with antenatal depressive symptoms may have perceived partner support as lower in pregnancy, with this perception remaining in the postpartum thereby impacting on their emotional availability. For those women, antenatal intervention is necessary for the buffering effects of perceived support to be effective.

### **Limitations**

This study has important strengths including longitudinal data collected at three time points from pregnancy to the postpartum regarding perceived maternal support, as well as observational evidence to capture the quality of the mother-infant interaction, and the use of symptomatic and diagnostic assessment of perinatal depression. However, there remain limitations.

First, alternative models cannot determine exactly how maternal depression and perceived maternal support interact given the cognitive bias that can be associated with self-report measures (Krantz & Hammen, 1979). However, the hypothesized model in which perceived maternal support is proposed as the moderator between any association between maternal depression and maternal emotional availability is based on the theory that social support may buffer the effect of adverse life events on an individual (Thoits, 1982; Lakey et al., 2011). Although our specification of the models supports the buffering hypothesis in

terms of the transactional nature of stress and coping (Folkman & Lazarus, 1984), our results could not address causality between the variables.

Secondly, the EAS is one way to conceptualise the quality of maternal caregiving, and it is measured once at six-months postpartum with only the maternal scales applied to the analyses. Follow up would be required to understand the implications of the lower emotional availability experienced by women with early pregnancy depressive symptoms, and whilst exclusive use of maternal scales is supported (e.g., Teti et al., 2010), application of the child and parental scales might be considered in future studies. Moreover, though there is an age range of infants in our sample (4.75 – 11.25 months), given the previously reported moderate stability of emotional availability over infancy including between 2 and 14 months across two studies (Racine et al., 2020; Biringen et al., 1999), as well as the fact emotional availability is not determined by developmental stage, this should not limit the accuracy of our findings.

In addition, partner support is captured exclusively by the MSPSS with no other insight into the quality of the partner relationship (e.g., the Experiences in Close Relationships Questionnaire; Wei et al., 2007), and the measurement of each type of maternal support is by self-report only. Information regarding whether the target for clinical intervention is a woman's perception of her partner or family support, or the provision of actual received support, is crucial. Future research might consider the inclusion of measurement of both perceived and received maternal support.

Perceived partner support was the strongest moderator which may reflect 95% of this sample having a partner. It would be interesting to repeat this study using a higher proportion of single mothers to see if friends may compensate for the absent partner. Finally, we only examine perceived maternal support in the context of antenatal depressive symptoms because there was no evidence of any adverse effect of maternal depression at other time points. Future research can test how robust this finding may be in younger mothers, particularly

given the protective effect of maternal age in this sample on both maternal emotional availability and perceived support.

### **Conclusion**

This study identifies the specific source of perceived maternal support most likely to protect against any adverse effect of antenatal depressive symptoms: support from a partner and family. Antenatal intervention is encouraged given maternal ratings of perceived support show little variation from pregnancy to the postpartum. With the prevalence of antenatal depression (Bennett et al., 2004), and the possible benefit to child outcomes of high emotional availability (Jian & Teti, 2016; Volling et al., 2002; Pressman et al., 1999), evidence of a potentially modifiable factor that can be targeted in treatment is significant. Future research could test the effectiveness of an intervention designed to enhance maternal perception of partner and family support (Pilkington et al., 2017).

### **Acknowledgements**

The authors would like to thank those who have supported the development of MPEWS including Marinus van IJzendoorn and Michael Permezel. In addition, Marian Bakermans-Kranenburg, Peter Fonagy and Robert Emde in their advice on the design of the postpartum interactional assessment within the study. The authors thank Josephine Power for her assistance with the EAS coding of the mother-infant interactions. The authors also thank staff, students and volunteers on the MPEWS study as well as study co-ordinators: Nicole Brooks and Tina Vaiano for their role as Melbourne based project coordinators for MPEWS. In addition, students and staff who administered the structured interaction task for MPEWS in Melbourne: Sunaina Seth, Sue Mitford, Emma Austin, Madeline Young, Brittany Watkins, Rebecca Knapp and Alex Flowers. Finally, we are sincerely grateful to the study participants who have contributed a substantial amount of time to participating in this research.

