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A Critical Review of Maternal-Infant Bonding and Attachment Interventions to Promote Healthy
Emotion Regulation in Childhood

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ABSTRACT

The purpose of this critical review is to analyze current research of maternal-infant bonding and attachment interventions that promote healthy emotion regulation in early childhood. A practical overview of the current research on this topic will be presented, followed by recommendations for best practices in the application of maternal-infant bonding and attachment interventions. Current interventions generally enhance the maternal-infant bond and prevent adverse health outcomes in mothers such as postpartum hemorrhage and depression. However, how these interventions affect the development of emotional regulation capabilities in infants has yet to be comprehensively investigated. Thus, the rationale for the current review is to synthesize the current literature on this topic, with consideration of potential consequences of a weak maternal-infant bond, including the development of infant anxiety, depression, and other psychological disorders. Findings revealed that there are several interventions implicated for promoting emotion regulation in children; yet routine postnatal assessment to identify mother-infant dyads at risk for impaired attachment has not been widely implemented.

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Chapter 1

Introduction

After becoming a child psychiatrist, John Bowlby was fascinated by the different personalities of children he encountered while working at a school for maladjusted youth (Bowlby & Ainsworth, 1992). Bowlby was particularly intrigued by children who were affectionless and prone to stealing, a pattern he observed across 44 prior cases. He realized that these symptoms could be linked to an early childhood history of maternal separation and deprivation (Bowlby & Ainsworth, 1992). Bowlby concluded that, to facilitate healthy childhood development, a child “should experience a warm, intimate, and continuous relationship with his mother (or permanent mother substitute) in which both find satisfaction and enjoyment” (p. 13).

Building on the concepts of ethology and developmental psychology, Bowlby and his contemporary, Mary Ainsworth, presented a conjoint theory of infant attachment. In *The Nature of the Child's Tie to His Mother*, Bowlby explained that an infant's attachment behavior is comprised of instinctual responses that aid in forming the bond between infant and mother (Bowlby & Ainsworth, 1992). These behaviors (e.g., sucking, clinging, following, smiling, and crying) exhibited by the infant influence the mother to respond accordingly. After reviewing research related to an infant's cognitive and social development, Bowlby introduced his own concepts regarding infant development such as sign stimuli, an ethological conceptualization that specific caregiver responses to infants activate, suppress, or terminate infant behavioral responses (Bowlby & Ainsworth, 1992).

Ainsworth continued Bowlby's research through several observational studies. Her methodology emphasized meaningful behavioral patterns between infant and mother rather than the frequency of certain behaviors (Bowlby & Ainsworth, 1992). For example, she observed that the strength of a mother's responsiveness to cues from the infant increased an infant's confidence. The more responsive mothers were to their infant's cry during the early months of life, the less babies tended to cry. Consolidation and separation anxiety were also tested as factors of attachment through her Strange Situation study (Bowlby & Ainsworth, 1992). Ainsworth observed that the foundation for attachment is the capacity for a caregiver to act as a secure base for their infant (Benoit, 2004).

Ainsworth identified four different types of infant-parent attachment styles within her observations of mothers and their infants. The type and quality of attachment that develops between a caregiver and their infant is largely based upon the caregiver's response to their infant (Benoit, 2004). Three attachment types are categorized as 'organized' and include secure, avoidant, and resistant types. The last type is considered 'disorganized'. After six months of age, infants learn to anticipate specific responses from their caregivers when they exhibit distress or certain behaviors (Benoit, 2004).

Secure attachment develops when the quality of caregiving is sensitive and loving (Benoit, 2004). Thus, caregivers consistently respond to their infant's distress in a nurturing way, which helps them feel secure and comforted. This type is considered organized because the infant knows exactly how to engage and respond to their sensitive, responsive caregiver (Benoit, 2004). Insecure-avoidant attachment develops when the caregiver is insensitive and rejecting. For instance, a caregiver who ignores or becomes easily annoyed with an infant's cues may

inhibit the infant's natural tendency for exploration and pursuit of emotional connection (Benoit, 2004). Insecure-resistant attachment develops when the quality of caregiving is insensitive and inconsistent. This attachment style is associated with anxiety, anger, and insecurity among infants, which increases the risk for subsequent social and emotional maladjustment. Lastly, disorganized attachment develops when the caregiver exhibits atypical responses (Benoit, 2004). Disorganized attachment is most common among infants in high-risk situations. This attachment style develops in the presence of unusual or distorted caregiver behaviors, including erratic behavior, dissociation, or sexual perpetration (Benoit, 2004). Evidence reveals that caregivers who display these behaviors most likely have a history of unresolved emotional or sexual trauma, or some type of traumatic stress disorder (Benoit, 2004).

