Depressive Symptom Contagion in the Transition to Parenthood: Interparental Processes and
the Role of Partner-Related Attachment

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Abstract

How depressive symptoms unfold within a couple during the perinatal events of pregnancy, childbirth, and early parenthood is poorly understood. In this prospective study, we aim to investigate the reciprocal relation between maternal and paternal depressive symptomatology, specifically how symptoms in one partner relate to subsequent symptom level changes in the other partner throughout the perinatal period. Further, we aim to identify parents that are particularly vulnerable to the development of disruptive processes of negative mood states. Data were collected from 1,036 mothers and 878 fathers participating in the *Little in Norway* study from mid-pregnancy until 12 months postpartum. Depressive symptoms were assessed at seven time points (four prenatally) in both parents. Partner-related attachment was measured early in pregnancy. By utilizing an autoregressive latent trajectory modeling approach, accounting for time invariant confounding, we found mothers' depressive symptoms late in pregnancy to predict elevated symptom levels in fathers 6 weeks after birth, with a small effect size. No other time-adjacent effects were observed among partners at other time points or with the opposite directionality. However, moderation analyses revealed that among parents characterized by insecure partner-attachment styles, additional cross-lagged pathways were evident during pregnancy and throughout the first year of parenthood. Clinicians need to be aware of fathers' vulnerability to symptom development in instances of maternal perinatal depressive states at the time around childbirth, and tailor preventive and treatment efforts to address both parents' needs. Further, particular attention should be directed to parents with heightened susceptibility to prolonged depression contagion processes.

Keywords: Perinatal depression, postnatal depression, partner-related attachment, autoregressive latent trajectory (ALT) models

General Scientific Summary

We found that heightened maternal depressive symptoms towards the end of pregnancy predicted elevated depressive symptoms in fathers after the baby was born. For parents with an insecure attachment style, such processes were also evident earlier in pregnancy and throughout the first year after birth. These findings underscore the importance of including the partner of the affected parent when working to prevent and treat depressive states in the perinatal period.

Depressive Symptom Contagion in the Transition to Parenthood: Interparental Processes and the Role of Partner-Related Attachment

To experience perinatal depressive symptoms is not only disruptive for new parents, it also places children at risk of a variety of social, emotional, and developmental problems (Stein et al., 2014). While researchers and clinicians have recognized postpartum depression in women as a serious condition for decades, they have, until recently, given little attention to understanding and treating depressive symptoms during pregnancy, not to mention among new fathers (Howard et al., 2014; Underwood et al., 2017). Consequently, the dynamics of how depressive symptoms unfold over time within a couple during the transition to parenthood is poorly understood; however, advances in this field have the potential to yield clinical information that might translate into interventions suited to addressing both parents' symptom courses.

Meta-analyses show that maternal and paternal perinatal depressive symptoms are moderately associated (Cameron, Sedov, & Tomfohr-Madsen, 2016; Paulson & Bazemore, 2010). Attempts to explain depression concordance within couples include assortative mating, shared health beliefs and habits, common contextual influences, and depression contagion (Joiner & Katz, 1999; Meyler, Stimpson, & Peek, 2007). The latter refers to the transmission of negative mood states in the context of interpersonal relationships and as such highlights the interpersonal determinants of depression. Investigating depressive symptom contagion processes may thus shed light on interpersonal mechanisms in the development of depressive symptoms, as well as maintenance of such problems in a family context. It has been shown that increases in husbands' depressive mood predict subsequent elevations in their wives' symptom levels (Kouros & Cummings, 2010); however, there is a lack of studies examining such mechanisms with respect to perinatal depressive symptoms. The transition to parenthood entails changing partner dynamics with new parents spending less time

exclusively devoted to their intimate relationship, as well as facing the challenges of navigating the new roles of being parents together. Such changing dynamics may increase partners' vulnerability for contagion processes. Therefore, examining contagion processes in the perinatal period may be of particular importance.