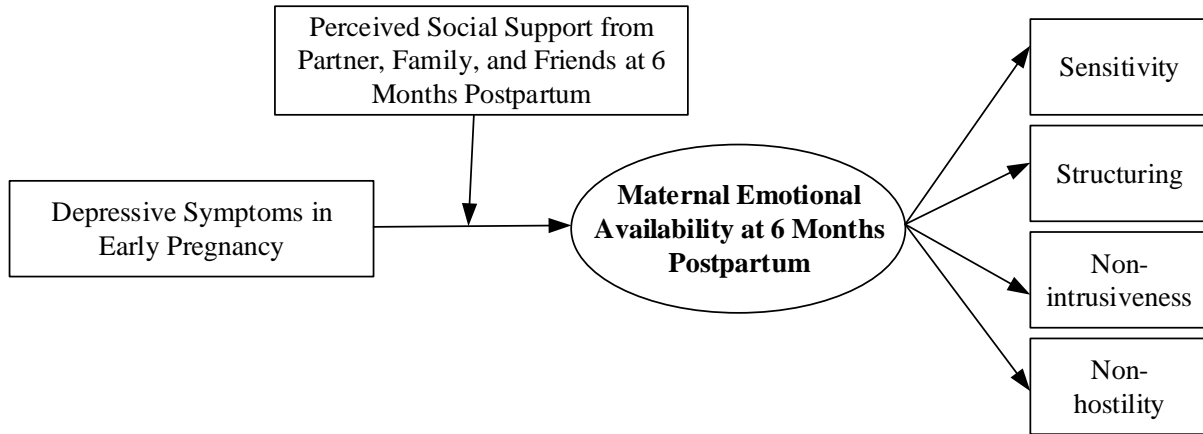


**Declaration of interest**

The authors declare that they have no competing interests.

**Funding**

This study is supported through the 2012 National Priority Funding Round of Beyond Blue in a three-year research grant (ID 519240), and a 2015 National Health and Medical Research Council (NHMRC) project grant for 5 years (APP1106823). Financial support has also been obtained from the Academic Research and Development Grants, Mercy Health and Centre for Mental Health and Well-Being, and Deakin University.



**Figure 1.** Hypothesized model of the relationship between depressive symptoms in early pregnancy, perceived social support from a partner, friends and family at six months postpartum and maternal emotional availability at six months postpartum.

**Table 1.** MPEWS Cohort Demographic Characteristics, and Frequencies for Other Key Variables ( $N = 210$ )<sup>a</sup>

Baseline characteristics	<i>N</i>	% <sup>b</sup>
<i>Relationship status</i> <sup>c</sup>		
Not currently in a relationship	10	4.8
In a relationship	64	30.8
Married	134	64.4
<i>First time mother</i>	191	90.5
<i>Maternal education</i> <sup>d</sup>		
No further study after school	13	6.2
Post-secondary qualification (e.g., apprenticeship/certificate)	51	24.6
Tertiary education	144	69.2
<i>Employment status</i> <sup>e</sup>		
Employed	191	91.9
Unemployed	6	2.9
Other	11	5.2
<i>Primary caregiver of child at six months postpartum</i>		
Mother	198	93.8
Partner	3	1.4
Other (i.e., grandparent)	3	1.4
<i>Hours spent per week with the infant by the father</i>		
0	4	2
1 – 10	35	17.4
11 – 20	45	22.4
21 – 40	97	48.3
41 – 80	20	10
<i>Types of care received by the infant</i>		
No childcare	143	71.5
Childcare	15	7.5
Grandparent	30	15
Community Centre	5	2.5
Nanny	1	.5
Other	1	.5
<i>Early pregnancy depressive symptoms</i>		
EPDS score below 12	180	87.7
EPDS score above 12	26	12.3
<i>Depression Diagnosis at recruitment or six months postpartum</i>		
Depressed	59	28.0
Not Depressed	152	72.0
<i>Emotional Attachment Evaluation Zone</i> <sup>f</sup>		
Emotionally Available	86	40.8
Non-emotionally available <sup>g</sup>	125	59.2

<sup>a</sup> 211 dyads were analysed - one woman had twins so was recorded separately with each infant; <sup>b</sup> Valid percentage shown; <sup>c</sup> Missing = 2; <sup>d</sup> Missing = 2; <sup>e</sup> Missing = 2; <sup>f</sup> Measured using the Emotional Availability Scales;

<sup>g</sup>Non emotionally available attachment evaluation zones include complicated, detached or problematic.