These attachment styles clearly emerged in Ainsworth's Strange Situation, which assessed infant behavior in response to two separations from their caregiver (Benoit, 2004). Infants with secure attachment demonstrated balance between connection with their caregiver and exploration of their environment. Alternatively, infants with insecure/avoidant attachment failed to greet their caregiver following separation and avoided them (Benoit, 2004). Infants with disorganized attachment displayed contradictory, confused behavior as they sought a solution to their fear and stress.

Longitudinal studies highlight the developmental implications of attachment style. Children with disorganized attachment are more vulnerable to stress, have issues regulating and controlling negative emotions, and often display hostile behaviors. Parental behaviors are strongly associated with the development of disorganized attachment among infants. Notably, infants who experience maltreatment account for about 80% of those who develop disorganized

attachment (Benoit, 2004). Children of parents with a difficult temperament were more likely to develop aggressive behavior by age five, along with subsequent behavioral problems, poor peer relationships, and unusual behavior in school (Benoit, 2004). Infants with disorganized attachment may develop anxiety anywhere from early childhood to adolescence as well (Colonnesi et al., 2011). Under these circumstances, an abusive caregiving relationship is detrimental to healthy childhood development; in other situations, quality of caregiver relationship(s) may facilitate healthy attachment in the presence of external stressors.

Another related concept is self-regulation, which consists of cognitive, emotional, and behavioral domains. To build adequate self-regulation, children need to learn effective strategies through repeated interactions with caregivers and positive parenting practices that incorporate sensitivity, warmth, and responsiveness. This is evident in toddlerhood as infants develop cognitive and motor skills necessary for independent forms of regulation (Planalp et al., 2021). Therefore, self-regulation is built within the parent-child relationship and, thus, influenced by the characteristics of the caregiver and environment.

Early childhood trauma, however, increases the risk for adverse developmental outcomes, including difficulty developing trust, empathy, and remorse, and hinders the formation of healthy interpersonal relationships (Erozkan, 2016). A secure and healthy relationship between a caregiver and their infant acts as a protective factor against the negative effects of trauma. Not only does it create a safe environment for the infant to explore and engage, but it also promotes the healthy regulation of emotional arousal (Erozkan, 2016). For example, a child with a secure attachment will respond to a source of threat by leveraging the support of their caregiver as a basis to cope (Fearon et al., 2010).

Sub-Chapter 1: Considerations for Maternal Factors

Given the adverse developmental trajectories associated with insecure attachment styles, many researchers have turned their attention to maternal risk factors that may compromise the development of secure attachment in early infancy. For example, a recent study examined positive parenting, parenting stress, and children's regulatory abilities across infancy and early childhood among three demographic risk groups, including adolescent mothers, low-educated mothers, or high-educated mothers (Planalp et al., 2021). Results indicated that mothers with lower educational level, income, and poor social support were less prepared for parenting and less likely to have skills needed for positive parenting. Specifically, adolescent mothers, along with mothers with a lower educational level, reported less access to resources, greater financial strain, and more problems with mental health. With respect to parenting practices, these mothers often utilized harsher parenting practices in lieu of positive parenting methods. Yet, if at-risk mothers implement positive parenting techniques later in their child's development (i.e., at 18 and 30 months), their efforts, albeit delayed, can still promote the development of self-regulation (Planalp et al., 2021). In comparison, mothers with a higher educational background demonstrated more sensitivity and warmth with their infants which, in turn, facilitated improved infant regulation at 30 months. Finally, mothers under increased parenting stress responded with more negativity toward their infants, which delayed self-regulation (Planalp et al., 2021). Results from this study generally converge with the extant literature: some maternal demographic characteristics are notable risk factors for the disruption of infant emotion regulation (Alhusen et al., 2012; Alhusen et al., 2013; Planalp et al., 2021).

Parenting stress is an expected outcome of the introduction of an infant to the family system. Higher parenting stress, however, can be associated with increased child behavioral problems and emotion regulation difficulties. Indeed, higher levels of stress on infants at three months of age was associated with a lower level of maternal sensitivity (Feldman et al., 2004). By 12 months, infant cognitive development was affected by this dynamic (Feldman et al., 2004). As some maternal demographic characteristics may increase parenting stress (i.e., lower education level, limited access to resources, lower socioeconomic status), this study establishes parenting stress as an independent risk factor for the disruption of infant emotion regulation.

