

Mother-Offspring Conflict:
The Roles of Breastfeeding, Night Waking, and Postpartum Depression

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Master's Thesis in Psychology

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TEOLOGI**

Subject: Psychology	
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Title: Mother-offspring Conflict: The Roles of Breastfeeding, Night Waking, and Postpartum Depression	
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<p>Abstract: Breastfed infants wake more often during the night and require more parental intervention to fall back asleep, compared to weaned or bottle-fed infants. Therefore, mothers who have wakeful infants often suffer from tiredness and fatigue, as well as symptoms of postpartum depression. It has been proposed that infant night waking is an adaption to exhaust the mother, as this could possibly delay the arrival of a sibling that would compete for maternal investment. The current study, thus, aimed to investigate the associations between infant night waking, breastfeeding frequency, maternal sleep disruption and postpartum depression, from the perspective of evolutionary mother-offspring conflict. We hypothesized that increased infant night waking would increase symptoms of postpartum depression, and that this association would be mediated by breastfeeding frequency and maternal sleep. Data was obtained from the FinnBrain cohort study. The sample consisted of 1598 mothers who had answered self-report questionnaires six months postpartum. A structural regression model was conducted to analyze the association between infant night waking, breastfeeding, maternal sleep and postpartum depression. The results showed a significant positive association between infant night waking and postpartum depression, when mediated by increased maternal sleep disruption ($\beta = .303$). The results also showed a significant negative association between infant night waking and postpartum depression, when mediated by breastfeeding frequency ($\beta = -.047$). The results, thus, indicated that infant night waking was associated with depressive symptoms when mediated by maternal sleep disruption. However, contrary to our initial hypothesis, more frequent breastfeeding was associated with fewer symptoms of postpartum depression. The validity of the included measurements should be taken in consideration when interpreting the results. Future research should investigate if frequent infant night waking, indeed, delays the arrival of a sibling.</p>	
Keywords: Mother offspring conflict, genomic imprinting, parental investment, postpartum depression, fatigue, infant night waking, breastfeeding	
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**ÅBO AKADEMI – FAKULTETEN FÖR HUMANIORA, PSYKOLOGI OCH
TEOLOGI**

Ämne: Psykologi	
Författare: My Sundén	
Titel: Evolutionär konflikt mellan förälder och avkomma – betydelsen av amning, nattvaknande och postpartumdepression	
Handledare: Jan Antfolk och Annika Gunst	
<p>Abstrakt: Sömnproblem som orsakas av spädbarns återkommande nattvaknande är vanligt bland mödrar. Studier har visat att barn som ammas oftare vaknar mer under natten, jämfört med barn som inte ammas. Mödrar till spädbarn som ammas stiger således oftare upp för att mata sina barn än mödrar som inte längre ammar, vilket ökar risken för utmattnings-, trötthet och postpartumdepression hos modern. Det har föreslagits att spädbarns nattvaknande i själva verket är en adaptation med syfte att trötta ut modern. På så sätt skulle sannolikheten för att få ett syskon som tävlar om moderns investering minska. Målet med denna studie var således att undersöka associationerna mellan spädbarns nattvaknande, amning, moderns sömnproblem och symtom av postpartumdepression, från perspektivet av evolutionär konflikt. Vår hypotes var att spädbarns nattvaknande ökar symtomen av postpartumdepression hos modern och att denna association medieras av mer frekvent ammande och mer sömnproblem hos modern. Data för studien mottogs från en kohortstudie inom projektet FinnBrain, och det totala samplet omfattade svar från 1 598 mödrar som svarat på självskattningsformulär sex månader postpartum. Data hade samlats in med hjälp av självskattningsformulär och analyserades med hjälp av en strukturell regressionsmodell. Resultaten visade en positiv signifikant association mellan barnets nattvaknande och förekomsten av postpartumdepression hos modern, då denna association medierades av moderns sömn ($\beta = 0,303$). Resultaten visade också en signifikant negativ association mellan barnets nattvaknande och förekomsten av depressionssymtom hos modern, då denna association medierades av amning ($\beta = -0,047$). Resultaten tyder således på att spädbarns nattvaknande var associerat med fler symtom av postpartumdepression, då associationen medierades av moderns sömn. Resultaten tyder även på att spädbarns nattvaknande, i motsats till vår hypotes, var associerat med färre symtom av postpartumdepression då associationen medierades av amning. Vid tolkning av resultaten bör mätinstrumentes validitet tas i beaktande. Framtida forskning bör undersöka huruvida spädbarns nattvaknande ökar tiden mellan födslar.</p>	
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Mother-offspring Conflict:
The Roles of Breastfeeding, Night Waking and Postpartum Depression

Night waking to breastfeed is common in newborn infants. Irregular night waking can, however, have a considerable impact on a mother's sleep quality, placing her at risk of fatigue and decreased well-being. Prolonged sleep deprivation due to an infant's frequent night waking can, at its worst, affect a mother's ability to adequately care for her child, and thereby, from an evolutionary perspective, negatively affect her and the infant's fitness. As the mother-offspring relationship is central to human reproduction, the problems related to infant night waking are puzzling, yet, somewhat overlooked in psychological research. The current study investigated how infant night waking and breastfeeding patterns are associated with disrupted maternal sleep and depressive symptoms in the postpartum period, and how the association might be explained by the evolutionary theory of mother-offspring conflict.

Infant Night Waking and Breastfeeding

Breastfeeding has several well-established short- and long-term health benefits to infants and their mothers (Bernardo & Cesar, 2013; Binns, Lee, & Low, 2016; Horta & Victora, 2013). Breastfeeding reduces infant mortality caused by infectious diseases (Bernardo et al., 2013) and may protect against immunological diseases and obesity in later childhood (Gdalevich, Mimouni, & Mimouni, 2001; Harder, Bergmann, Kallischnigg, & Plagemann, 2005). For the mother, breastfeeding decreases the risk of type-II diabetes, as well as breast and ovarian cancer (Chowdhury et al., 2015). Based on these benefits, the World Health Organization (2001) recommends that every child is fully breastfed for at least the first six months of life, and partially breastfed until two years of age.

Newborn infants commonly wake more than once a night to breastfeed. By three to four months of age, the infant's physiological need for night-time feeding decreases, after which many infants learn to self-soothe without parental intervention (Anders 1994; Elias, Nicolson, Bora & Johnston, 1986). Nevertheless, it is estimated that a considerable proportion of infants and toddlers regularly wake up during the night and are unable to return to sleep without signaling their parents (Goodlin-Jones, Burnham, Gaylor, & Anders, 2001; Moore & Ucko, 1957; Zuckerman, Stevenson, & Bailey, 1987). Several studies have identified the second half of the first year as an age when night waking temporarily increases. For example, Scher (1991) and Scher, Epstein, and Tirosh (2004) examined sleep patterns among infants and observed a period of increased night waking and more fragmented sleep between six and nine months of age, after which night waking gradually decreased. Interestingly, compared to

bottle-fed or weaned infants, breastfed infants wake more often during the night (Ball, 2003; DeLeon & Karraker, 2007; Eaton-Evans & Dugdale, 1988; Elias, Nicolson et al., 1986), require more help from the parents to be able to fall back asleep (Burnham, Goodlin-Jones, Gaylor, & Anders, 2002), are fed more frequently during the night (Ball, 2003), and continue to wake up during the night at older ages (Wright, Macleod & Cooper, 1983). The increased wakefulness of breastfed infants is often attributed to the density of breast milk. Breast milk is easier to digest than cow's milk or artificial formula, which could account for the shorter periods of satiety during the night (Ball, 2003). However, Ramamurthy and colleges (2012) found that breastfeeding infants who are not nursed during the night have longer continuous night-time sleep periods than breastfeeding infants that are nursed during the night, even though both consume breast milk. Apparently, night waking is reinforced by breastfeeding, which consequently, results in more night-time feedings for the mother as well.

