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**Longitudinal associations between depressive symptoms and postpartum sexual concerns  
among first-time parent couples**

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**Abstract**

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3 Most first-time parents experience novel concerns about their sexuality such as worries about the  
4 effects of labour and delivery on their sex life. The link between postpartum depressive  
5 symptoms and problems with sexual function is bidirectional; however, associations with  
6 postpartum sexual concerns (i.e., worries about one's sexuality that are not necessarily related to  
7 sexual function) have not been examined. First-time parent couples ( $N = 99$ ) completed measures  
8 assessing their postpartum sexual concerns and depressive symptoms at 3-, 6-, and 12-months  
9 postpartum. Dyadic latent growth curve modelling revealed that mothers' and partners' initial  
10 frequencies of postpartum sexual concerns were positively associated, with significant declines  
11 in the frequency of these concerns over time for both partners. Mothers' and partners' initial  
12 depressive symptoms were also positively associated; however, mothers' depressive symptoms  
13 did not change over time whereas partner's depressive symptoms worsened. Mothers' and  
14 partners' higher initial depressive symptoms were associated with partners' higher frequency of  
15 postpartum sexual concerns. Mothers' depressive symptoms at 3 months postpartum and the  
16 degree to which these symptoms changed over time were associated with a steeper decline in  
17 partners' postpartum sexual concerns over time. Results provide preliminary support for  
18 depressive symptoms as a risk factor for partners' postpartum sexual concerns.

19  
20 *Keywords:* postpartum sexual concerns, depressive symptoms, couples, longitudinal, transition to  
21 parenthood

1           The transition to parenthood is associated with marked changes to couples' sexual  
2 relationship, which many new parents find distressing (Schlagintweit et al., 2016). Postpartum  
3 sexual concerns are defined as worries about sexuality or changes to one's sexual relationship  
4 that are specific to the postpartum period—the year following the birth of a child. For example,  
5 these concerns include worries about when to resume and the frequency of sexual activity  
6 following the birth of a child, lack of time and energy for sex due to child-rearing, the influence  
7 of body image changes on sexuality, and the effect of breastfeeding on vaginal dryness, among  
8 others (Pastore et al., 2007). The majority of new parents report experiencing postpartum sexual  
9 concerns, yet there is limited understanding of how these concerns change over time as new  
10 parent couples adjust to the demands of new parenthood (Pastore et al., 2007; Schlagintweit et  
11 al., 2016). Indeed, it is possible that postpartum sexual concerns are most prevalent when couples  
12 typically resume sexual activity (i.e., around three months postpartum; Connolly et al., 2005),  
13 but that these concerns decrease over time (i.e., as couples approach 12 months postpartum);  
14 however, this has not yet been established in the literature. Pastore et al. (2007) did not find any  
15 significant associations between factors related to labor and delivery and frequency of  
16 postpartum sexual concerns, but no research has examined other factors specific to the  
17 postpartum period that may contribute to the experience of postpartum sexual concerns. Given  
18 the bidirectional links between postpartum depressive symptoms and sexual function among  
19 mothers (Chang et al., 2018; Dawson et al., 2020), we may also observe reciprocal links between  
20 postpartum depressive symptoms and the frequency of postpartum sexual concerns. The purpose  
21 of the current study was to establish trajectories of the frequency of postpartum sexual concerns  
22 and depressive symptoms for mothers and partners and to examine the links between these

1 variables, accounting for the shared experience of new parenthood and the interpersonal context  
2 of the sexual relationship.

### 3 *Postpartum sexual concerns*

4       Problems with sexual function—defined as experiencing pain during intercourse,  
5 difficulty reaching orgasm, and problems with vaginal lubrication, sexual desire and arousal—  
6 have been the focus of much of the research on postpartum sexuality (e.g., Dawson et al., 2020;  
7 McBride & Kwee, 2016). Much less is understood regarding the worries and concerns that new  
8 parents have with respect to how pregnancy, childbirth, and child-rearing changes their  
9 sexualities and the sexual relationship. Cross-sectional studies reveal that in previous studies  
10 between 30% to 89% of mothers and 36% to 89% of partners report experiencing more than 10  
11 sexual concerns unique to the transition to parenthood (Pastore et al., 2007; Schlagintweit et al.,  
12 2016), highlighting that many couples experience concerning changes to their sexuality during  
13 the postpartum period. Mothers' most frequent concerns include worries about their body image  
14 and its impact on sexual activity after a baby, as well as concerns regarding the physical impact  
15 of labor, delivery, breastfeeding, childrearing, and sleep deprivation on sexual activity  
16 (Schlagintweit et al., 2016). Partners share similar concerns to mothers, but their most commonly  
17 reported postpartum sexual concerns also include the impact of mothers' mood swings (not  
18 postpartum depression) on sexual activity and having a mismatch in sexual desire (Schlagintweit  
19 et al., 2016). Important for the current study, between 33% to 77% of mothers and partners  
20 reported concerns regarding the impact of postpartum depression on their sexual relationship  
21 (Pastore et al., 2007; Schlagintweit et al., 2016), highlighting a potential link between postpartum  
22 depressive symptoms and frequency of postpartum sexual concerns.