In our theoretical model of perinatal depressive symptoms, we propose that symptom development is governed both by a stable tendency of affective mood over time and by time-specific changes unfolding in the perinatal period, reflecting as such depressive problems as a mental state that may have both stable and transient properties. When investigating contagion processes, the time-specific components are of primary interest, as we are examining the partners' affective mood as a potential external source of time-specific changes in depressive symptoms. Thus, by disentangling stable and time-varying components of depressive symptoms by statistical design, we aim to provide a sound statistical approach to evaluate contagion processes within the parental couple.

Becoming a parent involves considerable changes in personal identity, partner relationships, and family dynamics, creating new relational experiences relevant to the attachment system. Attachment theory posits that the combination of insecure attachment and interpersonal stress may render individuals more prone to developing depressive symptoms (Bowlby, 1980). Following this line of reasoning, one would expect that spousal depression would influence depressive symptomatology predominantly in insecurely attached individuals while securely attached individuals are relatively protected against such influences; however, empirical studies on this issue are scarce (but see Rholes et al. (2011)).

To sum up, with perinatal depression on the rise (Pearson et al., 2018), and studies documenting that partners rarely are included in perinatal depression treatment efforts (Alves, Martins, Fonseca, Canavarro, & Pereira, 2018), more comprehensive knowledge of how depressive symptoms unfold within the parental couple during pregnancy and early

parenthood is called for. Key aspects include understanding the roles and needs of fathers and identifying parents who are vulnerable to prolonged disruptive processes when struggling with depressive symptoms. Our primary goal was to investigate whether either parent's depressive symptoms at one time point predicted the depressive symptom level of the other parent at the subsequent time point, thus delineating time-specific changes in symptom development. We expected stronger effects around and after birth, as the emotional interdependence and reciprocity in the relationship are likely to increase in this period. Moreover, we aimed to investigate whether partner-related attachment moderated these relations, and expected stronger effects with insecure partner-related attachment, as a partner's depressive symptoms may raise a fear of loss of relationship in the insecure partner. This fear may be more salient in the perinatal period where the time devoted to partner relationship is reduced and the birth of a new child may threaten the security of existing attachments between parents (Johnson & Whiffen, 2003).

Method

Procedure and Participants

This study is based on data from 1,036 families participating in the prospective, multisite *Little in Norway* project. Pregnant women ($N = 1,036$) were recruited together with their partners ($N = 878$) at nine well-baby clinics during pregnancy (estimated response rate 50.7%), and were followed until the end of the first postpartum year, with four prenatal (mean gestational weeks 21, 28, 32 and 36; T1 to T4) and three postnatal (6 weeks, 6 months and 12 months after birth; T5 to T7) data collection points. Participant characteristics are presented in Table 1. There were three categories of missingness: late recruitment, as the sample was not complete until gestational week 34; study withdrawal or participants lost to follow-up ($n = 116$); and intermittent missingness, as some participants missed one or more data collection points but participated at later data collection waves. Number of participants

at each data wave is presented in Table 2. For a detailed account of data collection procedures, see Fredriksen, von Soest, Smith, and Moe (2017). Bivariate logistic regression analyses showed that high levels of mothers' depressive symptoms at enrollment predicted attrition at 12 months postpartum (OR = 1.09, 95% CI [1.05, 1.14], $p < .001$), whereas fathers' depressive symptoms at enrollment and attachment levels were not related to dropout ($p > .05$). Written informed consent was obtained from all participants. The study was approved by the Regional Committees for Medical and Health Research Ethics in Norway (#2011/560).

Measures

Depressive symptoms were assessed using the Edinburgh Postnatal Depression Scale (EPDS) for men and women at all seven time points. The EPDS is a 10-item self-report questionnaire measuring depressive symptoms during the previous seven days on a 4-point scale (range: 0–30). It was originally developed for mothers in the postnatal period (Cox, Holden, & Sagovsky, 1987) and has since been validated for prenatal use (Murray & Cox, 1990) and for men (Matthey, Barnett, Kavanagh, & Howie, 2001). In this study, Cronbach's alphas at the various assessments indicated adequate internal consistency (range: .80 – .85 for women; .76 – .84 for men).