Although night-time feeding is important in sustaining the breastfeeding relationship over a period of several months (Howie & McNeilly, 1982; Heinig, Nommsen-Rivers, Peerson, & Dewey, 1994), a common reason to decrease or stop breastfeeding is the frequency with which mothers have to get up at night to feed their infant (Pinilla & Birch, 1993). Breastfeeding has many benefits, but high-quality maternal sleep is not one of them. Yet, as breastfeeding contributes to better health for both infant and mother, the problems related to breastfeeding and infant night waking are difficult to explain from an evolutionary perspective.

Infant Night Waking and Postpartum Depression

Sleep-related problems due to infant night waking are common among new mothers (Bayer, Hiscock, Hampton, & Wake, 2007). A recent study by Richter and colleagues (2019) found that maternal sleep satisfaction and duration sharply declines after childbirth and is at its lowest point the first three months postpartum, after which neither sleep duration nor satisfaction fully recovers for several years. Prolonged sleep disruption can cause impaired cognitive functioning and negatively affect parental behavior (Hockey, Maule, Clough, & Bdzola, 2000; McQueen & Mander, 2003; Teti & Crosby, 2012) and, consequently, have an adverse effect on mother-child interactions and infant development (Goodman et al., 2011).

Furthermore, maternal sleep disruption due to infant night waking is correlated with high levels of depression and fatigue, as well as poor general health (Bayer et al., 2007; Giallo, Rose & Vittorino, 2011; Karraker & Young, 2007). A study by Dennis and Ross (2005) showed that mothers exhibiting depressive symptoms in the postpartum period often rate their child's sleep as problematic. Depressed mothers also reported more frequent infant

night waking compared to non-depressed mothers, which suggests that infant sleep patterns affect maternal mood. In fact, 10–15% of mothers suffer from postpartum depression in the first year after birth, and many more report subclinical depressive symptoms (Gavin et al., 2005; O'hara & Swain, 1996). Postpartum depression is defined as a major depressive disorder, with an onset of symptoms either during pregnancy or within four weeks after delivery (American Psychiatric Association, 2013). However, research shows that a common peak time of new onset depression is approximately 2–3 months after delivery, and most experts define postpartum depression as occurring anytime within the first year postpartum (Gavin et al., 2005). Predisposing risk factors for postpartum depression include psychosocial stressors such as low socioeconomic status, being a single mother, relationship conflicts, and lack of social support, as well as a history of psychopathology (O'hara & Swain, 1996).

Although an association between infant night waking and postpartum depression has been identified, the causal mechanisms underlying the direction of effects are less studied. Prior research has focused on both “mother-driven” models, in which infant night waking is predicted to increase due to maternal depressive symptoms and parenting behavior during bedtime and night-time (Karraker & Young, 2007; Teti & Crosby, 2012), and “infant-driven” models in which infant night waking, when chronic and prolonged, is presumed to affect maternal mood by producing sleep deprivation (Bayer et al., 2007; Meltzer & Mindell, 2007). Simultaneously, many healthcare professionals have argued that frequent infant night waking is normal and not to be seen as problematic (Bayer et al., 2007), hence, implying that regardless of the underlying causal mechanisms, problems related to maternal sleep disruption are to be taken as a self-evident part of what motherhood includes. Understanding the etiology of problems in the postpartum period is, however, important in finding effective solutions. From an evolutionary perspective, it has been proposed that infant night waking could be seen as an adaption to expand the interbirth interval of the mother, rather than a pathological behavior (Jones & da Costa, 1987).

Mother-Offspring Conflict over Interbirth Intervals

The interbirth interval (IBI) describes the time elapsed between the birth of one child and the birth of the next. An important determinant of the length of the IBI is the duration of lactational amenorrhea, that is, the duration of temporary infertility that occurs due to postpartum breastfeeding (e.g., McNeilly, 1993). Several studies have recognized breastfeeding as a mechanism behind lactational amenorrhea, with positive correlations between frequent nursing and depressed ovarian function (Elias, Teas, Johnston, & Bora, 1986; Howie & McNeilly, 1982; Heinig et al., 1994). Breastfeeding is, thus, an important

function in regulating the IBI, especially in naturally fertile populations (Thapa, Short & Potts, 1988). Based on data from anthropological studies, the species typical average IBI for humans is about three years (Galdikas & Wood, 1990; Sellen, 2007), but varies across ecological and social contexts (Jones, 1987). The length of IBI can also be regulated by other mechanisms than breastfeeding, for example, through frequency of sexual intercourse (Bongaarts, 1978), or modern use of contraceptives (Yeakey et al., 2009). A short IBI (i.e., less than two years) is a risk factor for both adverse fetal and maternal outcomes (Conde-Agudelo, Rosas-Bermúdez, & Kafury-Goeta, 2006; Conde-Agudelo, Rosas-Bermudez, Castaño, & Norton, 2012) and this has been documented in both developing and industrial societies. From an evolutionary perspective, a too short IBI is, therefore, neither in the interest of the mother's nor the child's fitness (Hamilton, 1964; Sellen, 2007). While a short IBI poses several risks for both mother and infant, a too long IBI is not beneficial for maternal reproductive success. Women have a limited reproductive span and long IBIs would result in fewer children during the total lifetime, thus, reducing the reproductive fitness. Consequently, the length of IBIs has implications for how the mother balances her investment between herself and her current and future offspring.

Parental investment is defined as “any investment by the parent in an individual offspring that increases the offspring's chance of surviving (and, hence, reproductive success) at the cost of the parent's ability to invest in other offspring” (Trivers, 1972 p. 139). As there is a 50% probability that a gene in a mother also is present in her offspring, a mother optimizes her reproductive fitness by balancing investment between all her current and future offspring. However, any one of her children shares only 50% of its genes with a sibling, whereas the child “shares” 100% of its genes with itself. This leads to children and mothers having different fitness optima: the optimum for a child is at a higher level of maternal investment than what the maternal optimum dictates (Trivers, 1974). These conflicting fitness optima between mother and offspring explain an evolutionary tug-of-war between maternal and fetal fitness interests (Haig, 2000; Haig, 2011), that is expressed as a *mother-offspring conflict*, in which both individuals prioritize their own needs over that of the other. For example, it is in an infant's interest to nurse as much as possible when given the chance, while for the mother, balancing her energy and milk availability between all her offspring, will increase the probability that they all survive. This, in turn, increases her fitness.

The conflicting fitness optima can also explain a *genetic* tug-of-war between maternal and fetal fitness interests (Haig, 2000; Haig, 2011). The genetic tug-of-war between maternal and fetal fitness interests is exacerbated by genomic imprinting, in which the expression of

genes in an offspring depends on whether they are maternally or paternally derived (Haig, 1993; Reik & Walter, 2001). There is relatively high chance that paternally derived genes present in one child are not present in the mother's other offspring. Hence, paternally derived genes are predicted to increase an offspring's demands on the mother—even at the cost of her other offspring—whereas maternally expressed genes benefit from reducing these demands (Haig, 2011). Therefore, certain infant behavior, such as frequent breastfeeding, would be beneficial for paternal fitness because it would prolong the lactational amenorrhea and enable the infant to receive full investment from the mother for a longer time, or in other words prologue the IBI.

Based on the theory of parental investment, competition over maternal investment would have selected offspring to favor longer IBI than what is optimal for maternal fitness (Jones & da Costa, 1987; Haig, 2014b). Jones and da Costa (1987), therefore, proposed that infant night feeding is an adaption of infants to expand the IBI for mothers and, thus, delay the arrival of a sibling who will compete for vital maternal resources and investment. Frequent breastfeeding, and especially breastfeeding at night, is important to maintain the lactational amenorrhea over a long period (Howie & McNeilly, 1982). Nightly feeding could, therefore, contribute to a longer IBI. Furthermore, frequent breastfeeding subjects the mother to a considerable metabolic strain by depleting energy resources (Valeggia & Ellison, 2009), which is why maternal energy availability might affect the return of ovarian functions and, in turn, the length of the IBI. Additionally, exhausted mothers might have less desire to have more children. Haig (2014b), thus, hypothesized that maternal fatigue, caused by infant night waking to breastfeed, could be an integral part of an infant's strategy to extend IBI. This could explain why some mothers experience extreme exhaustion and fatigue in the postpartum period. Moreover, maternal fatigue and exhaustion in the postpartum period often occur in conjunction with postpartum depression caused by infant night waking (Giallo et al., 2011; Dennis & Ross, 2005; Karraker & Young, 2007). Even so, postpartum depression has, from an evolutionary perspective, mainly been viewed as an adaptive mechanism for the mother, signaling that further investment would be unprofitable for her reproductive success (Hagen, 1999). However, postpartum depression caused by infant night waking could be beneficial for the infant's fitness if depression, indeed, would reduce the competition over maternal investment. To the best of our knowledge, the association between infant night waking, breastfeeding frequency, maternal sleep disruption and postpartum depression has not yet been empirically studied.