1           Despite the inherently interpersonal nature of new parenthood and adjusting to sex after a  
2 baby, few studies have examined the frequency of postpartum sexual concerns for *both* partners  
3 and none to our knowledge have examined how postpartum sexual concerns evolve over time.  
4 According to family systems theory, family members—such as romantic partners—influence one  
5 another in a reciprocally reinforcing manner due to their interdependent life experiences  
6 (Minuchin, 1988; O’Brien, 2005). In line with this theory, the postpartum sexual concerns of one  
7 partner would be expected to be related to the postpartum sexual concerns of the other partner  
8 because the sexual relationship is common to both members of the couple. Hence the importance  
9 of taking a dyadic approach to account for this interdependence. Given that mothers and partners  
10 differ in their most commonly reported postpartum sexual concerns, it is possible that how these  
11 concerns change over time may also differ (i.e., show different trajectories). Most couples have  
12 resumed sexual activity by three months postpartum (Connolly et al., 2005). It follows that the  
13 frequency of postpartum sexual concerns might be greatest at this time, and that the number of  
14 sexual concerns may improve over time as they adjust to their roles as parents, and as the  
15 physical demands of pregnancy, labor, and delivery, and breastfeeding lessen. It is also possible  
16 that despite the shared experience of new parenthood, mothers and partners may show different  
17 trajectories (e.g., stable versus decreasing numbers of concerns). Mothers are often the ones to  
18 bear more of the burden associated with childcare and housework, in addition to physical  
19 recovery from childbirth and breastfeeding and may experience more change relative to their  
20 partners (Dush et al., 2018; Goldberg & Perry-Jenkins, 2007).

### 21 *Postpartum depressive symptoms and postpartum sexual concerns*

22           The challenges of the postpartum period for new parents may engender changes in mood;  
23 namely, depressive symptoms (Slomian et al., 2019). Up to 26% of new mothers and partners

1 report experiencing postpartum depressive symptoms with the prevalence increasing at 3- and 6-  
2 months postpartum (meta-analyzed in 43 studies; Paulson & Bazemore, 2010). Longitudinal  
3 studies, largely focused on mothers, show that depressive symptoms tend to decline over the  
4 postpartum period (Vliegen et al., 2014). Most research focuses on postpartum depressive  
5 symptoms in mothers; however, there is evidence to support an interpersonal context to  
6 postpartum depression consistent with family systems theory (Minuchin, 1988; O'Brien, 2005).  
7 Specifically, mothers' and partners' postpartum depressive symptoms are significantly and  
8 positively related ( $r = .31$ ; Paulson & Bazemore, 2010).

9         The most conclusive evidence for a bidirectional relationship between depression and  
10 sexual function comes from a meta-analysis of studies of women and men not in the transition to  
11 parenthood (Atlantis & Sullivan, 2012). Using prospective data from 3,285 individuals followed  
12 between two and nine years, Atlantis and Sullivan (2012) found that depression significantly  
13 increased the risk of problems with sexual function ( $OR = 1.52$ ). Using data from 11,171  
14 individuals followed between one and ten years, they found that problems with sexual function  
15 were associated with significantly increased risk of depression ( $OR = 2.30$ ). With regards to the  
16 relationship between depression and sexuality during the transition to parenthood, there was  
17 similar evidence of bidirectionality, at least for mothers. Cross-sectional studies examining  
18 mothers with and without postpartum depressive symptoms have found that those with  
19 depressive symptoms experience lower sexual desire (Moel et al., 2010), lower sexual  
20 satisfaction (Asselmann et al., 2016), and poorer overall sexual function (Chivers et al., 2011). In  
21 a prospective study, compared to mothers with greater sexual function, those with lower sexual  
22 function had significantly increased risk of depressive symptoms in the 24 months following the  
23 birth of a child ( $OR = 1.62$ ; Chang et al., 2018). In a longitudinal study of first-time mothers,

1 depressive symptoms at 3 months postpartum were associated with increased odds of  
2 membership in trajectories characterized by moderate ( $OR = 1.07$ ) or marked ( $OR = 1.11$ ) sexual  
3 function problems (Dawson et al., 2020).

4         Prior studies examining postpartum depressive symptoms and sexuality have focused on  
5 overall sexual function and have not examined bidirectional links with more general worries  
6 about changes to the sexual relationship that are unique to, and arise following, the birth of a  
7 baby. Cognitive biases underpinning depression, such as interpreting neutral situations as  
8 negative, discounting positive information, and paying greater attention to negative information  
9 (Beck, 1967; Disner et al., 2011), may contribute to a greater frequency of postpartum sexual  
10 concerns and less improvement in these sexual concerns over time. For example, mothers and  
11 partners who are higher in depressive symptoms at three months postpartum may be more  
12 hypervigilant to adverse changes in their sexual relationship (e.g., reduced sexual frequency) or  
13 be more likely to interpret and amplify common changes as negative (e.g., changes in sexual  
14 self-perception now that they are a parent). These cognitive biases would be expected to result in  
15 a greater frequency of postpartum sexual concerns, as well as concerns that persist over time. It  
16 is also possible that couples experiencing greater difficulty adjusting their sexual relationship  
17 following the birth of a baby (i.e., more frequent sexual concerns) may internalize these  
18 difficulties, reinforcing negative emotions (e.g., guilt and shame) common to depression  
19 (Berman et al., 2003; Laurent & Simons, 2009).