Partner-related attachment was assessed by the Experiences in Close Relationships Scale (ECR) at enrollment. The ECR is a 36-item self-report measure of adult romantic attachment styles rated on a 7-point scale, yielding two subscales of underlying attachment: anxiety and avoidance (Brennan, Clark, & Shaver, 1998). When creating grouping variables for the moderator analyses, we used a categorization that ensured that the secure/insecure attachment status was emphasized, rather than the types of insecure patterns. Thus, participants scoring in the lower range on both subscales (cutoff on the 75th percentile) were categorized as securely attached, while those scoring above the cutoff on either one or both of

the subscales were categorized as insecure. In the couples-level moderation analyses, couples in which both partners were categorized as insecurely attached comprised the insecure partner-related attachment group, whereas the secure partner-related attachment group included couples with one or both partners being securely attached.

Statistical Analyses

To examine the relation between maternal and paternal depressive symptoms we used an autoregressive latent trajectory (ALT) model, which combines the strengths of growth curve modeling and autoregressive cross-lagged analyses within a structural equation modeling framework (Bollen & Curran, 2004). This model is particularly suited to examining our hypotheses as it provides an opportunity to investigate the time-adjacent effects among parents while at the same time avoiding potential bias that could result if the parents' mean level and change over time had not been simultaneously modeled (Hamaker, Kuiper, & Grasman, 2015). More specifically, we modeled initial level and linear change in mothers' depressive symptoms (MDS) by estimating random intercepts and slopes in a growth curve framework in addition to the autoregressive effects of prior levels of MDS and the cross-lagged effects of prior levels of fathers' depressive symptoms (FDS). FDS were modeled correspondingly within the same model. As a result of the model specification, time-adjacent effects are within-person effects and thus relative to persons' own mean level of symptoms, rather than relative to the group mean. This implies taking into account confounding due to time-invariant covariates, as inter-individual differences in mean levels of depressive symptoms are partialled out of the autoregressive cross-lagged part of the model. Following Bollen and Curran (2004), the baseline observed variables were treated as predetermined and not included in the intercept and slope. Further, the latent factors and baseline observed variables were allowed to correlate, along with within-time residuals. The linear slopes were parametrized in weeks, providing an estimate of change in depressive symptoms within one

week. Within-time residual correlations were constrained to equality. To explore whether partner-related attachment moderated the relation between partners' depressive symptoms, multi-group analyses were performed to compare ALT model estimates from insecurely and securely attached parents.

Missing data were handled using the full information maximum likelihood procedure (FIML) accounting for missing at random (MAR) assumptions. All data analyses were performed in Mplus version 7.3 using robust maximum likelihood estimation.

Results

Means, standard deviations, and correlations between study variables are presented in Table 2. Symptom scores remained relatively stable throughout the period, with mean paternal symptom levels being somewhat lower than the maternal levels. Mean levels of both MDS and FDS were on the lower end of the scale, as expected in a community sample. At all time points, parental depressive scores were positively correlated (range: $r = .19$ to $.27$) and partner-related attachment showed small to moderate correlations with depressive symptom scores.

Results from the multivariate ALT model are presented in Figure 1. Our theoretical model of symptom development proposed that the repeated measures of maternal and paternal depressive symptoms were governed by both a stable component across the perinatal period, as represented by the slope and intercept factors, and by time-specific changes represented by autoregressive and cross-lagged relations, with our primary interest being the cross-lagged relations. Maternal and paternal symptom trajectories had a declining (slope mean = -0.01 , $p < .001$) and flat trend (slope mean = 0.00 , $p = .717$), respectively. For both parents, there were significant variances in initial status, but not in the slope factors. The maternal autoregressive estimates showed significant associations of prior depressive states with current depressive symptom levels across the entire perinatal period (β ranging from

0.17 to 0.39, $p < .01$, see Figure 1), while paternal autoregressive estimates were only significant in the initial part of pregnancy ($\beta = 0.18$ and 0.23 , $p < .05$, respectively). However, data points were unevenly distributed across time; thus, the relative strength of coefficients at different time points cannot be compared directly. When examining the cross-lagged relations, maternal symptom levels towards the end of pregnancy (T4) predicted paternal depressive symptom levels in the early postpartum period (T5) ($\beta = 0.11$, 95% CI [0.03, 0.18], $p = .006$), while the remaining cross-lagged relations were not significant ($p > .05$).