The Current Study

The aim of the current study was to investigate infant night waking, breastfeeding frequency and maternal sleep disruption, to elucidate the associations between them and how they might relate to maternal postpartum depression. The current study, thus, aimed at providing information regarding the etiology of problems related to infant night waking, which might have valuable implications for treatment and intervention of problems in the postpartum period. Based on previous literature and theoretical considerations (Ball, 2003; DeLeon & Karraker, 2007; Dennis & Ross, 2005; Eaton-Evans & Dugdale, 1988; Elias, Nicolson et al., 1986; Haig, 2014b; Jones & da Costa, 1987) we made the following predictions: Increased infant night waking is associated with increased symptoms of postpartum depression. This association, in turn, is mediated by increased maternal sleep disruption and increased breastfeeding frequency.

Method

Ethical Statement

The current study obtained data from the FinnBrain cohort study (Karlsson et al., 2017). The Ethical Board for the Hospital District of Southwest Finland (20.6.2011, nr. 6/2011), has given an ethical statement in favor of the FinnBrain project. The current study is in line with the informed consent forms signed by the mother, the father, and by the legal guardians of the focal child.

Participants

Data was obtained from the FinnBrain cohort study. The original sample included 3838 Finnish children and their families, who had been followed since the first ultrasound screening at gestational week 14 until two years of age. From the longitudinal data available, we selected variables that measured maternal and infant sleep patterns, breastfeeding patterns and postpartum depression. Although the FinnBrain data was longitudinal, some of the variables of interest were only included at one timepoint. Therefore, the present study was cross-sectional, and included data only from the timepoint six months postpartum. Participants who had not responded to all critical measurements at the six months timepoint, were excluded ($n = 2240$). Because participants who had not responded to critical variables used in the statistical analysis were excluded, there were no problems with missing values. The final sample, thus, included 1598 mothers.

The mean age of mothers was 30.24 years ($SD = 4.71$). Of the final sample, 1403 mothers were married, 75 were in a relationship, five were divorced, four were in a registered partnership, ten were single, and 101 mothers had not given information about relationship status. In total, 826 participants were first-time mothers, while 706 participants had two or more children.

Measures

All items described in the next section were used in the statistical analysis. A description of all the included items, as well as their means and standard deviations, can be found in Table 1.

Infant sleep. Information about infant sleep patterns was obtained using the Brief Infant Sleep Questionnaire (BISQ; Sadeh, 2004). The BISQ is a 12-item questionnaire that includes specific questions about infant daytime and night-time sleep patterns, as well as sleep-related behaviors during the past week. In the original publication by Sadeh (2004), the BISQ demonstrated high test-retest reliability ($r = .82$), as well as high validity, and applicability for screening sleep problems among infants. Internal consistency for the BISQ has been proven good (Cronbach's $\alpha = 0.79$; Talero-Gutiérrez et al., 2008). In the current study, we used BISQ item 5, where the mother is asked to freely rate the average amount of hourly night-time sleep for her infant. In the statistical analysis, item 5 was coded so that high scores indicated less night-time sleep disturbance for the infant. We also used BISQ items 7 and 8, in which the mother is asked to freely rate the average amount of night awakenings, as well as hours spent awake during the night for the infant. Thus, high scores on items 7 and 8 indicated more infant sleep problems. BISQ item 12 was used to measure how severe mothers consider their infant's sleep problems on a scale of 1–3 (1 = severe problems, 2 = mild problems 3 = no problems at all). In the current study, BISQ item 12 was reversed so that high scores indicated more severe sleep problems.

Maternal sleep. Information about maternal sleep patterns was obtained using the Basic Nordic Sleep Questionnaire (BSNQ; Partinen & Gislason, 1995). The BNSQ is a standardized self-report questionnaire, designed to measure the frequency of sleep-related disturbances. The BNSQ has 27 items assessing how many nights or days per week something happens on a 5-point Likert scale (1–5), with higher scores indicating more sleep-related disturbance. The BNSQ has been used in a variety of studies performed in the Nordic countries (Partinen & Gislason, 1995), however, it has undergone inadequate psychometric evaluation to date (Devine, Hakim & Green, 2005). In the current study, we used BNSQ items 4 and 8–12. Maternal night waking frequency was measured using item 4, in which the

mother is asked to rate the average number of awakenings on a scale of 1–5 (1 = I don't usually wake during the night, 2 = once a night, 3 = twice a night, 4 = two to three times a night, 5 = at least five times a night). The average amount of night-time sleep for the mother was measured using item 12, in which the mother is asked to freely estimate her night-time sleep in hours. In the current study, item 12 was reversed so that high scores indicated more maternal sleep disturbance. Daytime tiredness was measured using a composite variable created by summing the scores on items 8–11. Thus, the possible range of the composite variable was 5–20 points, with 20 points indicating severe daytime tiredness.

Breastfeeding. Information about breastfeeding patterns and time of weaning was obtained from the background information collected by the FinnBrain cohort study. Three variables measuring breastfeeding patterns were selected from the available data: (1) A variable measuring the total breastfeeding duration in days, from birth to six months of age. In our analysis, this variable was converted from measuring breastfeeding duration in days to measuring breastfeeding duration in months. The maximum value of this variable was six months. It is, however, important to note that some mothers continued breastfeeding for longer; (2) A variable measuring how many times during a 24-hour day the infant breastfed on average, given that the infant was fully breastfeeding. This variable included only participants who had responded that their infant was fully breastfeeding at six months of age; (3) A variable measuring how many times during a 24-hour day the infant breastfed on average, given that the infant was eating breastmilk and either baby formula or solid foods. This variable included only participants who had responded that their infant was partially breastfeeding at six months of age. Participants who had ceased breastfeeding before six months postpartum were assigned with zero breastfeedings on variable 2 and 3. In the statistical analysis, variable 2 and 3 were combined into one variable, in which higher values indicated more frequent breastfeeding.

Postpartum depression. Symptoms of postpartum depression were measured using the Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden & Sagovsky, 1987). The EPDS is a standardized 10-item self-report questionnaire, designed to assess symptoms of depression during and after pregnancy. In the current study, we used all 10 EPDS items to measure maternal postpartum depression. Each item in the EPDS is scored on a 4-point Likert scale (0–3). The maximum score on the EPDS is, therefore, 30 points, with higher scores indicating more depressive symptoms. A cut-off indicating probable depression has been suggested at 12–13 points (Cox et al., 1987). In the original version of the questionnaire, items 1, 2 and 4 are scored from top to bottom on a scale of 0–3, where low scores indicate

fewer depressive symptoms. Items 3 and 5–10, are scored from top to bottom on a scale of 3–0, where low scores indicate fewer depressive symptoms. However, in our data file items 3 and 5–10 were scored in the same manner as items 1, 2 and 4, that is, from top to bottom on a scale of 0–3. Thus, in the current study, we reversed items 3 and 5–10, so that higher scores indicated more depressive symptoms on all EPDS items. The EPDS has been validated in many languages (Gibson, McKenzie-McHarg, Shakespeare, Price & Gray, 2009) and the internal consistency has been demonstrated to be adequate (Cronbach's $\alpha = .77$; Jadresic, Araya, & Jara, 1995).