#### 20 ***The current study***

21         Overall, previous research suggests that mothers and partners experience concerning  
22 changes that are specific to their postpartum sexuality during the transition to parenthood.  
23 Postpartum depression is a risk factor for problems with sexuality more generally and has been

1 linked to more sexual problems during the postpartum period; however, there is also evidence to  
2 support sexual problems contributing to increased risk of depressive symptoms. The aims of the  
3 current study were: 1) to establish the trajectories of postpartum sexual concerns and depressive  
4 symptoms for mothers and partners across 3-, 6-, and 12-months postpartum, accounting for the  
5 interdependence of both postpartum sexual concerns and depressive symptoms; and 2) to  
6 examine the associations between sexual concerns and depressive symptoms at 3 months  
7 postpartum (i.e., when most couples have resumed sexual activity; Connolly et al., 2005), as well  
8 as how changes in postpartum sexual concerns and depressive symptoms relate to each other  
9 over time.

10 We hypothesized that 1) both postpartum sexual concerns and depressive symptoms  
11 would be initially high and then decline significantly over the postpartum period for both  
12 mothers and partners; and 2) mothers' and partners' initial frequencies of postpartum sexual  
13 concerns and initial levels of depressive symptoms would be positively associated (i.e., at 3  
14 months postpartum). No a priori predictions were made regarding whether mothers' slopes  
15 would be related to their partners' slopes. Regarding the bidirectional links, we hypothesized that  
16 3) mothers' and partners' initial depressive symptoms would be positively associated with their  
17 own and their partners' initial sexual concerns (i.e., at 3 months postpartum); 4) mothers' and  
18 partners' initial depressive symptoms would be associated with their own and their partner's  
19 change in sexual concerns over time (i.e., slopes); 5) mothers' and partners' initial frequency of  
20 postpartum sexual concerns would be associated with their own and their partner's change in  
21 depressive symptoms over time (i.e., slopes); and 6) change in mothers' and partners' postpartum  
22 sexual concerns and depressive symptoms would be positively associated.

23

### Method



## 1 *Participants*

2           The current study was a sub-study of a larger project examining the biopsychosocial  
3 determinants of mothers' genito-pelvic pain and sexuality from pregnancy through two years  
4 postpartum. For the larger project, mothers were initially recruited through a local hospital where  
5 research assistants identified potentially eligible mothers prior to their routine anatomical  
6 ultrasound appointment scheduled at approximately 20-weeks gestation. Mothers were eligible if  
7 they had a first-time, single, uncomplicated pregnancy, the ability to read and speak English,  
8 access to a personal email account, and were above 18 years of age. Mothers with a self-reported  
9 severe medical or psychiatric disease were excluded if it was not well-managed. For the current  
10 sub-study, a sample of 202 mothers participating in the larger study were invited to participate  
11 and if interested, were asked to invite their partners. Thirty-seven mothers did not respond to the  
12 invitation, 27 partners and 17 mothers declined the invitation, and 5 mothers reported no longer  
13 being in a relationship. Of the eligible sample of mothers ( $n = 116$ ), 106 (91%) completed the 3  
14 months postpartum survey. Partners were only sent the survey after mothers had completed it; of  
15 the eligible sample of partners ( $n = 106$ ), 99 (93%) completed the postpartum survey at 3 months  
16 postpartum. Given that both members of the couple needed to have completed the survey at 3  
17 months postpartum to be included in the current study, the total sample available for analysis was  
18 99 couples. Mothers reported demographic information in the baseline 20-week gestation survey,  
19 whereas partners reported this information at 3 months postpartum (see Table 1). The majority of  
20 partners ( $n = 97$ ; 98%) identified as male, with one partner identifying as female and one as two-  
21 spirit.

## 22 *Procedure*

1           As stated above, at 3 months postpartum, mothers from the larger longitudinal study were  
2 approached and asked if they and their partners were willing to participate. Interested partners  
3 were then called by a research assistant to be enrolled in the study and completed informed  
4 consent electronically at the start of their first survey. Online surveys assessing frequency of  
5 postpartum sexual concerns and depressive symptoms were administered to mothers and partners  
6 at 3-, 6-, and 12-months postpartum using Qualtrics survey software. Survey links expired after 4  
7 weeks. E-mail and phone call reminders were conducted to promote participation and  
8 engagement with the study (Dawson et al., 2020). Mothers received \$10 gift certificates to  
9 Amazon.ca for the 20-week survey, and \$15 gift certificates for each of the postpartum surveys  
10 (because their compensation included measures completed for the larger study), and partners  
11 received \$10 in gift cards for each of the postpartum surveys. The study was approved by the  
12 ethical review board at the IWK Health Centre (Halifax, Nova Scotia, Canada).

### 13 *Measures*

14           Mothers were asked to report at baseline their age, type of relationship (e.g., married,  
15 engaged, or common law), relationship length, highest level of education, combined annual  
16 income, ethnic background, and sexual orientation. Partners reported their age, highest level of  
17 education, ethnic background, sexual orientation, and gender.