Fortunately, positive parenting techniques may mitigate maternal risk factors that compromise the development of healthy emotion regulation in infants. For example, children of parents who displayed more responsive parenting techniques experienced more positive outcomes at 14 months and age three (Braungart-Ricker et al., 2014). Alternatively, children of parents under significant stress experience more difficulties with self-regulation at the same stage of development. Characteristics of warmth, responsiveness toward infant cues and needs, affective expression, vocal positivity and praise, and physical affection toward the child reflect positive parenting practices (Planalp et al., 2021). Responsiveness of caregivers appears to be particularly protective for the development of healthy emotion regulation in children.

Responsiveness is experienced when a mother speaks to her infant, engages her infant in a shared enjoyment, or encourages the infant to attend to something in the environment. Multiple studies indicate that infants with mothers who were more responsive and sensitive to their needs early in development were more regulated at later stages (Braungart-Ricker et al., 2014; Jennings et al.,

2008; Planalp et al., 2021). The earlier an intervention that targets maternal responsiveness is applied, the earlier robust positive regulation capabilities emerge in infants (Planalp et al., 2021).

Chapter 2

Literature Review

Several existing evidence-based interventions strengthen maternal-infant attachment and enhance the potential emotion regulation capacities of the developing infant. The following review will present an explanation of each intervention, how each addresses attachment and emotion regulation, and pertinent clinical implications for implementation.

Attachment and Biobehavioral Catch-up

The Attachment and Biobehavioral Catch-up (ABC) program is an evidence-based intervention developed to enhance children's abilities to regulate three components after facing adversity: their behavior, emotions, and physiology. Created by Mary Dozier, each of the three components addresses specific parenting behaviors that influence attachment and stress neurobiology. The first behavioral target is non-nurturing care, which is associated with disorganized attachment in vulnerable children (Dozier & Bernard, 2017). The second is parental responsiveness to their child's cues that contribute to self-regulation. As such, parents are taught to behave in a synchronous and delighted way with their child (Dozier et al., 2014). Lastly, the third component aims to reduce frightening behavior which may include verbal and physical abuse and intrusion of personal space, both which undermine a child's ability to develop organized attachments (Dozier & Bernard, 2017). It is important for the parent to first recognize how their own behavior may be frightening to a child, and then learn and implement alternative strategies (Dozier et al., 2014).

ABC implementation occurs in infancy and early childhood, given the important period of brain development and growth that occurs early in life. Infants and toddlers develop self-

regulation capabilities with assistance from a caregiver coregulation until the child can do so autonomously (Dozier & Bernard, 2017). Toddlerhood is accompanied by additional challenges, as young children often exhibit behaviors of defiance, aggression, and hyperactivity which may increase stress for parents and interfere with responsive care and coregulation (Dozier & Bernard, 2017). The absence of sensitive, responsive care from a primary caregiver may inhibit brain development and the subsequent formation of self-regulatory mechanisms needed for adequate emotion regulation. Underdeveloped emotion regulation strategies increase the risk for physical and mental health concerns across the lifespan (Martin & Ochsner, 2016). Yet, the establishment of responsive care may mitigate the effects of prior childhood adversity (Dozier & Bernard, 2017). ABC directly addresses attachment needs and nurturance between the mother and child, which supports the development of healthy self-regulation throughout childhood.

ABC is delivered across 10, once-weekly sessions to mothers and their children (ages 6 months to 4 years). Sessions are manualized, with structured topics to promote responsive caregiving, and typically occur in the home of the mother and child. ABC is offered nationally and internationally by parenting coaches who facilitate program implementation (Dozier, 2017). Response of the caregiver to feedback received from the parenting coach is critical for intervention success (Dozier & Bernard, 2017). Parenting coaches provide feedback at each opportunity for the parent to follow their child's lead (e.g., attending to a cue or offering nurturance) to increase sensitivity. These are known as "In the Moment" comments, which promote parent behaviors that increase synchrony between parent and child (Dozier et al., 2014). For example, in response to the parent taking a toy that the child handed to her, a parenting coach might say, "He handed you that toy and you took it right from him (i.e., description). That's a

great example of you following his lead (i.e., target). That lets him know he has an effect on the world (i.e., effect on child)” (Dozier et al., 2014, p. 48).

The efficacy of ABC was clinically tested across randomized controlled trials (RCT) with varying scenarios. One RCT included birth parents involved in the child welfare system as part of a foster care diversion program and CPS-referred birth parents (Dozier et al., 2014). In each study, parents were randomly assigned to receive ABC or a control intervention, the Developmental Education for Families (DEF). Both the parents and evaluators were blind to the intervention. ABC was tested in the lab, and DEF in the home. Results revealed that parent-child dyads who received ABC were more likely to be classified as securely attached compared to those in the control group, and fewer dyads exhibited disorganized attachments.