Statistical Analysis

To adjust for measurement error in the analyses, we conducted a Structural Equation Model (SEM), or more specifically, structural regression (SR). We also analyzed descriptive statistics and correlations for the included variables. For the analyses we utilized the lavaan and corrplot packages in R (version 3.5.0; R Core Team, 2018).

Results

Descriptive results

Table 1 contains descriptive information of the variables used to measure infant night waking, maternal sleep disruption, postpartum depression and breastfeeding patterns. All included items were used as indicators when creating the latent variables in the structural regression model, described on page 13.

On the variable measuring the average amount of night waking for the mother (BNSQ item 12), 4% of the mothers reported that they do not usually wake during the night, 16% reported waking once a night, 29% reported waking twice a night, 39% reported waking three to four times a night and 12% reported waking at least five times on average. On the variable measuring the severity of infant sleep problems (BISQ item 12), 28% of the mothers reported mild to severe problems.

Table 1.

Items used to Measure Maternal and Infant Sleep, Maternal Depression and Breastfeeding Patterns (n = 1598)

Latent variable	Item Name	Description of item	<i>M</i>	<i>SD</i>
Infant Sleep	BISQ 5	How many hours does your infant spend in sleep during the night?	9.93	1.18
	BISQ 7	Average amount of awakenings per night for the infant	2.43	1.77
	BISQ 8	How many hours during the night does your child spend in wakefulness (from 10 in the evening to 6 in the morning)?	0.45	0.48
	*BISQ 12	Do you consider your child's sleep as problematic?	0.30	0.49
Maternal Sleep	BNSQ 4	How many times do you usually wake up during the night?	3.37	1.03
	*BNSQ 12	How many hours do you usually sleep during the night?	7.45	1.11
	BNSQ_sleep	A composite variable created to measure maternal daytime fatigue and tiredness. BNSQ_sleep was created by summing the scores on items 8–11	8.27	2.59
Breastfeeding	BF_month	Total breastfeeding duration in months	4.36	1.66
	BF_day	Times breastfed per day on average. Created using two separate variables from the data file.	3.39	3.79
Maternal Depression	EPDS 1	I have been able to laugh and see the funny side of things	0.23	0.47
	EPDS 2	I have looked forward with enjoyment to things	0.19	0.48
	*EPDS 3	I have blamed myself unnecessarily when things went wrong	0.93	0.86

EPDS 4	I have been anxious or worried for no good reason	0.62	0.80
*EPDS 5	I have felt scared or panicky for no very good reason	0.33	0.66
*EPDS 6	Things have been getting on top of me	0.80	0.76
*EPDS 7	I have been so unhappy that I have had difficulty sleeping	0.29	0.59
*EPDS 8	I have felt sad or miserable	0.67	0.68
*EPDS 9	I have been so unhappy that I have been crying	0.36	0.57
*EPDS 10	The thought of harming myself has occurred to me	0.06	0.30

Note: All values were calculated after reversing critical items, the reversed items are marked with *. The number after the abbreviation of the questionnaire stands for the item number. BNSQ = Basic Nordic Sleep Questionnaire, scored on a 5-point Likert scale (range 1–5), where high scores indicate more sleep-related problems. BNSQ item 12 is a free estimate. EPDS = Edinburgh Postnatal Depression Scale, scored on a 4-point Likert scale (range 0–3), where high scores indicate more depressive symptoms. BISQ = Brief Infant Sleep Questionnaire. BISQ item 7 and 8 are free estimates, while item 12 is scored on a 3-point Likert scale (range 1–3), where high scores indicate more infant sleep problems. BF = Breastfeeding.

Correlations

We calculated, plotted, and investigated the zero-order correlations between all items used to measure associations between breastfeeding, infant and maternal sleep patterns, as well as maternal depression (See Figure 1). As the data was ordinal, we used Spearman correlations for the correlation analysis.

We found a positive correlation of moderate strength ($r = .47$) between BISQ item 7 and BISQ item 12, suggesting an association between infant night waking and the mother's rating of the severity of their infant's sleep problems. In addition, we also found a weak positive correlation between BISQ item 12 and the composite variable BNSQ_sleep ($r = .32$), suggesting that maternal fatigue and tiredness during the day is associated with their rating of the severity of infant sleep problems. We also found weak, positive correlations between BISQ item 7 and the two items measuring breastfeeding patterns, BF_day ($r = .30$) and BF_month ($r = .34$), suggesting infant night waking correlated, to some extent, with more frequent breastfeeding and breastfeeding for a longer period of time before weaning. The

results also showed a positive correlation of moderate strength between the two variables measuring breastfeeding patterns, BF_day and BF_month ($r = .52$), suggesting that they measure different aspects of the same construct, namely breastfeeding. The variable measuring daytime tiredness BNSQ_sleep correlated positively, although weakly, with most of the variables on the EPDS, suggesting that more tiredness during the day was associated with increased depressive symptoms. All correlations were significant at a p -level of < 0.001 .

