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Post-Partum Depression and Infant Crying Behaviour

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Introduction

Excessive infant crying can be troublesome for parents and health-care providers, even though for the most part, it is quite benign for the infant.[1] However, in the context of post-partum depression (PPD), excessive crying behaviour may be problematic if it leads to a failure to elicit appropriate maternal responses. This may have substantial and lasting adverse consequences for development. Understanding the impact of infant crying in this setting and the implications for interventions that promote healthy child development services will be the focus of this article.

Subject

Understanding infant social and emotional development in the context of maternal mental illness is a timely and urgent issue. Post-partum depression is common, affecting 10 to 20% of all mothers in the first few post-partum months.[2-4] Accumulating evidence shows that maternal depression adversely influences some aspects of infant development and behaviour,[5,6] particularly difficulty soothing, irritability (i.e., altered behavioural state regulation) and crying behaviour.[7] Arguably, excessive infant crying is a signal waiting for a response. Consequently, it may be a useful target to use for interventions in mothers with depression that improves

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outcomes for infants and their mothers.

Problems

There are several reasons to believe that targeting infant crying behaviour may be an effective way to improve developmental outcomes among infants of depressed mothers:

- PPD may interfere with the infant's ability to "use" the cry signal as a way to engage or communicate with its depressed mother, thereby compromising social and emotional development.
- Limited research examining how crying characteristics of infants of depressed mothers are interpreted or understood by their mothers or how they are related to developmental outcomes.
- While reported interventions for PPD have typically improved maternal mood, interventions have been successful in effecting sustained improvement of infant developmental outcomes .[8]
- Emerging evidence suggests a potential beneficial effect of addressing infant cry as a strategy for treating maternal mood disorders. Therefor, if crying can be regarded as a meaningful "target behaviour" for intervention with depressed mothers, research needs to address how to identify it (cry), what aspect of its character is meaningful (to the mother and clinician), who should be the target of the intervention (mother and/or infant) and whether the crying infant or the mother's processing of the signal matters (i.e., mother vs. infant).

Research Context

Infant crying duration and intensity reaches its peak during the first three months of life. All healthy low-risk infants will cry for prolonged periods for no apparent reason that is typically not associated with an identified etiology or pathology, although about 20% do this so much that they are sometimes considered to have "colic."

Further, under these circumstances infant crying is a key signal that engages mothers and therefore may assist in the emerging social and emotional development of the infant. This three-month period also corresponds with the peak incidence of post-partum depression. What does this mean for the developing infant when the cry signal is ignored, or misinterpreted by the depressed mother?

Post-partum depression poses substantial adverse consequences for mothers and their infants via multiple direct biological (i.e., medication exposure, maternal genetic factors) and environmental (i.e., life with a depressed mother) mechanisms.[8,9] From the earliest newborn period, infants are very sensitive to the emotional states of their mothers and other caregivers.[10,11] Maternal mood and behaviour appear to compromise infant social, emotional and cognitive functioning.[11-15] As children grow, the impact of maternal mental illness appears as cognitive compromise, insecure attachment and behavioural difficulties during the preschool and school periods.[6,16-19]

Timely and appropriate maternal sensitivity to the infant's behaviour is a central component of mother-infant relationships and healthy social and emotional development.[20,21] Maternal depression may disrupt the maternal-child relationship,[22] contribute to maternal failure to respond appropriately to infant signals[23] and lead to insecure attachments.[24] A mother's failure to respond to the crying infant can have important immediate and lasting consequences for infant development.

Maternal insensitivity and emotional unavailability influences the infant's ability to develop a capacity for arousal regulation.[25] Insensitive maternal behaviour results in increased anger, distress and crying – together, these might reflect an infant's poor arousal regulation.[26] PPD also alters the capacity to regulate the reciprocal interaction between mothers and their infant via two patterns: intrusiveness and withdrawal. Depressed mothers have more negative perceptions of their infants' behaviour and are less likely to offer stimulation to their infants.[27-29] Such lessened stimulation may lead to disrupted learning during non-social learning tasks. Depression appears to lead the mother to ignore or misinterpret the infant cry signal, compounding the damage of maternal depression. In addition, in a single report, infant crying may even exacerbate or trigger maternal depression, thereby increasing developmental risk.[5]

Understanding maternal failure to respond appropriately may be a key element in developing interventions that promote healthy infant and child development in the presence of post-partum depression. However, little work has been done that describes how well mothers are able to make correct and/or avoid incorrect judgments. Thus, the question remains: Does improving maternal responses to infant crying offer an opportunity to support healthy infant development in this context?