### 18 *Postpartum Sexual Concerns*

19           Frequency of postpartum sexual concerns was measured using the Postpartum Sexuality  
20 Concerns Questionnaire (PSCQ; Pastore et al., 2007; Schlagintweit et al., 2016). The items in the  
21 PSCQ were generated by informal focus groups of new parents who had recently given birth  
22 (Pastore et al., 2007), followed by formal pre-testing via mailed surveys. The PSCQ was initially  
23 designed to assess the presence/absence of a list of sexual concerns specific to the postpartum

1 period (i.e., yes/no; Pastore et al., 2007), rather than the presence or absence of specific sexual  
2 problems that would be more reliably assessed via measures of sexual function. In the current  
3 study we used a modified version of the PSCQ that has been used in more recent research  
4 examining postpartum sexual concerns (Schlagintweit et al., 2016). The revised PSCQ required  
5 participants to rate each concern using the following 7-point scale 1 (*not at all concerned*) to 7  
6 (*extremely concerned*). This version of the PSCQ included one additional sexual concern  
7 regarding the impact of changes in one's partner's body image on sexual activity after childbirth  
8 (to mirror the same item that was asked about one's own body image) for a total of 20 items  
9 (Schlagintweit et al., 2016). For the current study, and in line with the original design of the  
10 questionnaire (Pastore et al., 2007), we calculated the sum of the number of sexual concerns that  
11 were rated as 2 or higher on the 7-point scale. Thus, a total score, ranging from 0 to 20, only  
12 included areas of postpartum sexuality that were associated with some degree of concern or  
13 distress for the participant (Schlagintweit et al., 2016). Sample items include "*Frequency of*  
14 *intercourse between my partner and me*" and "*The impact of child-rearing duties on time for*  
15 *sexual activity.*" Consistent with previous research (Schlagintweit et al., 2016), the current study  
16 showed excellent internal consistency for both mothers ( $\alpha$ s = .86 to .90 across time points) and  
17 partners ( $\alpha$ s = .88 to .91 across time points).

### 18 *Postpartum Depressive Symptoms*

19 Depressive symptoms were measured using the 10-item Edinburgh Postnatal Depression  
20 Scale (EPDS; Cox et al., 1987). This measure assesses depressive symptoms in the past seven  
21 days and has been validated for use among women and men during the postpartum period  
22 (Matthey et al., 2001). The measure is scored on a 4-point likert scale with total scores ranging  
23 from 0 to 30. Higher scores indicate more depressive symptoms, with scores greater than 13

1 indicative of postpartum depression. This measure has demonstrated excellent psychometric  
2 properties (Cox et al., 1987). The current study showed excellent internal consistency for both  
3 mothers ( $\alpha$ s = .81 to .83) and partners ( $\alpha$ s = .84 to .89) across time points.

#### 4 ***Data analysis***

5 Descriptive statistics were calculated with SPSS version 25.0 and all other analyses were  
6 estimated with *Mplus* version 8.4 (Muthén & Muthén, 1998-2015). Descriptives and correlations  
7 between postpartum sexual concerns and postpartum depressive symptoms across time-points  
8 and between partners are available in Table 2. Prior to calculating total scores, maximum  
9 likelihood imputation was used provided that the missing data within a measure was less than  
10 20% of the total number of items in a given measure (Newman, 2003). Full Information  
11 Maximum Likelihood was used within the dyadic latent growth curve models (DLGCM) to  
12 estimate missing data due to attrition, enabling all 99 couples who provided data for at least one  
13 of the time points to be retained for analyses.

14 DLGCM within a structural equation model (SEM; Kenny et al., 2006; Peugh et al.,  
15 2013) were used to establish trajectories of mothers' and partners' sexual concerns and  
16 postpartum depressive symptoms. These DLGCMs were tested within an Actor-Partner  
17 Interdependence Model (APIM; Kenny et al., 2006). APIM is a model that includes actor effects  
18 (i.e., the relationship between one's own intercept and one's own slope controlling for partner  
19 effects) and partner effects (i.e., the relationship between one's own intercept and their partner's  
20 slope controlling for actor effects). Members of the couple were distinguished based on the  
21 person who gave birth (i.e., mother) and the person who did not give birth (i.e., partner). We  
22 adjusted the weights for each of the time points to account for the varied sampling time-frames

1 postpartum. This adjustment means that the slope value can be interpreted as the unit change per  
2 month between 3 and 12 months postpartum.

3 First, unconditional linear models for sexual concerns and depressive symptoms were ran  
4 separately to establish: 1) initial levels of sexual concerns and depressive symptoms (i.e.,  
5 intercepts); 2) changes in sexual concerns and depressive symptoms across 3-, 6-, and 12-months  
6 postpartum (i.e., slopes); and 3) covariance between mothers' and partners' intercepts and slopes  
7 for both sexual concerns and depressive symptoms (i.e., actor and partner effects reported as  
8 standardized correlation coefficients). See Figure 1 for an example of the unconditional model.  
9 Second, to investigate bidirectional relationships between postpartum sexual concerns and  
10 postpartum depressive symptoms, a parallel DLGCM using the above unconditional models was  
11 conducted. The parallel DLGCM enabled an examination of two growth trajectories  
12 simultaneously in order to evaluate the associations between mothers' and partners' intercepts  
13 and slopes. Given that the intercepts have temporal precedence over the slopes, the parallel  
14 model also allowed us to investigate directionality, that is whether initial postpartum sexual  
15 concerns are associated with change in depressive symptoms and the reverse. There is currently  
16 no consensus regarding required sample sizes for these analyses. Recommendations include a  
17 sample size of at least  $n = 50$  and ideally  $n = 100$  in order to avoid convergence and model fit  
18 problems and to have trustworthy parameter estimates (Curren et al., 2010). Model fit was  
19 evaluated using a chi-square value at or above  $p = .05$ , Standardized Root Mean Square Residual  
20 (SRMR) of less than .08, a Comparative Fit Index (CFI) and Tucker Lewis Index (TLI) of  
21 greater than .95, and a Root Mean Square Error of Approximation (RMSEA) of less than .06 for  
22 good fit (Hu & Bentler, 1999).

