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MATERNAL DEPRESSION AND INFANT DEVELOPMENT:

THEORY AND CURRENT EVIDENCE

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Abstract

Maternal depression (MD) is a condition that has wide-ranging effects on the woman, her family, and the broader global society. It is generally agreed that MD is associated with untoward effects on the developmental trajectory of offspring. The aim of this article is to review the historical and theoretical underpinnings informing current thought linking MD with infant development, and to highlight some of the neuroendocrine and epigenetic processes related to MD and its sequelae. A broad understanding of the association between MD and infant developmental outcomes can inform nursing care of the childbearing family.

Key Words: Attachment; Bonding; Infant development; Maternal depression.

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Maternal depression (MD) is a common debilitating condition associated with numerous deleterious effects on individuals, families, and society globally (Horwitz, Briggs-Gowan, Storfer-Isser, & Carter, 2007; Institute of Medicine, 2009). Pregnancy and childbirth is a time during the life course when women are most vulnerable to this and other psychiatric disorders (Vesga-Lopez et al., 2008). The reported incidence of depression during this time varies widely, from 5% to 25%, depending on the population characteristics, the method of assessment, and the timing of the assessment (Gaynes et al., 2005). MD is frequently accompanied by other disorders—both medical and psychiatric (Institute of Medicine, 2009), and there is often an association between depressive disorders before and during pregnancy with postpartum depression (Horwitz, Briggs-Gowan, Storfer-Isser, & Carter, 2009). Indeed, Wachs and colleagues (2009) assert MD has a somewhat “infectious” nature, where prenatal depression increases the risk for depression in the postpartum period, which increases the risk for continuation of depression in the mother, which may initiate depressive symptomatology in her children.

MD is of particular concern during the perinatal period, due to its potential impact on fetal, infant, and child development (Tronick & Reck, 2009). Effects on early ontogenic processes is a prime concern because the quality of development that takes place in early life is an important determinant of health, learning, and behavior over an individual's life course, which in turn affects the degree of an individual's well-being and ability to function within and contribute to the society at large. Children who have attained optimal physical, intellectual, and social development may be more resilient to the vagaries of life, including those imposed by poverty and violence (World Health Organization, 2004). Consequently, investing in early child development pays significant dividends in human and economic development by fostering the development of productive and capable adults.

The association between MD and its potential deleterious effects on human ontogeny (the development of an organism) is perhaps intuitive, but the linking of these issues is a product of an extensive history of investigation and theory development spanning the centuries (Table 1). This review describes some of the notable historical and theoretical underpinnings that support a connection between MD and infant development, and current research that has measured the impact of MD on

infant developmental outcomes. A sustained awareness of MD and an appreciation of its potential sequelae are timely, as they encourage continued efforts to identify and support affected women and their families, ameliorating its untoward effects. The specific relationship between a mother and her child is the focus here; although there is a growing body of literature that addresses the contribution of paternal care, when present, and the role of caregiving by nonparental individuals.



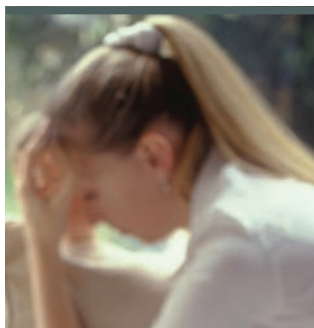
Infant Development: We've Come a Long Way, Baby

The many professions that are concerned with the welfare of infants and young children have progressed significantly from the notion of the infant as a *tabula rasa* (Locke, 1699), experiencing the world as a buzzing confusion (James, 1890). Throughout the ensuing centuries, philosophers and theorists from Rousseau (1762) to Vygotsky (1978) have

added their individual perspectives to a rich tapestry of understanding of the physical, cognitive, and socioemotional aspects of early development. Although many theorists focused on delineating the ontogenic process itself, other theorists examined the social and ecological determinants of development, with the maternal–infant relationship being a primary focus. Intriguing clues to the centrality of the mother–infant dyad to human development have been provided by early investigations using nonhuman primates and by human case studies of maternal deprivation.