Key Research Questions

Research needs to address the following:

1. What is the evidence that infant crying might be different in the context of post-partum depression?
2. How do depressed mothers respond to their crying infants?
3. Is excessive crying causally linked to post-partum depression?
4. What do we know about maternal perception of infant crying in this setting?
5. What implications do altered maternal sensitivity (associated with depressed mood) to infant crying have for infant and young child development? How does the absence of a meaningful/appropriate maternal response influence infant crying?
6. How can findings from the questions above be used to develop interventions that utilize infant crying behaviour to promote improved maternal mood, maternal-infant interaction and child development in general? Are there services that target crying in infants of depressed mothers that promote maternal sensitivity to crying and lead to improved early childhood social-emotional development in a setting where crying is misperceived? Should those strategies focus on infant or mother, or perhaps on both?

Recent Research Results

While soothability (i.e., ability to regulate behaviour) may be altered in infants of depressed mothers,[30] and by extension crying behaviour (duration, timing and fundamental frequency), little is known about infant crying in the context of post-partum depression. Even less is known about how to intervene in this setting to promote optimal developmental outcomes. However, in a single study, Milgrom[31] et al compared crying behaviour in infants of depressed and non-depressed mothers at three and six months. From one-week daily recordings, variations in cry patterns were similar between groups and between ages (i.e., crying peaked in the afternoon and early evening and there was a reduction in total crying per week by six months). However, infants of depressed mothers cried significantly more in total per day than infants of non-depressed mothers at three months. Interestingly, depressed mothers did not rate their infants as more difficult, suggesting that crying amount differences could not easily be explained as a function of infant temperament. By six months, maternal depression had lessened and differences between crying groups had disappeared. Milgrom speculates that this change reflected the fact that infants had learned that crying was not a useful comforting strategy,

thereby leading to a reduction in this mode of communication.

Convergent evidence from studies examining other aspects of infant behaviour in this setting also suggests that infants of depressed mothers are more likely to cry more. Depressed mothers gaze less at their infants, rock less, are less active and show poorer responsiveness to their infants.[32] Infants may be more drowsy, more distressed and fussy, look less at their mothers and engage in more self-directed activity.[33]

Depression may affect maternal response via altered sensitivity to their infant's signal.[34] Schuetze and Zeskind[34] show that perception of infant crying varies with level of maternal depression: as the level of depression increases, infant crying is perceived as less urgent and sick-sounding (i.e., less aversive and less arousing). Using Signal Detection Theory, Donovan examined to what extent maternal psychosocial factors affect sensitivity to responses to infant cry. Mothers of four- to six-month-olds were asked whether they could detect differences between a standard cry and frequency variations of that cry. Mothers who were more depressed reported perceiving their infant as more difficult and were less sensitive to changes in cry frequency. Importantly, maternal sensitivity was also affected by marital happiness and conflict over work/home happiness. Moreover, a recent imaging study compared the neural response of non-depressed mothers versus depressed mothers to their own infant crying and found a reduced neural activation in the depressed mothers in regions related to emotional response and regulation.[35] Together, it appears that both the character of infant crying behaviour and maternal perception of crying differ when mothers are depressed.

Community-based early intervention programs[22] and population-based maternal screening for PPD[36] have been attempted as ways to improve developmental outcomes. To date they have yielded inconsistent results.[22] Brief home-based psychotherapeutic interventions appear to improve maternal mood and lead to a short-term improvement in mother-infant interaction. However, it remains unclear whether this leads to a sustained improvement in child development.[37–39] Some interventions aimed at improving maternal mood and marital supports have reported an effect on infant behaviour[40] but not on infant emotional development.[22,41]

Multiple lines of evidence point to relationships between excessive crying and long-term social and emotional development,[42] as well as the impact of maternal depression. In a single study, Miller and Barr[43] found a relationship between increased infant crying in the first six weeks post-partum and increasing maternal depressive symptoms. While this finding does not suggest a

causal relationship between crying and maternal mood, it does highlight the importance of understanding infant crying as a possible reflection of a distressed or stressed mother-infant relationship. However, to date there has been no research reported that examines the use of infant crying in this context as an intervention to promote improved social and emotional development. Data, on the other hand, do suggest that intervention strategies could be developed.

Donovan[30] speculates that an intervention that increases maternal capacity to attend (i.e., enhanced ability to recognize relevant or meaningful aspects of their infant's behaviours) to infant crying would be beneficial. Similarly, a focus on maternal understanding of the causal attributions associated with the cry (i.e., "the baby is not crying to bother you") might lead to appropriate response to the infant.

Recently, increasing attention has turned to focusing on a search for more practical approaches to infants crying as an approach to maternal depression by offering different strategies for intervention.