23

## Results

1           There was minimal attrition over time, with retention rates of 99% and 94% between 3  
2 and 6 months for mothers and partners, respectively, and 99% and 94% between 3 and 12  
3 months for mothers and partners, respectively. Data, syntax, and output are available on the  
4 Open Science Framework (<https://osf.io/nqb7k/>).

#### 5 *Frequency of postpartum sexual concerns*

6           The initial unconditional linear model had a negative residual variance for partner's  
7 postpartum sexual concerns at 12-months postpartum and for the latent construct of mothers'  
8 slope. To address these issues, both residual variances were constrained to zero. The  
9 unconditional linear model for sexual concerns had good fit indices:  $\chi^2(12) = 11.17, p = .51$ ; CFI  
10 = 1.00, TLI = 1.00, RMSEA = 0.00 [CI = 0.00 – 0.10]; SRMR = 0.08. Mothers' (12.46,  $SE =$   
11 0.50,  $p < .001$ ) and partners' (11.80,  $SE = 0.49, p < .001$ ) sexual concerns intercepts were both  
12 significant. There was also significant variance for mothers' (17.18,  $SE = 2.92, p < .001$ ) and  
13 partners' (16.07,  $SE = 3.67, p < .001$ ) intercepts, indicating significant variability in reported  
14 sexual concerns at 3 months postpartum for mothers and partners. Both mothers' (-0.13,  $SE =$   
15 0.05,  $p = .01$ ) and partners' (-0.13,  $SE = 0.06, p = .03$ ) sexual concerns declined significantly  
16 over time (see Figure 2). Variance for partners' slope (0.20,  $SE = 0.05, p < .001$ ) was significant,  
17 indicating that the rate at which partners' sexual concerns declined over time differed within  
18 partners. Variance in mothers' slope was not estimated as it was fixed to zero in the model  
19 specification.

20           Covariance between mothers' and partners' sexual concerns was used to examine APIM  
21 relationships and are reported as correlation coefficients. Mothers' and partners' initial levels of  
22 sexual concerns (i.e., intercepts) were significantly positively related (0.33,  $SE = 0.12, p = .008$ ),  
23 meaning that mothers with higher frequency of postpartum sexual concerns at 3 months

1 postpartum tended to have partners who also reported higher frequency of postpartum sexual  
2 concerns. Mothers' and partners' initial levels of postpartum sexual concerns were not related to  
3 partners' rate of change over time ( $-0.13$ ,  $SE = 0.14$ ,  $p = .33$  and  $0.07$ ,  $SE = 0.19$ ,  $p = .74$ ,  
4 respectively). No actor or partner effects were able to be examined with regards to mothers'  
5 slope as the variance was fixed to zero.\*

### 6 *Postpartum depressive symptoms*

7         At 3-, 6-, and 12-months postpartum, 7.14%, 6.06%, and 4.30% of mothers exceeded the  
8 clinical cut-off for depression. In contrast, 6.06%, 8.79%, and 13.10% of partners exceeded the  
9 clinical cut-off over the same period. The unconditional linear model for depressive symptoms  
10 had good model fit:  $\chi^2(7) = 1.06$ ,  $p = .99$ ; CFI = 1.00, TLI = 1.00, RMSEA = 0.00 [CI = 0.00 –  
11 0.00]; SRMR = 0.01. Mothers' ( $5.33$ ,  $SE = 0.39$ ,  $p < .001$ ) and partners' ( $5.01$ ,  $SE = 0.39$ ,  $p <$   
12  $.001$ ) intercepts were both significant. There was significant variance in mothers' ( $11.58$ ,  $SE =$   
13  $2.35$ ,  $p < .001$ ) and partners' ( $10.85$ ,  $SE = 2.37$ ,  $p < .001$ ) intercepts, indicating variability within  
14 mothers and partners in terms of their reported depressive symptoms at 3 months postpartum.  
15 Mothers' depressive symptoms did not change significantly over time ( $-0.06$ ,  $SE = 0.05$ ,  $p = .24$ );  
16 however, there was significant variance in mothers' slope ( $0.15$ ,  $SE = 0.06$ ,  $p = .02$ ), suggesting  
17 that mothers differed in the degree to which their depressive symptoms changed over time.  
18 Partners' depressive symptoms increased significantly over time ( $0.10$ ,  $SE = 0.05$ ,  $p = .04$ ), with  
19 no significant variance ( $0.05$ ,  $SE = 0.08$ ,  $p = .51$ ), suggesting that partners' depressive symptoms  
20 increased at a similar rate (see Figure 3).

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\* We also ran the unconditional model using the total score for the severity of sexual concerns reported on the PSCQ. While the general pattern of results was the same as for the frequency of postpartum sexual concerns total score, the model fit indices were not as good, leading us to conclude that the model estimates were less trustworthy. Full reporting of this analysis is available in a supplemental file located here: <https://osf.io/nqb7k/>.