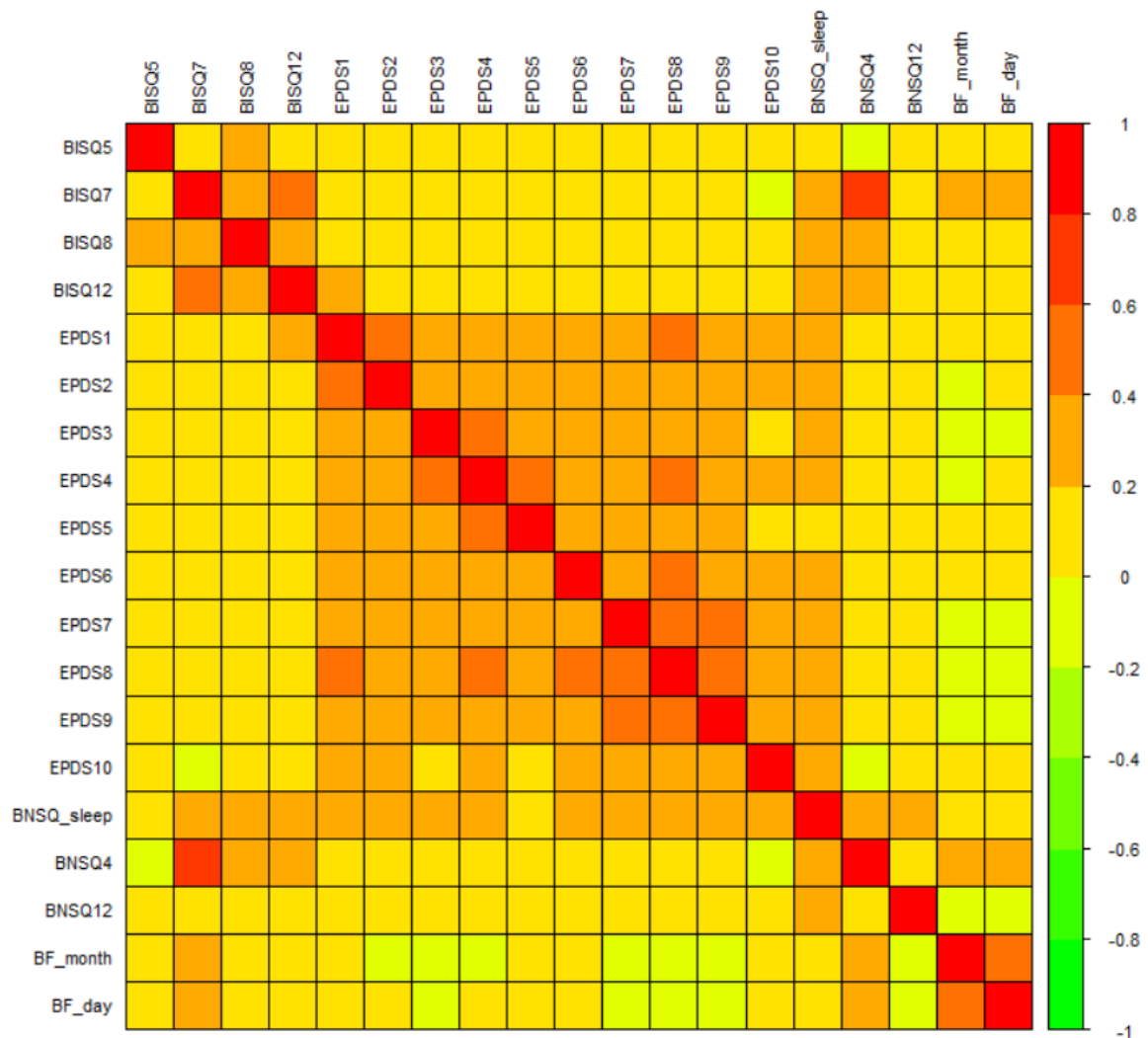


Figure 1. Plot of the zero-order correlations between all included items designed to measure infant sleep, maternal sleep disruption, maternal depression and breastfeeding. High positive correlations are shown in red, high negative correlations are shown in green. Correlations close to zero are shown in yellow. The number after the abbreviation of the questionnaire stands for the item number. BNSQ = Basic Nordic Sleep Questionnaire. EPDS = Edinburgh Postnatal Depression Scale. BISQ = Brief Infant Sleep Questionnaire. BF = Breastfeeding.

Results from the Structural Regression Model

Initial model specification and identification. An initial SR model, which included four latent variables, was specified: *Maternal Sleep* (three indicators), *Maternal Depression* (10 indicators), *Infant Sleep* (four indicators) and *Breastfeeding* (two indicators). The underlying assumption in our model specification was that infant night waking would be positively associated with postpartum depression and that this association would be mediated by breastfeeding patterns and maternal sleep disruption. In our model, the association of infant night waking on postpartum depression could be mediated either via maternal sleep, or via breastfeeding. See Table 1 for description of items used as indicators.

We first investigated the fit of the model. As the first model with 42 free parameters showed suboptimal fit ($\chi^2 [148] = 1507.97, p < .001, CFI = .837, TLI = .811, RMSEA = .072 [0.072, .079], SRMS = .075$), we added four residual correlations, one of which was between items in two different scales. In this case, the items allowed to correlate measured similar constructs. The items allowed to correlate were EPDS items 4 and 5, which measured anxiety and feelings of panic, and EPDS items 1 and 2, which measured the mother's ability to laugh and look forward to enjoyable things. We also allowed the composite variable BNSQ_sleep, which measured daytime fatigue, to correlate with BNSQ item 4, which measured the average number of awakenings per night for the mother. The two items on different scales that were allowed to correlate, were BISQ item 7, which measured the average number of awakenings per night for the infant and BNSQ item 4, which measured the average number of awakenings per night for the mother. Because the loading of BISQ item 5 on the latent variable *Infant Sleep*, was very low ($\beta = .094$), we excluded the variable from the analysis.

Adjusted model. After we excluded BISQ item 5 as an indicator on the latent factor *Infant Sleep*, the final model contained four latent variables; *Maternal Sleep* (three indicators), *Maternal Depression* (10 indicators), *Breastfeeding* (two indicators) and *Infant Sleep* (three indicators). After adding the four residual correlations, the fit indices of the final measurement model with 44 free parameters indicated adequate fit ($\chi^2 [127] = 676.179, p < 0.001, CFI = 0.933, TLI = 0.919, RMSEA = 0.052 [0.048; 0.056], SRMS = 0.051$).

The results showed a significant positive association between *Infant Sleep* and *Breastfeeding* ($b = 0.386, SE = 0.049, Z = 7.901, p < .001$), indicating that infant night waking was associated with more frequent breastfeeding. The standardized value of this association was $\beta = .30$. We also found a significant positive association between *Infant Sleep* and

Maternal Sleep ($b = 1.140, SE = 0.077, Z = 14.873, p < .001$), suggesting that infant night waking was associated with increased maternal sleep disruption. The standardized value of this association was $\beta = .58$. In addition, the results showed a significant negative association between *Breastfeeding* and *Maternal Depression* ($b = -0.034, SE = 0.008, Z = -4.512, p < .001$), indicating that frequent breastfeeding was associated with fewer symptoms of postpartum depression. The standardized value of this association was $\beta = -.15$. *Maternal Sleep* was also positively associated with *Maternal Depression* ($b = 0.074, SE = 0.007, Z = 10.722, p < .001$), thus, suggesting maternal sleep disruption was associated with increased postpartum depression. The standardized value of this association was $\beta = .52$.

The results showed a significant, positive, indirect association between *Infant Sleep* on *Maternal Depression* via *Maternal Sleep* ($b = 0.085, SE = 0.009, Z = 0.524, p < .001$). This indirect association suggests that infant night waking, when associated with maternal sleep disruption, increased symptoms of postpartum depression. The standardized value of this association was $\beta = .303$. There was also a negative indirect association between *Infant Sleep* on *Maternal Depression* via *Breastfeeding* ($b = -0.013, SE = 0.003, Z = -4.032, p < .001$), suggesting that infant night waking, when associated with frequent breastfeeding, in fact, decreased symptoms of postpartum depression. The standardized value of this association was $\beta = -.047$. Therefore, the indirect associations between infant night waking and postpartum depression, were stronger when mediated by maternal sleep than when mediated by breastfeeding.