For instance, randomized trials targeting infant's colic crying by treating the infant (less than 3-4 month of age) with probiotics (Lactobacillus Reuteri),[44–46] with the assumption that reducing crying time will also benefit mother's mental state, however the results are inconsistent. Although none of the groups reported on drug side effects, while Guo who tested only breastfed infants reported on significant decrease in infant crying, and decrease in depressive symptoms at one month and at two months respectively, Sung who tested both formula fed and breastfed infants reported on increase crying in the probiotic treated infants (particularly in the formula fed infants) compared to placebo with no effect on maternal depressive symptoms. Clearly, additional large randomize trials are needed to further understand the possibility of using probiotics to manage infant colic crying and which subgroup of infant could potentially profit from such intervention.

Another study has reported on a unique intervention previously shown beneficial for preterm infants, using a "breathing bear" with gentle body motion rates that can be adjusted to match infant's breathing rates to serve as a comforting, nonintrusive crib friend for the infant, and a reassuring aid for the mother.[47] As infant can use the bear at his own will, the infant can learn that he can either approach or withdraw from the bear providing him opportunity for positive reinforcement. Surprisingly, although the exposure to the breathing bear was not effective in

reducing crying/fussiness (as reported by the mother) compared to use of a regular bear, mother's reports on infants' negative temperament scores, and on depression and stress levels have decreased (at 7 and 9 months – 2 months post intervention period). Novosad et al suggests that this positive effect on mothers mood might be mediated through changes in infant' self-regulation (i.e., lower negative temperament) which can potentially be associated with changes in mother infant interactions.[47]

While these reported interventions target the infant, other interventions target the mother-infant interaction[48] or the whole family (rather just the mother)[49,50] to improve parental skills by providing practical parental care techniques (such as sleeping habits and feeding) in combination with psychoeducation about the postpartum period and mindfulness techniques.[48] This set of studies have shown positive results such that maternal depression, anxiety scores[48] and baby crying times,[48,50] were reduced. However, although these intervention programs do show positive effects on both infant and mother/family, the beneficial effect was only short termed (peaking at 6 weeks of age).

Another perspective for improving maternal care was offered by the group of Young and colleges who tested the potential contribution of musical training in depressed adults to their ability to interpret infant crying in relation to changes in pitch.[51] Using auditory recordings of infants crying manipulated such that the pitch of the crying increased gradually to sound more distressed, it was shown that depressed adults with previous musical training showed higher sensitivity in discriminating distress variations in the infant crying. Although this study was not specifically tested on mothers with PPD, Young suggests that even short musical training can have a protective effect to overcome diminished sensitivity to auditory cues for distress in infant crying that mothers with PDD might have.

While most of these interventions are promising in providing relief to both mother, family and infant, none of these interventions have shown or examined long term effects on infant developmental outcomes.

Conclusions

Reviewing what is known about infant crying behaviour and post-partum depression raises more questions than it answers. Little is known about the character of crying among infants of depressed mothers. However, preliminary studies suggest that cry frequency is increased and

that PPD may reduce the maternal capacity for processing infants' signals (i.e., crying), which interferes with social and emotional development. Infant crying itself may adversely influence maternal mood. Together, these findings may suggest that we might target crying behaviour for interventions that alter both infant behaviour and maternal perception of their infant's behaviour as ways to improve maternal sensitivity and infant developmental outcomes. At this point, it remains unclear whether excessive infant crying in the presence of post-partum depression is just a "window" onto a disturbed dyadic relationship and a reflection of developmental risk, or a "door" through which we can enter and intervene to improve developmental outcomes and mental health. In this sense infant crying may also be a "signal by proxy" eliciting help for the depressed mother. Developing services that promote and/or target infant cry during the first four to six weeks may offer ways to intervene and improve the depressed mother-infant dyad.

Implications

Infant crying behaviour may be an important step towards addressing maternal mental health and developmental consequences. We need to address a number of unanswered questions. Do the quality and character of the crying behaviour in this setting matter? What is the role of maternal perceptions of crying, the effect of antidepressant medications (via prenatal exposure and breast milk), specific relationships between crying behaviour and developmental outcomes? Finally, how do contextual factors (family, social and economic variables) influence child development in this context?

Second, if crying is a meaningful "target behaviour" for intervention with depressed mothers, we need to know how to identify it, what aspect of its character is meaningful and who should be the target of the intervention: the crying infant or the mother's processing of the signal (i.e., mother vs. infant). Recent studies have shown beneficial effects for both approaches; however most of these studies are preliminary, and showing only short term effects. Can maternal mood and developmental outcomes be improved in the long term? Clearly, additional longitudinal studies are warranted to compare between different intervention strategies on larger sample size and to follow up on infant developmental outcomes in the long term.

Ultimately, focusing on infant crying behaviour associated with maternal mental illness should not be disregarded from the context in which child development occurs. Excessive infant crying in this setting may be only a "red flag" of distress, and as such reflects key co-existent elements

of the context in which it occurs, such as the role of the father, social and economic factors and the community context. Infant cry in the context of maternal mood disturbances can also be recognized as an opportunity to improve mother's mood, which could in turn support healthy early development.

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