1 Covariance between mothers' and partners' depressive symptoms was used to examine  
2 APIM relationships. Mothers' and partners' intercepts were positively related ( $0.33, SE = 0.12, p$   
3  $= .008$ ), indicating that mothers with higher depressive symptoms at 3 months postpartum tended  
4 to have partners who also reported higher depressive symptoms at 3 months postpartum.  
5 Mothers' depressive symptoms at 3 months postpartum were negatively associated with their  
6 own rate of change ( $-0.50, SE = 0.11, p < .001$ ), meaning mothers with higher depressive  
7 symptoms at 3 months postpartum showed steeper declines in their own depressive symptoms  
8 over time. Mothers' depressive symptoms at 3 months postpartum were not significantly  
9 associated with her partners' slope ( $-0.02, SE = 0.23, p = .93$ ). Partners' depressive symptoms at  
10 3 months postpartum were not significantly related to their own slope ( $0.26, SE = 0.52, p = .61$ )  
11 or to mothers' slope ( $-0.09, SE = 0.14, p = .53$ ). Mothers' and partners' slopes were not  
12 significantly related ( $0.07, SE = 0.26, p = .80$ ). Together this suggests that an individual's own  
13 depressive symptoms at 3 months postpartum were unrelated to their partners' rate of change in  
14 depressive symptoms and that mothers' and partners' depressive symptoms postpartum were not  
15 changing together.

#### 16 *Parallel model of postpartum sexual concerns and depressive symptoms*

17 The parallel DLGCM examining the relationships between postpartum sexual concerns  
18 and depressive symptoms had good fit indices:  $\chi^2(43) = 42.37, p = .50$ ; CFI = 1.00, TLI = 1.00,  
19 RMSEA = 0.00 [CI = 0.00 – 0.07]; SRMR = 0.06. The relationships with mothers' postpartum  
20 sexual concerns slope were not examined as the variance was fixed to zero in the unconditional  
21 model reported above. Only those APIM relationships between mothers' and partners'  
22 postpartum sexual concerns with depressive symptoms (and vice versa) are reported here, as the



1 other APIM relationships (e.g., associations between mothers' and partners' latent constructs for  
2 postpartum sexual concerns) are reported separately in the two unconditional models above.

3 First, we examined the degree to which initial levels of postpartum sexual concerns and  
4 depressive symptoms were related. Mothers' initial depressive symptoms were not significantly  
5 associated with their own initial levels of postpartum sexual concerns ( $0.17, SE = 0.12, p = .17$ ),  
6 but were positively associated with their partners' initial levels of postpartum sexual concerns  
7 ( $0.34, SE = 0.13, p = .006$ ). Partners' initial depressive symptoms were significantly associated  
8 with their own initial levels of postpartum sexual concerns ( $0.46, SE = 0.13, p = .001$ ), but were  
9 not significantly associated with mothers' initial levels of postpartum sexual concerns ( $0.21, SE$   
10  $= 0.12, p = .10$ ).

11 Next, we examined the degree to which initial depressive symptoms were associated with  
12 change in postpartum sexual concerns, Mothers' initial depressive symptoms were significantly  
13 negatively associated with their partners' change in postpartum sexual concerns over time ( $-0.48,$   
14  $SE = 0.13, p < .001$ ). Partners' initial depressive symptoms were not significantly associated with  
15 their own change in postpartum sexual concerns over time ( $-0.03, SE = .15, p = .82$ ). Mothers'  
16 change in sexual concerns were not examined as the variance was fixed to zero. In sum, higher  
17 depressive symptoms at 3 months postpartum in mothers and partners were significantly  
18 associated with a higher frequency of postpartum sexual concerns for partners at 3 months  
19 postpartum. Mothers' higher depressive symptoms at 3 months were also associated with a  
20 steeper decline in how their partner's postpartum sexual concerns resolved over time.

21 The parallel model also enabled us to examine the other direction of the relationships,  
22 that is, between postpartum sexual concerns and depressive symptoms. Mothers' initial levels of  
23 postpartum sexual concerns were not significantly associated with their own change in

1 depressive symptoms over time ( $0.19, SE = .14, p = .17$ ) or their partners' change in depressive  
2 symptoms ( $-0.02, SE = .26, p = .94$ ). Partners' initial postpartum sexual concerns were also not  
3 significantly associated with their own change in depressive symptoms ( $0.32, SE = .44, p = .48$ )  
4 or mothers' change in depressive symptoms ( $-0.11, SE = .16, p = .49$ ). In sum, these results  
5 suggest that initial levels of postpartum sexual concerns are not significantly associated with how  
6 depressive symptoms change over the postpartum period.

7 Finally, we examined associations between slopes, that is, if changes to postpartum  
8 sexual concerns and depressive symptoms are moving together (i.e., in parallel). The degree to  
9 which mothers' depressive symptoms improved over time was positively associated with the  
10 degree to which their partners' sexual concerns improved ( $0.41, SE = .17, p = .02$ ). Change in  
11 partners' sexual concerns was not significantly associated with change in their own depressive  
12 symptoms ( $0.19, SE = .33, p = .58$ ) or change in mothers' depressive symptoms over time ( $0.06,$   
13  $SE = .32, p = .86$ ). Change in mothers' sexual concerns was not examined as variance was fixed  
14 to zero.

### 15 Discussion

16 The current study examined trajectories of the frequency of postpartum sexual concerns  
17 and depressive symptoms in a sample of first-time mothers and their partners across the  
18 postpartum period. Findings add to our understanding of postpartum sexuality among first-time  
19 parent couples by demonstrating evidence of some interdependence. Specifically, mothers with a  
20 higher frequency of postpartum sexual concerns tended to have partners with a higher frequency  
21 of sexual concerns. We also found that the number of postpartum sexual concerns although high  
22 initially, tended to decline significantly, on average, over time. In contrast, although mothers'  
23 and partners' depressive symptoms were significantly associated at three-months postpartum,

1 they showed different trajectories. Mothers' depressive symptoms remained stable, whereas  
2 partners' symptoms worsened over time. We also found preliminary support for depressive  
3 symptoms as a risk factor for partner's postpartum sexual concerns, but not the reverse.