Moderation hypotheses were tested using three multi-group analyses in which women, men, and couples, respectively, characterized by secure partner-related attachment versus insecure partner-related attachment were compared. Following Hussong, Hicks, Levy, and Curran (2001), a fully constrained model was compared with a model in which the cross-lagged parameters were relaxed, and a significant moderation effects were found for women ($\Delta\chi^2[12] = 66.96$, $p < .01$), men ($\Delta\chi^2[12] = 26.29$, $p < .01$), and couples ($\Delta\chi^2[12] = 38.07$, $p < .01$). As shown in Table 3, post-hoc tests (evaluated by χ^2 -differences with one degree of freedom) revealed that several paths were significantly different between groups. More specifically, a distinct pattern emerged where securely attached individuals and couples did not show significant cross-lagged paths, whereas insecurely attached individuals and couples showed significant cross-lagged paths at multiple time points. Further, results for men and women's analyses indicated that the insecure partner was affected by the partner's depressive symptoms in most instances, whereas cross-lagged relations in the reversed direction were only found on one occasion. In the couples' level analyses, findings showed cross-lagged associations in several instances in both directions, but only in the insecure attachment group. Importantly, the path from MDS at T4 to FDS at T5 that was significant in the single group model was not significantly different across groups in any of the three moderation models.

Discussion

We found that mothers' depressive symptoms at the end of pregnancy predicted fathers' level of depressive symptoms six weeks after the baby was born, however the effect size was small. Replication are thus needed to provide evidence of this result not being a chance finding among a set of null findings. Nevertheless, relations were tested in a conservative modeling context, as the ALT takes into account both time-invariant confounding and effects from the individual's own prior depressive symptoms. Further, the consistency of this particular result across the three moderation models does offer some support. The finding is in line with previous studies of perinatal depression concordance between spouses (Cameron et al., 2016) and provides new knowledge on the temporal pattern of the partner dynamics of symptom development. The statistical modeling approach used takes time-invariant confounding into account, thereby rendering interpretations such as assortative mating, common time-invariant contextual influences or shared health habits unlikely, as these mechanisms would have been manifest as time-invariant components in the model. Thus, the finding provide indications of depressive symptom contagion in the perinatal period, in terms of a transmission of negative mood states from mothers to fathers around the time of birth. This specific timing suggests that the period around birth is a particularly vulnerable time for fathers in terms of being influenced by depressive symptoms in their partners. The finding that women's depressive symptoms are not predicted by men's symptoms at the same time point, may be due to a heightened focus on fetal and maternal well-being in the time around childbirth relative to that of paternal well-being, rendering an effect from men to women less likely.

In accordance with our hypotheses, we found that partner-related attachment moderated the interparental relations of depressive symptoms. In the individual level analyses, results showed a pattern of multiple paths being moderated in the direction of insecurely attached individuals being affected by their partner's symptoms, while the cross-

lagged paths rarely or never pointed in the reverse direction. This pattern was evident for both men and women, and in both pre- and postnatal periods. In the groups with securely attached individuals this pattern of cross-lagged relations did not appear. In the couple-level analyses a similar pattern emerged with cross-lagged paths going from both men and women in the insecure attachment group, whereas such patterns were not found in the securely attached group. These results suggest that depressive symptom contagion processes are associated with insecure attachment in the perinatal period. A reasonable interpretation might be that for insecure individuals a partner's depression may be perceived as a threat to the relationship. The perinatal context, with a diminished focus on the partner relationship may even intensify such perception of threat, thereby rendering the individual more vulnerable to develop depressive symptoms of their own in response to a partner's depressive problems. Finally, our findings also suggest that a secure attachment style buffers against depressive symptom contagion processes when an individual's partner struggles with depressive problems.

Importantly, the cross-lagged path from maternal to paternal depressive symptoms at the time of birth was not moderated in any of the three moderation models. This suggests that new fathers, regardless of attachment status, are vulnerable to depressive symptom contagion in the time around birth, a time characterized by considerable change, emotional interdependence, not to mention a heightened focus on the mother's well-being as she is about to go through childbirth.