The Dawning of a New Perspective

Over the years, many a student sitting in an introductory psychology class has been moved at the sight of a baby monkey clinging to a surrogate mother made of wire and terry cloth. These classic experiments were conducted by American psychologist Harry Harlow in the 1950s and 1960s. Like most in the scientific community during this time, Harlow was influenced by Sigmund Freud's psychoanalytic theory, which asserted, among other things, the maternal–infant relationship was paramount in human development (Freud, 1949). Harlow was also influenced by the work of René Spitz (1945) who described the detrimental effects of the separation of mothers and infants in state-run hospitals and orphanages in post-World War II Europe. Spitz reported a lack of maternal contact resulted in what he termed *hospitalism*, a spectrum of psychogenic maladies characterized by arrested growth, lethargy, diverse psychological and behavioral pathologies, and even death in the institutionalized children. The incidence of psychopathology and mortality were not



THE MOST RELEVANT CONSEQUENCE OF THE OBSTETRIC DILEMMA IS THE LIMITATION IT IMPOSES ON THE DEGREE OF BRAIN DEVELOPMENT THAT CAN OCCUR PRENATALLY.

offset by the provision of food and attendance to hygiene needs (Spitz, 1945). Intrigued by these findings, Harlow conducted a series of investigations examining the mother–infant affectional bond, using rhesus monkeys as a model for human behavior. The outcomes of these experiments are a familiar story. Baby monkeys deprived of their mothers became emotionally disturbed and demonstrated abnormalities in behavior. When baby monkeys were given two surrogate mothers, a bare wire surrogate mother that had a nipple for feeding and a cozier cloth-covered surrogate, the baby monkeys developed a strong attachment to the cloth surrogates and little or no attachment to the bare wire surrogates, regardless of which surrogates provided nourishment. Among other things, these experiments pointed to the importance of what Harlow termed *contact comfort* (Harlow & Harlow, 1962). However, contact comfort alone was not sufficient for normal development to proceed. Harlow also noted none of the baby monkeys that clung to cloth surrogates developed into normal adolescents or adults—neither socially nor sexually. This led Harlow to speculate there must be multiple processes connecting mothers and babies, and maternal–infant social phenomena such as vocalizations, gestures, and various other social behaviors may be essential elements supporting early developmental processes. Harlow’s work and the work

of others began a paradigm shift in the field of infant and child development. Although it was understood animal models do not fully mimic human behavior, observations in nonhuman primates correlated well with human studies involving maternal deprivation, and thus paved the way for theorists to develop the important constructs of bonding (Bowlby, 1988) and attachment (Klaus, Kennel, & Klaus, 1995). These theorists began to illuminate the nature of the relationship between infants and young children with their primary caregivers.

Attachment, Bonding, and Beyond

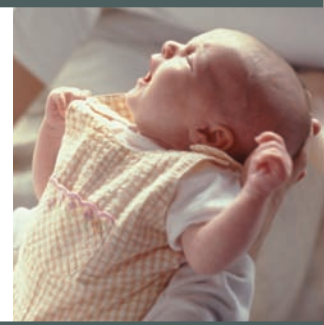
English child psychiatrist John Bowlby (1988) drew on the findings of Spitz, Harlow, and other investigators who focused on the effects of maternal care on early development (Sumoni, van der Horst, & van der Veer, 2008). Along with American developmental psychologist Mary Ainsworth, Bowlby described the mutual process by which infants and their primary caregivers interact with each other, resulting in the formation of the intimate emotional attachment bonds. Bowlby and Ainsworth described a variety of infant behaviors that comprise a repertoire of signals designed to keep the individual to whom the infant has bonded close at hand, thus ensuring the infant’s needs are met. The maternal–infant social phenomena about which Harlow speculated are demonstrated by infant behaviors such as smiles, coos, and eye contact, which are aimed at eliciting a reciprocal response of warmth and social contact from caregivers.