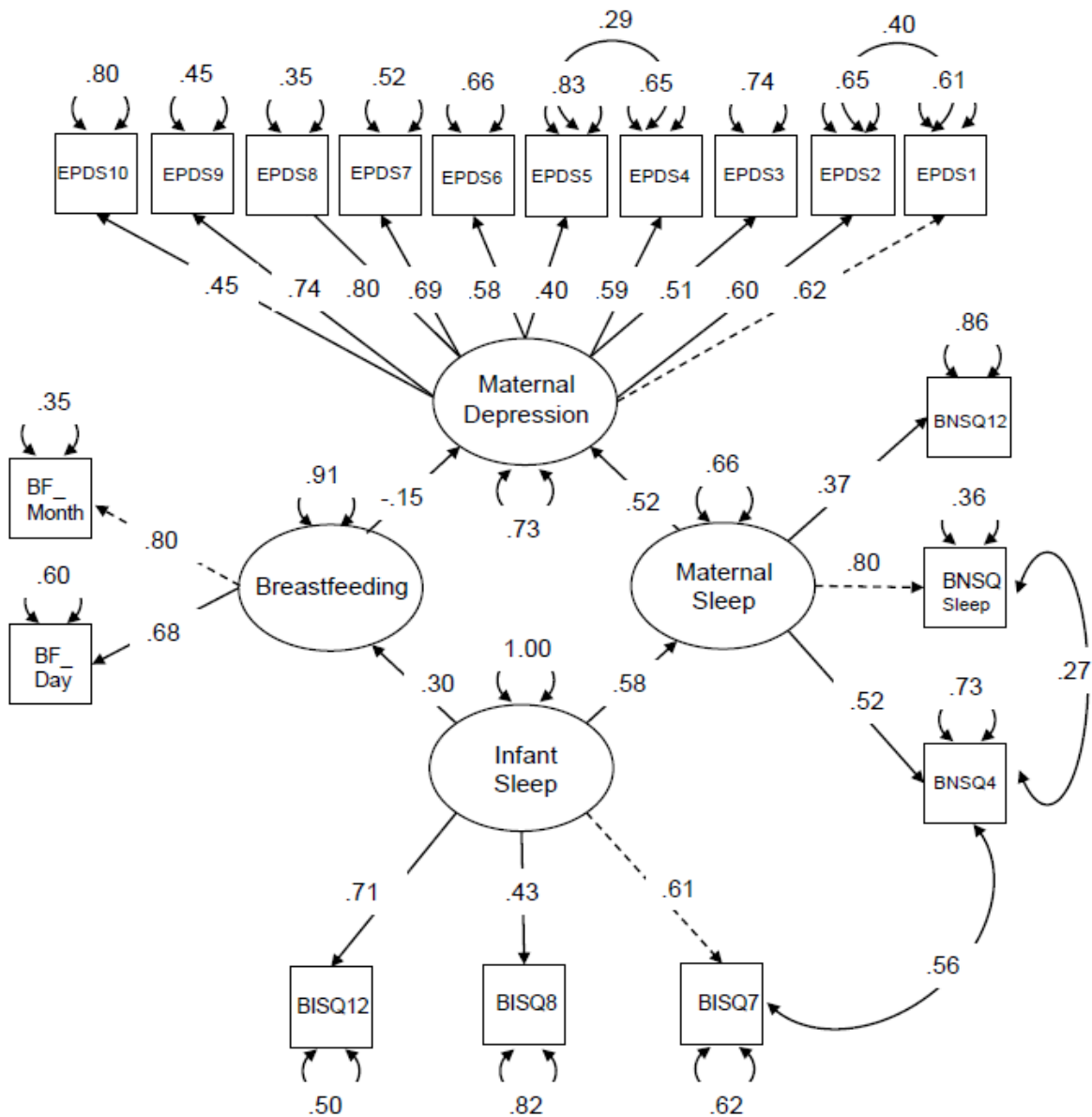


Figure 2. Results from the Structural Regression Model shows standardized values for all the associations between the latent variables *Infant Sleep*, *Maternal Sleep*, *Breastfeeding* and *Maternal Depression*, and their indicators. *Infant Sleep* was hypothesized to be associated with *Maternal Depression*, either via *Breastfeeding* or *Maternal Sleep*. The latent variables are drawn in ovals, while the observed variables (indicators) are drawn in boxes. A single-headed arrow represents a hypothesized direct effect of one variable on another. A two-headed arrow represents the correlation between two different variables. A two-headed arrow that exit and reenter the same variable represents the residual variance of that variable. BNSQ = Basic Nordic Sleep Questionnaire. EPDS = Edinburgh Postnatal Depression Scale. BISQ = Brief Infant Sleep Questionnaire. BF = Breastfeeding

Discussion

The current study investigated the association between infant night waking, breastfeeding, maternal sleep disruption, and postpartum depression. Based on theories regarding evolutionary mother-offspring conflict (Haig, 2014b; Jones & da Costa, 1987), we hypothesized that infant night waking would be associated with increased symptoms of postpartum depression and that this association would, in turn, be mediated by maternal sleep disruption and breastfeeding frequency. Data was obtained from the FinnBrain cohort study and analyzed using a structural regression model. The sample consisted of 1598 mothers. Therefore, the sample size is a strength in the current study.

Main Findings and Interpretation

In line with our initial hypothesis, the results of the structural regression analysis showed a positive association between infant night waking and postpartum depression, when mediated by maternal sleep. In other words, the results suggest that postpartum depression, at least partly, can be explained by maternal sleep disruption that, in turn, is associated with infant night waking. This association is consistent with previous research (i.e., Bayer et al., 2007; Dennis & Ross, 2005; Giallo et al., 2011; Meltzer & Mindell, 2007), in which infant night waking has been linked to symptoms of fatigue and poor general health, as well as postpartum depression. In the current study 28% of the included mothers rated their infants sleep problems as mildly to severely problematic and 50% reported waking up three to five times during the night. The results in the current study are, thus, in line with results from Dennis and Ross (2005), who found that higher scores on the EPDS were related to frequent infant crying and mothers waking more than three times a night. Dennis and Ross (2005) also reported that mothers suffering from postpartum depression were more likely to report that their infant's sleep problems did not allow them to get enough sleep. Nevertheless, depressed mothers might also experience more anxiety, rumination and difficulty relaxing which, in turn, may contribute to the mental experience of fatigue and result in less adequate parenting behavior during night-time (Giallo et al., 2011). The association between infant night waking and postpartum depression might, therefore, also be due to a vicious cycle in which the behavior of both the infant and the mother cause and maintain the dysfunctional behavior in the other.

Regardless of the causal direction, the positive association between infant night waking and postpartum depression when mediated by maternal sleep disruption is interesting from an evolutionary perspective. Infants usually benefit from their mother's continued well-

being, as a mother's ability to invest in her children is vital for infant survival (Haig, 2014a; Trivers, 1972). Sleep disruption and a negative mood state subjects the mother to an increased risk of fatigue and health problems, which in turn might negatively affect her ability to adequately care for her infant (Teti & Crosby, 2012). The positive association between infant night waking and postpartum depression, thus, speaks of a complex cost-benefit relationship in the mother-infant dyad that could potentially be a sign of an underlying evolutionary conflict that is worthy of further investigation. In other words, future research should not just aim to establish causality between infant night waking and postpartum depression, but to also understand the underlying evolutionary basis of these problems.

The results from the structural regression also showed a negative association between infant night waking and maternal depression, when mediated by breastfeeding. In this case, infant night waking was associated with increased breastfeeding, but, contrary to our hypothesis, breastfeeding seemed to decrease depressive symptoms. We hypothesized that infant night waking and frequent breastfeeding would both be positively associated with depressive symptoms, as breastfeeding subjects the mother to a considerable metabolic strain. In line with previous studies (Ball, 2003; DeLeon & Karraker, 2007; Eaton-Evans & Dugdale, 1988; Elias, Nicolson et al., 1986), frequent infant night waking was, indeed, associated with increased breastfeeding. This association suggests that infants who wake more often, also breastfeed more times during the day and a longer time before weaning. Frequent breastfeeding, and specifically breastfeeding during the night, is a prerequisite for sustaining lactational amenorrhea for a longer period (Howie & McNeilly, 1982), which is why the positive association between infant night waking and breastfeeding found in the current study is in line with night-waking to breastfeed being adaptive mechanism for the infant. Unfortunately, the current study could not address the question on whether the association between infant night waking and breastfeeding, in fact, prolongs lactational amenorrhea and, in turn, contribute to longer IBIs. Investigating such an association could better test the hypothesized evolutionary mother-offspring conflict over these behaviors.

From the perspective of evolutionary mother-offspring conflict, it is, however, interesting that breastfeeding was associated with fewer symptoms of postpartum depression in the current study. There are several possible explanations for this association. It is possible that breastfeeding, in fact, protects the mother from developing postpartum depression, for example, through hormonal changes, such as lowering cortisol levels and releasing oxytocin (Abou-Saleh, Ghubash, Karim, Krymski & Bhai, 1998; Moberg & Prime, 2013) or through enhancing bonding and attachment between the mother and her infant (Gibbs, Forste &

Lybbert, 2018). Studies have also linked breastfeeding difficulties such as pain (Watkins, Meltzer-Brody, Zolnoun & Stuebe, 2011) and low breastfeeding self-efficacy (Haga et al., 2012) to higher levels of postpartum depression. Mothers in Scandinavian countries are often very aware of the benefits of breastfeeding and may, therefore, experience pressure or high expectation on their ability to breastfeed (Laantera, Pölkki, Ekström & Pietilä, 2010; Larsen, Hall & Aagaard, 2008). Consequently, when breastfeeding is experienced without difficulties, it might have a positive effect on maternal mood, which may further improve the mother's self-efficacy and perception of her abilities to care for her child's needs. The positive effects of breastfeeding might outweigh some of the negative effects of frequent night waking.

In sum, the results supported our initial hypothesis that infant night waking is associated with postpartum depression, when mediated by maternal sleep. In contradiction to our initial hypothesis, infant night waking was negatively associated with postpartum depression, when mediated by breastfeeding. The association between infant night waking and postpartum depression was stronger when mediated by maternal sleep than when mediated by breastfeeding. Although the associations in the current study support some of the theoretical predictions regarding mother-offspring conflict, further research regarding the consequences of infant night waking is warranted. In particular, it is warranted to investigate whether infant night waking to breastfeed, indeed, produces longer IBIs.