#### 4 **Changes in New Parents' Postpartum Sexual Concerns**

5 To our knowledge, the current study is the first to assess change in the frequency of  
6 postpartum sexual concerns during the transition to parenthood. We found that the number of  
7 postpartum sexual concerns was highest at 3 months postpartum and declined significantly  
8 thereafter for both mothers and partners, with significant variance in the initial frequency of  
9 sexual concerns for mothers and partners and in rate of decline for partners. This variability is  
10 likely due to differences in couples' ability to adjust to changes to their sexual relationship and  
11 the demands of new parenthood. Despite the significant declines in sexual concerns, even at 12-  
12 months postpartum both mothers and their partners continued to experience more than 10  
13 distressing postpartum sexual concerns. Clinicians working with individuals and couples could  
14 provide psychoeducation related to these postpartum concerns in an effort to normalize the  
15 experiences and minimize the associated distress.

16 Consistent with the inherently interpersonal nature of couples' sexual relationship and the  
17 shared experience of becoming parents, mothers' and partners' postpartum sexual concerns were  
18 positively associated at 3 months postpartum. Unfortunately, we were unable to examine  
19 associations between mothers' and partners' intercepts and mothers' change over time, including  
20 how couples' trajectories moved together because of problems with the latent construct of  
21 mothers' slope. Our results did reveal that initial levels of postpartum sexual concerns (partners'  
22 own or mothers') were not associated with the degree to which partners' sexual concerns  
23 improved over time. It seems possible then that other factors unique to each member of the

1 couple (e.g., stress management, expectations regarding changes to postpartum sexuality) may be  
2 more relevant for understanding how the number of postpartum sexual concerns improves over  
3 time for each partner.

#### 4 **Changes in New Parents' Postpartum Depressive Symptoms**

5         Contrary to our hypothesis, mothers' depressive symptoms did not change significantly  
6 over the postpartum, and partners' depressive symptoms worsened, rather than improved.  
7 Previous research has revealed multiple distinct trajectories that characterize mothers' depressive  
8 symptoms (Fredriksen et al., 2017; Vliegen et al., 2014). It is possible that the average trajectory  
9 estimated in our sample actually incorporated trajectories depicting stability, improvement, and  
10 worsening of depressive symptoms. Indeed, the significant variance in the trajectory of mothers'  
11 depressive symptoms would support that not all mothers were exhibiting the same pattern or rate  
12 of change over time. The increase in depressive symptoms among partners is contrary to  
13 previous findings from studies examining depressive symptoms among partners (Goodman,  
14 2004; Paulson & Bazemore, 2010). Although surprising, partners' initial depressive symptoms  
15 were well below established clinical thresholds and the overall change over time, while  
16 significant, was minimal (i.e., less than 1 point over the 9 months). Still, an examination of those  
17 partners who met clinical cut-offs for depression revealed that this number almost doubled from  
18 3 to 12 months postpartum. Thus, it is possible that given the small sample size, a few  
19 individuals with higher scores that worsened over time unduly influenced the overall trajectory.  
20 As predicted and consistent with previous work (Goodman, 2004; Paulson & Bazemore, 2010),  
21 there was some interdependence of couples' mood, such that mothers' and partners' depressive  
22 symptoms were positively associated at 3 months postpartum. The degree to which depressive  
23 symptoms changed over time was not related between mothers and partners, again raising the

1 possibility that other intra-individual factors may be more important for understanding how  
2 postpartum depressive symptoms evolve during this transition. For example, shifts in depression  
3 among mothers may be tied to biological and hormonal changes inherent to the postpartum  
4 period, whereas depression among partners may be related to stress related to balancing the  
5 demands of work and new parenthood.

### 6 **Associations between Postpartum Sexual Concerns and Depressive Symptoms**

7         In an effort to better understand changes in two potentially related phenomena specific to  
8 the transition to parenthood, we examined bidirectional associations between postpartum sexual  
9 concerns and depressive symptoms using a parallel model. Contrary to our hypotheses, no  
10 significant associations were revealed between mothers' or their partners' initial depressive  
11 symptoms and mothers' initial number of postpartum sexual concerns. Additionally, we did not  
12 find evidence to support associations between initial postpartum sexual concerns (mothers' or  
13 partners') and mothers' change in depressive symptoms over time. Unfortunately, we were  
14 unable to examine associations in the reverse direction due to specifications within our model.  
15 Given the absence of significant associations for mothers', it is possible that other factors,  
16 specific to mothers (e.g., labor and delivery, hormones) or the dyad (e.g., fatigue, changes to the  
17 interpersonal relationship, differences in child-rearing responsibilities) may be more strongly  
18 related to mothers' initial postpartum sexual concerns and depressive symptoms. Indeed, a recent  
19 study observed that fatigue and relationship satisfaction—the strength of connection between  
20 partners—were significant predictors of having sexual problems at 3 months postpartum  
21 (Dawson et al., 2020). Another example may be that the gendered cultural expectations  
22 surrounding mothers' greater responsibility for childrearing tasks and societal messaging that  
23 often separates sexuality from motherhood may be more strongly associated with mothers'

1 sexual concerns at 3 months postpartum than depressive symptoms (Hipp et al., 2012; Katz-Wise  
2 et al., 2010).