The construct of attachment was refined by Klaus, Kennel, and Klaus (1995). It is generally believed both attachment and bonding refer to unidirectional phenomena, where attachment describes the infant’s emotional tie to the parent and bonding refers to the parent’s emotional bond to the infant. However, bonding is often used to refer to the strong emotions that bind one person to another in either direction. The formation of attachment, although primarily a developmental task for the infant, serves to bond the infant and caregivers in a kind of a partnership. With the introduction of the constructs of attachment and bonding, a picture of infant development began to come into focus. It would become established science that a sensitive and responsive caregiving environment is as crucial to optimal health of the developing child as the provision of nourishment.

TABLE 1. INFANT DEVELOPMENT:
A BRIEF TIMELINE OF THINKING

Locke (1699)	<i>Tabula rasa</i>
James (1890)	Buzzing confusion
Spitz (1945)	Hospitalism
Harlow (1962)	Contact comfort
Bowlby (1988)	Bonding
Klaus, Kennel, and Klaus (1995)	Attachment
Rosenberg and Trevathan (2002)	Obstetrical dilemma
Gunnar and Adam (2012, others)	Gene–environment interaction

MATERNAL BEHAVIORS DETERMINE THE CHARACTER AND QUALITY OF THE ENVIRONMENT IN WHICH INFANT DEVELOPMENT OCCURS.



The Obstetrical Dilemma

With the growing realization that the nature of the maternal–infant relationship is a strong determinant of infant developmental outcomes, it is essential to understand why; what is it about mothers and their babies that makes this so? Much of the answer lies in the well-established fields of neurobiological, behavioral, and social sciences, which have opened our collective minds to the remarkable fetal, neonatal, and infant patterns of development, and the extraordinary degree of encephalization that sets humans apart from other species in the animal kingdom.

The exceptional cognitive abilities of humans require relatively large brains with extensive cortical development and neural circuitry (Rosenberg & Trevathan, 2002; Williams, 2002). A large brain presents a problem, however, when taking into account the relatively small pelvic opening through which the fetus emerges (DeSilva & Lesnik, 2008). An obstetrical dilemma is created when the aforementioned encephalization is coupled with the constraints of the curved and compacted pelvis characteristic of human bipedalism—the fact that humans walk upright on two feet (Rosenberg & Trevathan, 1995; Rosenberg & Trevathan, 2002; Tague & Lovejoy, 1986). The mechanical requirements of erect bipedalism place limits on the size, shape, and degree of flexibility of the female pelvis and birth canal. In contrast to their human counterparts, the birth canals of nonhuman quadrupedal primates tend to be relatively straight with a spacious anterior–posterior diameter (Rosenberg & Trevathan, 2002).

The most relevant consequence of the obstetric dilemma created by the cephalopelvic ratio is the limitations it imposes on the degree of encephalization that can occur prenatally. This central feature of the human brain is of singular importance, because it obliges the human organism to accomplish a large degree of brain development in the early postnatal environment (DeSilva & Lesnik, 2008). Once the infant begins life outside the womb, accelerated brain growth and intense differentiation, myelination, and synaptogenesis occurs, supporting extensive changes in physiological, motor, cognitive, social, and emotional growth (Volpe, 2008). The corollary to this explosion of neurodevelopment is an extended period of immaturity and dependency. Immaturity and dependency produce a high degree of

vulnerability, where the effects of experience and environment on the developing brain are particularly strong. For optimal outcome, then, a sensitive and responsive environment is crucial—not only to meet physiological needs, but to guide critical changes in brain architecture and neurodevelopment.

When Attachment Is Derailed

Parenting behaviors—particularly those of the mother—determine the character and quality of the environment in which human ontogenesis occurs, sustaining the altricial (incapable of feeding itself) infant through the extended period of immaturity and dependency (Swain, 2007), and laying the groundwork for secure attachment. From the first minutes of extrauterine life, the neonate's neurophysiological state is primed to anticipate and depend on touch, voice, face, and nurturing care. Essential to nurturing care are maternal sensitivity and responsiveness, where infant cues such as crying or facial expressions are recognized, interpreted, and responded to in an appropriate manner. Normally, the maternal brain is activated to respond to these cues, motivating the mother to respond (Swain, 2007). This synchronous give and take between mother and infant creates a healthy and supportive caregiving environment (Tronick & Reck, 2009).