**Table 2.** Parametric and non-parametric descriptive statistics and results for non-parametric repeated-measures tests to compare within group differences for participant ratings of perceived maternal social support<sup>a</sup> from a partner, friends and family at three time points from early pregnancy to the postpartum ( $N = 210$ ).<sup>b</sup>

Source of Support and Wave	Mean	Standard Deviation	Median	Inter-quartile Range	Friedman's $\chi^2$
<i>Partner</i>					7.46*
Early Pregnancy	6.46	1.23	7.00	6.25 - 7.00	
Late Pregnancy	6.45	0.91	7.00	6.00 - 7.00	
6 months postpartum	6.46	0.63	7.00	6.00 - 7.00	
<i>Family</i>					2.94
Early Pregnancy	5.66	2.27	6.13	5.00 - 7.00	
Late Pregnancy	5.65	1.96	6.00	5.00 - 6.75	
6 months postpartum	5.75	1.62	6.00	5.25 - 6.75	
<i>Friends</i>					1.99
Early Pregnancy	5.80	1.72	6.00	5.25 - 7	
Late Pregnancy	5.78	1.41	6.00	5.25 - 6.75	
6 months postpartum	5.82	1.16	6.00	5.50 - 6.56	

<sup>a</sup> Measured using the *Multidimensional Scale on Perceived Social Support*; <sup>b</sup> 211 dyads were analysed - one woman had twins so was recorded separately with each infant; \*  $p < .05$

**Table 3.** Descriptive Statistics and Spearman Correlation and Point Biserial Correlation Coefficients for all Variables in the Regression Model ( $N = 211$ ).

	1	2	3	4	5	6	7	8	9	10
1. Family Support T4										
2. Partner Support T4	.50**									
3. Friends Support T4	.54**	.52**								
4. Dep symptoms T1	-.36**	-.34**	-.28**							
5. Depression Diag <sup>1</sup>	-.04	-.06	-.16	.35**						
6. Sensitivity	.09	.06	.09	-.19**	-.11					
7. Structuring	.09	.08	.08	-.18*	-.09	.86**				
8. Non-intrusiveness	.09	.07	.06	-.13	-.02	.72**	.67**			
9. Non-hostility	-.003	.05	.08	-.16*	-.14*	.74**	.72**	.61**		
10. Maternal Age	-.16*	-.21**	-.02	.04	-.08	.14*	.17*	.21**	.18*	
Mean	5.75	6.46	5.82	6.48	.28	21.71	22.59	20.44	25.09	31.5
Standard Deviation	1.27	.79	1.08	4.68	.45	4.66	3.91	4.80	3.15	4.67
Range	1-7	1-7	1-7	0 - 27	1.00	8.5-29	8.5-29	9-29	12-29	19-48

\*\* $p < .01$ ;  $p < .05$ . <sup>1</sup> Point biserial correlation.

**Table 4.** Multivariate linear regression models for maternal emotional availability as predicted by maternal support at six months postpartum and depression ( $N = 211$ ).<sup>a</sup>

	Maternal EA <sup>b</sup> Interaction 1: Perceived Partner Support				Maternal EA Interaction 2: Perceived Family Support				Maternal EA Interaction 3: Perceived Friends Support			
	<i>B</i>	<i>SE</i>	$\beta$	95% <i>CI</i>	<i>B</i>	<i>SE</i>	$\beta$	95% <i>CI</i>	<i>B</i>	<i>SE</i>	$\beta$	95% <i>CI</i>
<b>Block 1</b>												
Depression diagnosis	-.08	.07	-.008	-.14, .13	-.02	.07	-.002	-.14, .13	-.007	.08	-.001	-.14, .14
Early pregnancy depressive symptoms	-.14	.08	-.14	-.30, .01	-.14	.07	-.14	-.29, .01	-.015	.08	-.15	-.31, .01
Partner support at six months postpartum	-.36	.08	-.06	-.22, .10	.06	.07	.01	-.13, .15	.12	.07	.02	-.12, .17
Family support at six months postpartum	.43	.08	.12	-.04, .29	.29	.09	.08	-.09, .25	.44	.09	.13	-.04, .30
Friend support at six months postpartum	.04	.07	.01	-.13, .15	.01	.07	.003	-.13, .14	-.15	.08	-.04	-.19, .11
<b>Block 2</b>												
<i>Interaction Terms:</i>												
Depressive symptoms * Partner Support	.18*	.07	.17*	.03, .31								
Depressive symptoms * Family Support					.12*	.07	0.18*	.03, .32				
Depressive symptoms * Friends Support									.09	.07	.12	-.01, .24
$R^2$	.13, $p = .006$				.14, $p = .010$				.12, $p = .010$			

<sup>a</sup>The reported effects included covariate maternal age at recruitment; the  $R^2$  for Block 1 predictors was .11,  $p = .019$ . <sup>b</sup>Maternal EA = maternal emotional availability.

\*  $p > .05$ ; \*\*  $p > .01$ .

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