Limitations

The current study had several limitations. To answer our research question, we used cross-sectional data. Potential causal associations between problems in infant and maternal sleep patterns, breastfeeding, and maternal depression are, however, better studied through longitudinal data. Because we analyzed data only from measures at six months postpartum, problems before or after six months postpartum remained undetected. For example, other studies have shown that postpartum depression predicts an earlier cessation of breastfeeding (Dias & Figueiredo, 2015) and, consequently, some mothers might have ceased breastfeeding before the six months timepoint. The associations between breastfeeding, infant night waking and postpartum depression over time are, thus, not detected in the present study

Another limitation was that no item addressed how many times infants woke during the night, specifically to breastfeed. In the current study, we used variables that measured infant sleeping and breastfeeding patterns separately, with no available information on the perceived reason for infant night waking. The latent variable for breastfeeding was estimated using variables measuring breastfeeding duration in months, as well as average amount of

breastfeeding during a 24-hour day, all of which are only rough proxies of breastfeeding during nighttime. This negatively affected the validity of the study.

It would also have been interesting to know if mothers answered to night waking with breastfeeding, or if they soothed their infant in another way. Similarly, approximately 50% of the mothers in the total sample responded that they woke at least 3–5 times a night, yet, 28% rated their infant's sleep as mildly or severely problematic. This suggests some mothers had other reasons for their own wakefulness during the night. The present study did not distinguish between, for example, mothers who experience sleep disturbance due to pain or discomfort, and mothers who woke because of their infant's wakefulness. Additionally, mothers who expect frequent night waking might rate their infant's sleep as less problematic because they consider nightly wakefulness as something normal. In other words, expectations on sleep quality might affect how problematic the mother experiences both her own and her infant's night waking.

Moreover, the current study also did not measure social support or relationship status on maternal sleep patterns and depression. Research suggests that lack of social support is a strong predictor of postpartum depression (O'hara & Swain, 1996). In the current study, 93% of the included mothers reported either being married or in a relationship, which indicates that most mothers possibly received some support. Social support most likely contributes to more rest and fewer awakenings during the night for the mother and would, thus, be important to include when investigating the association between infant night waking and maternal postpartum depression.

All measurements used in the current study were retrospective self-report questionnaires, which allows mothers to over- or underestimate her or the infant's behavior. A more reliable method to gather information about infant night waking could, for example, be through an app that is easy for the mother to use in real time, or through using technology allowing for direct observation. In addition, not all questionnaires had been validated. For example, the BNSQ, although widely used in the Nordic countries, has undergone inadequate psychometric evaluation and should, hence, be used with caution. The generalizability of the results in the current study is also limited, given that all the women in the total sample were Finnish.

Conclusions

To the best of our knowledge, the current study is the first to investigate the association between infant night waking, breastfeeding frequency, maternal sleep disruption and postpartum depression based on theoretical assumptions of evolutionary mother-offspring conflict. The current study, thus, provides novel and valuable information concerning the etiology of postpartum depression, as well as implications for further research regarding the psychological aspects of evolutionary mother-offspring conflict. We found a positive association between infant night waking and symptoms of postpartum depression, mediated by maternal sleep disruption. Thus, infant night waking was associated with increased sleep disruption for the mother which, in turn, was associated with increased symptoms of postpartum depression. The results also showed a negative association between infant night waking and postpartum depression, when mediated by breastfeeding. Infant night waking was, indeed, associated with increased breastfeeding, however, this association was associated with fewer symptoms of postpartum depression.

Future research should examine how postpartum depression is related to infant night waking and breastfeeding over time, as longitudinal studies would provide more information about the etiology of the problems. Future research should also investigate if wakeful infants, indeed, prolong the IBI through maternal sleep deprivation and breastfeeding, as such an investigation would further test the theoretical assumption regarding mother-offspring conflict. To further investigate problems in the mother-offspring dyad from the perspective of evolutionary psychology would increase the understanding of the underlying processes that shape infant behavior.

Swedish summary

Evolutionär konflikt mellan förälder och avkomma – betydelsen av amning, nattvaknande och postpartumdepression

Inledning

Ett spädbarns oregelbundna sömnmönster påverkar moderns sömnkvalitet. Kronisk trötthet orsakat av frekvent nattvaknande kan ha en negativ inverkan på mödrars förmåga att ta hand om sina barn och är därmed inte gynnsamt för varken modern eller barnet. Målet med denna studie var att undersöka huruvida spädbarns nattvaknande är associerat med amningsfrekvens och avbruten sömn hos mödrar, samt om detta samband påverkar förekomsten av postpartumdepression.

Spädbarn vaknar ofta flera gånger om natten för att amma. Vid fyra månaders ålder har däremot det fysiologiska behovet för bröstmjolk under natten minskat och de flesta spädbarn sover då mer regelbundet (Anders 1994; Elias, Nicolson, Bora & Johnston, 1986). Trots det fortsätter en betydande andel barn att vakna flera gånger om natten, och klarar inte av att somna om utan en förälders närvaro (Goodlin-Jones, Burnham, Gaylor, & Anders, 2001; Moore & Ucko, 1957; Zuckerman, Stevenson & Bailey, 1987). Studier som jämfört barn som ammas med barn som inte ammas, har hittat ett samband mellan amning och mer frekvent nattvaknande (Ball, 2003; DeLeon & Karraker, 2007; Eaton-Evans & Dugdale, 1988; Elias, Nicolson et al., 1986). Ammande mödrar stiger således oftare upp för att mata sitt barn, jämfört med mödrar som inte ammar. Bröstmjolk har många obestridliga hälsoeffekter (Bernardo & Cesar, 2013; Binns, Lee & Low, 2016; Horta & Victora, 2013), men många mödrar slutar ofta amma sina barn på grund av sömnbrist och utmattning orsakat av återkommande nattvaknande (Pinilla & Birch, 1993).

Sömnrelaterade problem kopplat till spädbarns nattvaknande är på grund av detta förhållandevis vanligt bland nyblivna mödrar (Bayer, Hiscock, Hampton & Wake, 2007). Sömnbrist orsakad av spädbarns nattvaknande korrelerar med mödrars postpartumdepression, utmattning och försämrad generell hälsa (Bayer et al., 2007; Giallo, Rose & Vittorino, 2011; Karraker & Young, 2007). I själva verket diagnostiseras upp till 10–15 % av nyblivna mödrar med postpartumdepression inom det första året efter födseln, och många fler rapporterar lindrigt depressiva symptom (Gavin et al., 2005; O'hara & Swain, 1996). Trots att en stor del mödrar drabbas av nedstämdhet under tiden efter födseln, är de underliggande orsakerna till nedstämdhet i samband med barnets nattvaknande fortfarande debaterade inom vetenskaplig

forskning. Från ett evolutionärt perspektiv, skulle orsaker till problem med spädbarns nattvakande möjligen kunna förklaras med hjälp av teorin om evolutionär konflikt.

Enligt teorin om "föräldrainvestering" (eng. parental investment; Trivers, 1972), delar modern 50 % av sina gener med sin avkomma, vilket innebär att hennes reproduktiva framgång ökar ju fler av hennes avkommor överlever. Däremot "delar" avkomman 100 % av sina gener med sig själv, vilket leder till att modern och barnet har olika nivåer av genetisk anpassning (eng. "fitness"). Med andra ord är det till barnets fördel att få så mycket av moderns investering som möjligt, samtidigt som det är till moderns fördel att balansera sin investering jämt mellan alla sina nuvarande och framtida avkommor (Trivers, 1974). Detta leder till en evolutionär konflikt mellan modern och barnet, där barnet gynnas av att tiden mellan födslar (eng. Interbirth interval; IBI) blir så långt som möjligt. Emellertid har kvinnor endast en begränsad tid av reproduktivitet, vilket innebär att längre avstånd mellan födslar blir ogynnsamt för kvinnors reproduktiva framgång (Hamilton, 1964; Sellen, 2007). Jones och da Costa (1987), föreslog följaktligen en teori om att spädbarns nattvakande och amning under natten kunde ses som en evolutionär adaptation, vars syfte är att sänka sannolikheten för att barnet får ett syskon. På så vis skulle tävlan om moderns investering minska. Eftersom frekvent amning utsätter modern för en betydande metabolisk ansträngning (Giallo et al., 2011; Valeggia & Ellison, 2009), byggde Haig (2014b) vidare på Jones och da Costas teori och föreslog att effekten av konflikten relaterad till spädbarnets nattvakande, medieras av moderns utmattningssymtom. Trötta mödrar är mindre benägna att skaffa fler barn. Trötthet och utmattning förekommer ofta i samband med postpartumdepression, vilket också har kopplats till frekvent nattvakande (Dennis & Ross, 2005; Giallo et al., 2011; Karraker & Young, 2007). I denna studien undersöktes huruvida spädbarns nattvakande är relaterat till amningsfrekvens och sömnproblem hos mödrar, samt om denna association ökar symtom av postpartumdepression. Tillsvidare har denna teori inte prövats inom empirisk vetenskap.