Alterations in maternal mood and emotional state, such as those found in perinatal depression, can alter effective maternal caregiving behaviors and transform the infant's developmental milieu. Depression is characterized by physiological and psychological dysregulation, producing such symptoms as fatigue, disturbances in sleep and appetite, anhedonia, negative affect, and bouts of irritability, guilt, and withdrawal (American Psychiatric Association, 2013; Wachs, Black, & Engle, 2009). In susceptible childbearing women, the rapid decline in female reproductive hormones that occurs after childbirth may contribute to monoamine, reproductive hormone, and stress hormone dysregulation, leading to the development of depressive symptomatology. Sacher and colleagues (2010) have advanced a neurobiological model for postpartum depression that involves a sharp decrease in estrogen levels, which is accompanied by an increase of monoamine oxidase, subsequent lowering of monoamines, resulting in mood alterations.

SUGGESTED CLINICAL IMPLICATIONS

- As advocates for our patients, nurses who care for childbearing families can implement educational programs to raise awareness of MD, its consequences, and the availability of local support groups.
- Nurses can be instrumental in screening for MD along the childbearing continuum: during childbirth education and prenatal healthcare delivery, during the postpartum period, at well-baby check-ups, in community child care settings, and in places of worship.
- By instituting routine screening for MD, nurses can help remove the stigma attached to mental health disorders, thus expanding outreach to susceptible individuals.
- Nurse-developed protocols can assist in ensuring appropriate referrals to mental health services for families at risk.
- As a component of evidence-based practice, nurses in perinatal and pediatric settings can reinforce the importance of early and sustained interaction and nurturing of newborns; interventions such as encouraging early skin-to-skin contact and promoting breastfeeding are two examples.
- By becoming politically engaged, nurses can advocate for access to mental health services, Early Head Start, and other initiatives for vulnerable infants, toddlers, and their families.

This neuroendocrine dysregulation begets compromised psychosocial functioning that then distorts mother–infant interaction patterns (Reck et al., 2011), thereby derailing social and emotional developmental processes (Tronick & Reck, 2009).

The “infectious” nature of depression is evident as the mother’s dysregulation potentially alters neonatal neuroendocrine function. Halligan and colleagues (2007) suggest that MD and resulting disturbances in the early caregiving environment alter the development of the child’s hypothalamic-pituitary-adrenal (HPA) axis, with far-reaching effects. They found a significant pathway from HPA dysregulation initiated in early life to mood alterations in adolescence.

Oberlander and colleagues (2008) propose HPA axis dysregulation may arise from genetic polymorphisms initiated by epigenetic programming via prenatal exposure to maternal depressed and anxious mood. Intrauterine exposure to maternal depressed mood and associated neuroendocrine pathology (e.g., hypercortisolemia) is associated with methylation of the *NR3C1* (glucocorticoid receptor) gene and increased infant HPA axis stress responsiveness. This points to the HPA axis as extremely sensitive to the impact of environmental stressors—even

from early fetal life (Gunnar & Adam, 2012)—and supports the notion of epigenetic gene–environment (G X E) interaction in the development of psychopathology. G X E interactions continue to be focus of numerous investigations into the predisposition for a variety of diseases, including MD and its sequelae.

Summary

Nurses are well-positioned to intervene and support families affected by MD. A broad historical and theoretical understanding of the effects of MD on infant development can impart a sense of urgency to prioritize screening of families at risk, and to implement interventions for families who may be affected by MD. In this way, nurses can support healthy infant development, which will significantly contribute to family well-being and the health of the greater global community. ❖

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ONLINE



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Early Heat Start National Resource Center
www.ehsnrc.org

Barnard Center for Infant Mental Health and Development
www.cimhd.org

IOM Consensus Report: Depression in Parents
www.iom.edu/Reports/2009/Depression-in-Parents-Parenting-and-Children-Opportunities-to-Improve-Identification-Treatment-and-Prevention.aspx

WHO: Maternal Mental Health & Child Health and Development
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