This study has several limitations. First, perinatal depression is complex, and it is unlikely that interpersonal perspectives alone can sufficiently explain the heterogeneous presentation and symptom course. Second, depressive symptoms were assessed by self-report; no information on clinical diagnosis was available. Further, the EPDS has been criticized for not taking typical male depressive symptoms into accounts, thus potentially underestimating male symptoms (Madsen & Juhl, 2007). Third, partner-related attachment

was also measured by self-report; thus, associations might be inflated due to shared methods variance. Fourth, data points were unevenly distributed, making direct comparisons of effect sizes among the autoregressive and cross-lagged coefficients difficult. Fifth, selective attrition might be a concern, as dropout was related to reporting depressive symptoms in this study and response rates were relatively low. This may affect results, however, by using FIML to handle missing data we reduced the impact of such selective attrition. Sixth, the study was conducted in Norway, a country with a rather ethnically homogenous population, a high average educational level, and free universal access to perinatal care services including one year paid parental leave. Our results may thus not be generalizable to other contexts. Finally, as in any community-based study, there is a possibility of self-selection bias with an overrepresentation of healthy participants.

Clinicians need to be aware of new fathers' vulnerabilities and needs in cases where mothers show depressive symptoms in the period around birth and direct preventive and treatment efforts at both parents. Notably, as there were relatively low levels of depressive symptoms in this community sample, findings underscore that symptoms do not have to reach clinical levels before one's partner's mental health is affected. Working to prevent symptom development in the initially unaffected parent is especially important considering newborns' need for emotional availability of their caretakers. Specific attention should be directed to identifying susceptible parents as indicated by insecure attachment styles. In future studies, increased efforts to understand temporal processes of perinatal depressive symptom development within the family context are needed.

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Figure 1

Standardized Parameter Estimates from the Single Group Autoregressive Latent Trajectory Model.

Note. * $p < .05$; ** $p < .01$. MDS = mothers' depressive symptoms; FDS = fathers' depressive symptoms; M = means; Var = variances. The variance of MDS slope factor was fixed to zero to allow for convergence. Model fit: $\chi^2(61) = 85.19$, CFI = 0.989, TLI = 0.984, RMSEA = 0.020, 90% CI [0.008, 0.029].

Table 1

Demographic Information for Mothers and Fathers Participating in the Study

	Mothers Mean (SD) / Proportion	Fathers Mean (SD) / Proportion
Age	30.26 (4.78)	32.76 (5.90)
Education (in years)	16.05 (2.13)	15.59 (2.37)
Ethnic minority	6.1%	4.6%
First-time parent	54.9%	56.2%
Work status:		
Full-time job	77.3%	91.0%
Part-time job	7.4%	1.7%
Student	11.6%	6.2%
Disability/Unemployed/At home	3.8%	1.0%
Relationship status:		
Married	36.2%	35.2%
Living together	59.7%	62.4%
Single	2.5%	0.9%
Divorced	0.2%	0.2%
Other	1.4%	1.2%

Note. SD = Standard Deviation.