Metod

Data över moderns och barnets sömn, amningsfrekvens och postpartumdepression var en del av kohortstudien FinnBrain och omfattade data från totalt 3 838 mödrar. Denna studie är en tvärsnittsstudie och inkluderar data insamlade sex månader postpartum. De mödrar som inte svarat på de variabler som var av intresse vid mätpunkten sex månader postpartum exkluderades. Det slutliga samplets storlek var därmed 1 598 mödrar.

Data analyserades med hjälp av en strukturell ekvationsmodell (eng. Structural equation model; SEM) eller mer specifikt, strukturell regression (eng. structural regression;

SR). Även korrelationer mellan de olika variablerna analyserades. De statistiska analyserna utfördes med hjälp av programmet R.

Information över mödrars sömnmönster erhöles med hjälp av variabler från frågeformuläret Basic Nordic Sleep Questionnaire (BNSQ; Partinen & Gislason, 1995). Information om postpartumdepression erhöles med hjälp av variabler från frågeformuläret Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden & Sagovsky, 1987). Information om barnets sömnmönster och nattvaknande erhöles med hjälp av variabler från frågeformuläret Brief Infant Sleep Questionnaire (BISQ; Sadeh, 2004). Information om amning erhöles från bakgrundsinformationen insamlad av FinnBrain kohortstudien.

Resultat

Desriptiva resultat och beskrivning av de inkluderade variablerna rapporteras i tabell 1 och resultat över de enskilda korrelationerna presenteras i figur 1. I SR-modellen skapades fyra latenta variabler för att mäta barnets och moderns sömn, amningsfrekvens och postpartumdepression. De latenta variablerna var: *barnets sömn* (tre indikatorer), *moderns sömn* (tre indikatorer), *amning* (två indikatorer) och *postpartumdepression* (tio indikatorer). De enskilda variablernas laddningar på de latenta variablerna presenteras i figur 2.

Resultaten visade en signifikant positiv association mellan barnets nattvaknande och moderns symtom av postpartumdepression, då denna association medierades av moderns sömn ($b = 0.085$, $SE = 0.009$, $Z = 0.524$, $p < .001$). Detta tyder på att det fanns en association mellan mer frekvent nattvaknande och mer sömnproblem hos modern, vilket i sin var associerat mer depressionssymtom hos modern. Det standardiserade värdet för den positiva indirekta associationen var $\beta = 0,303$.

Resultaten visade även en signifikant negativ association mellan mer frekvent nattvaknande och moderns symtom av postpartumdepression, då associationen medierades av amning ($b = -0.013$, $SE = 0.003$, $Z = -4.032$, $p < .001$). Detta tyder på att barnets nattvaknade i själva verket var associerat med förre depressiva symtom hos modern, då associationen medierades av mer frekvent amning. Det standardiserade värdet för den negativa indirekta associationen var $\beta = -0,047$.

Diskussion

Resultaten från denna studie tyder på att barnets nattvaknande påverkar moderns mående. Spädbarnets nattvaknande var associerat med mer trötthet och sämre sömnkvalitet hos modern, vilket i sin tur var associerat med fler symtom av postpartumdepression. Denna

association överensstämmer med tidigare studier, där trötthet och utmattning hos mödrar har kopplats till förekomsten av postpartumdepression (Bayer et al., 2007; Dennis & Ross, 2005; Giallo et al., 2011; Meltzer & Mindell, 2007). Associationen mellan barnets nattvaknande och symtom av postpartumdepression hos modern är intressant från ett evolutionärt perspektiv, eftersom moderns välmående är gynnsamt för barnets överlevnad. Trötthet och utmattning som orsakas av barnets nattvaknande kan i värsta fall påverka moderns förmåga att ta hand om sitt barn (Teti & Crosby, 2012). Associationen mellan frekvent nattvaknande och postpartumdepression, tyder således på ett komplext kostnad-nyttförhållande mellan modern och barnet som eventuellt är ett tecken på en underliggande evolutionär konflikt.

Resultaten visade även att nattvaknande var associerat med mer amning. I motsats till vår hypotes verkade denna association däremot minska depressionssymtomen hos modern. Orsakerna till detta kunde vara att amning i själva verket skyddar modern från depressiva känslor genom att öka utsöndringen av oxytocin eller genom att sänka kortisolnivåer (Abou-Saleh, Ghubash, Karim, Krymski & Bhai, 1998; Moberg & Prime, 2013). Amning som inte är förknippat med problem kan även tänkas minska risken för depression hos modern genom att öka hennes självförtroende kring sina förmågor att ta hand om barnet eller genom förbättrad anknytningen till barnet (Gibbs, Forste & Lybbert, 2018; Haga et al., 2012). Med andra ord kan positiva upplevelser av amning eventuellt vara mer betydelsefulla än de negativa effekterna av barnets frekventa nattvaknande och på så vis minska risken för postpartumdepression.

I denna studien bör vissa brister, såsom till exempel de inkluderade variabelernas validitet, tas i beaktande vid tolkning av resultaten. Framtida studier bör undersöka huruvida barnets nattvaknande i själva verket förlänger tiden mellan födslar, eftersom detta skulle stärka evidensen till det teoretiska antagandet gällande evolutionär konflikt. Teorier om hur evolutionär konflikt påverkar mödrars och barns relationer har länge ignorerats inom psykologisk forskning. Förståelse för de underliggande mekanismerna i spädbarns beteende skulle dock främja effektiviteten av behandlingar och interventioner för problem kopplade till spädbarns nattvaknande.

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PRESSMEDDELANDE

Spädbarns nattvaknande har ett samband med förekomsten av postpartumdepression hos nyblivna mödrar

Pro-gradu avhandling i psykologi

Fakulteten för humaniora, psykologi och teologi, Åbo Akademi

Resultaten från en pro-gradu avhandling i psykologi vid Åbo Akademi tyder på att spädbarns nattvaknande har ett samband med förekomsten av postpartumdepression hos mödrar.

Avhandlingen undersökte associationerna mellan spädbarns nattvaknande, amningsfrekvens, moderns sömn och postpartumdepression ur ett evolutionspsykologiskt perspektiv.

Data i avhandlingen var en del av en kohortstudie inom projektet FinnBrain och omfattade sammanlagt 1 598 mödrar som hade fyllt i självskattningsformulär sex månader efter barnets födsel. Resultaten tyder på att spädbarns nattvaknande i samband med störd sömn hos modern var associerat med fler symtom av postpartumdepression. Spädbarns nattvaknande i samband med frekvent amning var däremot associerat med färre symtom av postpartumdepression.

Vid tolkning av resultaten bör självskattningsformulärens validitet tas i beaktande. Resultaten ger heller ingen information om kausaleffekter. Spädbarns nattvaknande och dess koppling till amning, moderns sömnproblem och postpartumdepression har inte tidigare studerats från ett evolutionspsykologiskt perspektiv. Avhandlingen bidrar således med intressant information för framtida forskning.

Avhandlingen utfördes av My Sundén under handledning av Annika Gunst PsD och Jan Antfolk PsD.

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