3         Our parallel model did reveal some evidence of directionality with regards to the  
4 influence of depressive symptoms and the frequency of postpartum sexual concerns among  
5 partners. When mothers' and partners' had higher depressive symptoms at 3 months postpartum,  
6 partners had more frequent sexual concerns at 3 months and these concerns declined more  
7 rapidly over time, likely because there was more room for improvement. We did not find any  
8 evidence to support frequency of sexual concerns preceding change in depressive symptoms. Our  
9 findings are consistent with previous cross-sectional research establishing links between  
10 depression and sexual problems (e.g., Asselmann et al., 2016; Chivers et al., 2011; Moel et al.,  
11 2010), and provide evidence of a directionality whereby depressive symptoms preceded changes  
12 in the frequency of sexual concerns for partners. These results might be understood in light of  
13 other evidence that mothers with higher depressive symptoms tend to experience lower sexual  
14 desire generally, and desire discrepancies—differences in desire between partners—are among  
15 the most common sexual concerns of new parent partners (Pastore et al., 2007; Schlagintweit et  
16 al., 2016). Higher depressive symptoms among mothers may hinder feelings of closeness within  
17 the relationship, which may further contribute to their partners experiencing more sexual  
18 concerns (e.g., regarding sexual frequency) during the transition to parenthood. Taken together,  
19 these findings are in line with the cognitive model of depression; specifically, that the negative  
20 thinking styles characteristic of depression (e.g., possibly paying greater attention to and  
21 emphasizing negative impacts on sexuality or perceiving changes to one's sexuality as negative),  
22 may be linked with more frequent sexual concerns and shape how these concerns resolve over  
23 time (Beck, 1967; Disner et al., 2011).

1           The degree to which mothers' depressive symptoms remained stable over time was  
2 associated with partners' steeper decline in sexual concerns. Stability in mothers' mood may  
3 have acted as a buffer to their partners' postpartum sexual concerns, contributing to steeper  
4 declines or more rapid improvement over time. However, if mothers' depressive symptoms were  
5 initially high and stable or if they were to increase or fluctuate over time, we may expect that  
6 partners' sexual concerns would persist or not decline to the same degree.

7           The current study had a number of strengths including the dyadic, longitudinal  
8 methodology, and a sophisticated data analytic approach that accounts for change over time and  
9 the interdependence between couples. We also used measures of postpartum sexual concerns and  
10 depression that are specific to the postpartum period rather than general measures of sexual  
11 functioning or mood. The limitations of this study include the relatively small sample sizes for  
12 these analyses, which may have contributed to limited variability in the trajectories. The sample  
13 demographics may also limit the generalizability of the findings, such that the sample was  
14 largely comprised of White, heterosexual, cisgender individuals who were of high  
15 socioeconomic status. Finally, we did not assess for the use of anti-depressant medications in our  
16 sample, which may have influenced the frequency of postpartum sexual concerns. Future studies  
17 should explore changes in depressive symptoms among mothers and partners before and after the  
18 birth of the baby and directly examine whether negative cognitions mediate the link between  
19 depressive symptoms and sexual concerns consistent with the cognitive model of depression  
20 (Beck, 1967; Disner et al., 2011).

21           Despite changes to sexuality being fairly ubiquitous across new parent couples, less than  
22 20% of new parents receive information regarding possible changes to their sexuality following  
23 childbirth (Barrett et al., 2000). This poses a significant gap in postpartum sexual health care,

1 given the prevalence of postpartum sexual concerns experienced throughout the first year  
2 postpartum. Our findings may help to bridge this gap by providing data to support evidence-  
3 based sexual health education, assessment, and intervention during the transition to parenthood.  
4 For example, we found that sexual concerns specific to the postpartum period are common for  
5 mothers and their partners, and despite declining over time, remain relatively frequent at 12-  
6 months postpartum. Postpartum sexual concerns could be addressed by providing new parents  
7 with accurate psychoeducation about what to expect regarding changes to their sexuality.  
8 Concerns could be normalized by sharing data from existing empirical research in response to  
9 the concern (e.g., on the average time to resume sexual activity and average frequency). Given  
10 the observed prevalence of postpartum sexual concerns, clinicians should ask about these  
11 topics—that go beyond changes to sexual function—as part of their routine assessments. The  
12 finding that depressive symptoms appear to be a risk factor for postpartum sexual concerns may  
13 also be useful to clinicians working with individuals with postpartum depression, such that they  
14 may incorporate questions regarding changes to the sexual relationship. Opening the  
15 conversation between clinicians and patients is important, given that only 15% of new mothers  
16 report discussing changes to their sexuality with their health care provider (Barrett et al., 2000).  
17 Finally, given some preliminary evidence of interdependence between postpartum sexual  
18 concerns and depressive symptoms within couples, including depressive symptoms (own and  
19 mothers’) as a risk factor for partners’ postpartum sexual concerns, the development of  
20 interventions targeting postpartum sexual health should consider accounting for interpersonal  
21 context by including both members of the couple.

22

23



1 **Declaration of interest statement**

2

3 All authors of the current manuscript report no affiliations with, or involvement in, any  
4 organization or entity with any financial interest (such as honoraria; educational grants;  
5 participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or  
6 other equity interest; and expert testimony or patent-licensing arrangements), or non-financial  
7 interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the  
8 subject matter or materials discussed in this manuscript.

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