Table 2

Intercorrelations and Descriptive Statistics of all Study Variables

	M	SD	N	N _{Coupl} e	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
<i>Mothers' depressive symptoms</i>																				
(1) at T1	4.41	3.73	659	487																
(2) at T2	4.41	3.76	579	428	.69**															
(3) at T3	4.68	4.07	906	460	.60**	.72**														
(4) at T4	4.67	4.00	913	466	.56**	.63**	.73**													
(5) at T5	3.75	3.39	930	671	.41**	.46**	.48**	.49**												
(6) at T6	3.08	3.41	860	558	.42**	.47**	.47**	.44**	.56**											
(7) at T7	3.05	3.17	762	504	.49**	.51**	.55**	.55**	.47**	.56**										
<i>Fathers' depressive symptoms</i>																				
(8) at T1	2.44	2.81	487	487	.24**	.23**	.16**	.21**	.11*	.20**	.14**									
(9) at T2	2.36	2.80	590	428	.16**	.19**	.19**	.16**	.09*	.10**	.13**	.66**								
(10) at T3	2.71	3.34	487	460	.12*	.12*	.19**	.16**	.10*	.13*	.11*	.51**	.63**							
(11) at T4	2.39	2.74	486	466	.15*	.16**	.21**	.19**	.07	.08	.18**	.56**	.65**	.67**						
(12) at T5	2.41	2.71	677	671	.14**	.17**	.18**	.21**	.21**	.17**	.20**	.52**	.50**	.54**	.60**					
(13) at T6	2.57	2.99	575	558	.14*	.14**	.22**	.20**	.12**	.21**	.19**	.50**	.52**	.61**	.62**	.57**				
(14) at T7	2.38	2.82	540	504	.23**	.17**	.21**	.24**	.17**	.24**	.27**	.41**	.51**	.55**	.56**	.50**	.61**			
<i>Partner-related attachment</i>																				
(15) Couples ¹	0.19	0.40	878	878	.33**	.30**	.29**	.33**	.22*	.22**	.23**	.27**	.17**	.22**	.23**	.22**	.22**	.14**		
(16) Mothers ¹	0.39	0.49	1,036	878	.38**	.35**	.33**	.36**	.24**	.27**	.31**	.16**	.05	.12*	.15**	.12**	.11**	.08	.61**	
(17) Fathers ¹	0.41	0.49	878	878	.12**	.11*	.14**	.14**	.10**	.08*	.07	.32**	.28**	.34**	.33**	.22**	.26**	.27**	.59**	.15**

Note. *M* = mean, *SD* = Standard deviation, *N* = Number of participants. *N*_{couple} = Number of couples where both mother and father participated at the specific time points

¹Partner-related attachment was coded: 0 = securely attached parents and 1 = insecurely attached parents. Positive correlations thus reflect higher depressive symptom level among insecurely attached parents.

* $p < .05$, ** $p < .01$

Table 3

Multi-Group Moderation Analyses to Identify Differences in Cross-Lagged Paths Between Parents Characterized by Secure versus Insecure Attachment

	Women's attachment as moderator			Men's attachment as moderator			Couples' attachment as moderator		
	$\Delta\chi^2(1)$	Secure attachment group β (n = 627)	Insecure attachment group β (n = 409)	$\Delta\chi^2(1)$	Secure attachment group β (n = 523)	Insecure attachment group β (n = 356)	$\Delta\chi^2(1)$	Secure attachment group β (n = 710)	Insecure attachment group β (n = 168)
<i>Predicting men's symptom levels</i>									
women T1 → men T2	0.13	0.06	0.04	4.59*	-0.01	0.11	1.55	0.02	0.09
women T2 → men T3	0.71	0.00	0.05	8.20**	-0.03	0.15*	4.45	-0.01	0.14
women T3 → men T4	8.50**	-0.02	0.11*	13.52**	0.00	0.16**	11.00	0.01	0.17**
women T4 → men T5	2.47	0.07	0.13**	0.85	0.09*	0.13*	0.91	0.09*	0.14**
women T5 → men T6	1.04	0.01	0.06	14.04**	-0.04	0.13**	9.60	-0.01	0.16**
women T6 → men T7	0.19	0.05	0.08	5.02*	0.01	0.15	5.31	0.03	0.20*
<i>Predicting women's symptom levels</i>									
men T1 → women T2	16.58**	-0.06	0.21**	0.05	0.02	0.01	1.55	-0.01	0.09
men T2 → women T3	11.66**	-0.01	0.17**	0.36	0.02	0.05	4.47	0.01	0.15*
men T3 → women T4	18.82**	-0.05	0.20**	0.00	0.03	0.03	12.17	-0.04	0.17**
men T4 → women T5	0.05	0.04	0.05	0.00	0.04	0.04	0.25	0.04	0.10
men T5 → women T6	6.16*	-0.06	0.09	0.01	0.00	0.00	1.71	-0.02	0.07
men T6 → women T7	15.75**	-0.03	0.17**	0.05	0.05	0.04	1.98	0.01	0.10

Note. * $p < .05$, ** $p < .01$. Bold font indicates paths that are significantly moderated. Women and men scoring above the 75th percentile of either one or both Experiences in Close Relationships subscales were categorized into the insecure attachment group. Couples' were categorized into the insecure couples' attachment group when both partners were categorized as insecurely attached.