The three main concepts assessed to prove the effectiveness of the intervention included cortisol regulation, emotional expression, and executive functioning inhibitory control through self-regulation (Dozier et al., 2014). Regarding cortisol regulation, children who received ABC displayed more normative diurnal patterns of cortisol production than those in the control intervention at posttreatment and again three years later. To assess emotion regulation, children between 24 and 36 months of age (one- and two-years posttreatment) completed a challenging task designed to elicit frustration. Those who received ABC displayed less overall anger and anger toward parents than the control group. For executive function and inhibitory control, children between the ages of four to six years (two- and four-years posttreatment) who received ABC demonstrated higher executive functioning and better inhibitory control than those in the control group (Dozier et al., 2014). Although ABC demonstrates strong efficacy in laboratory

settings, the effectiveness of ABC intervention in the community has yet to be determined—a notable limitation.

Table 1. Overview of ABC Intervention Focus Areas by Session (Dozier et al., 2013).

Module	Title	Content
Sessions 1–2	Providing nurturance to the child	Helps parents understand that the child needs them to be nurturing when distressed.
Sessions 3–5	Following the child’s lead with delight	Emphasizes the importance of following the child’s lead in interactions. Helps parents become attuned and responsive to the child’s signals for engagement and disengagement.
Session 6	Frightening behavior	Helps parents understand that frightening behavior is problematic for the child and helps parents develop alternative ways of interacting.
Sessions 7–8	Overriding parents’ own issues	Parents are helped to develop strategies so they can override automatic ways of responding, providing nurturing, sensitive care even if it does not come naturally.
Sessions 9–10	Consolidating	Consolidates parents’ gains, provides practice with behaviors still in need of improvement.

Skin-to-skin Contact

Skin-to-skin contact (SSC) is the practice of an infant lying on their mother’s bare chest to mimic the intrauterine environment and promote adaptation to life. Research demonstrates that SSC contributes to regulation of several physiological systems within the infant, including sleep organization, temperature, heart rate, and behavioral responses (e.g., crying). Similarly, SSC may enhance socio-emotional development, attachment quality, and speech development (Norholt, 2020). Prior research supports the benefits of SSC for the developing infant. For example, one longitudinal study assessed the effects of sleep quality in preterm and full-term infants who received SSC (Feldman et al., 2007). Organized sleep provides the foundation for arousal regulation, physiologic maturation, and cognitive growth in the infant. In measurement of sleep

quality at term and again at follow-up with participants (age 10), children who received SSC demonstrated increased sleep efficiency during childhood and a higher sleep quality. Infants who received SSC also displayed longer periods of alertness, which increased their opportunity to engage in the social environment (Bastani et al., 2017). With an increased organization of sleep-wake cyclicality, infants had a more stable mental state distribution as well (Feldman et al, 2002).

Thermoregulation is critical to prevent hypothermia in infancy. SSC reduces the risks of hypothermia in infants, especially preterm and low birth weight infants (Norholt, 2020). Another randomized study assessed the effects of SSC on infant core and peripheral temperature during the two days of life. SSC was implemented during the first 120 minutes postpartum. Results revealed that infants who received SSC maintained peripheral temperature at a higher level than those separated from their mother at birth (Bystrova et al., 2003). Notably, thermoregulation difficulties are linked to poorer outcomes for mother-child social reciprocity and self-regulation at one year of age (Bystrova et al., 2003).

Breastfeeding may similarly involve skin-to-skin contact between an infant and their mother. Although breastfeeding is not considered SSC, it is associated with the practice and used to strengthen the maternal infant bond (Ekholuenetale, 2022). Breastfeeding can increase a mother's sensitivity to early infant hunger cues. A longitudinal study comparing mother-infant dyads who stayed in contact after birth versus being separated revealed the positive effects of SSC for mother-infant reciprocity and infant self-regulation (Bigelow et al., 2018). At the nine-year follow-up, the SSC mother-child dyads demonstrated greater mother-child reciprocity and emotional synchrony than the control group. Responsive mothers were also more likely to exclusively breastfeed for the first six months of life. Consistent with SSC, breastfeeding, which

involves close physical contact between mother and infant, promotes later emotional and cognitive stability in children (Oddy et al., 2010).

SSC is similarly associated with several positive maternal outcomes, including: 1) increased happiness, willingness to bond with infants, and general positive emotion regulation; 2) decreased risk for postpartum depression and physiologic stress; 3) improved breastfeeding outcomes and milk production; 4) resolution of loss and distress in connection with premature infants; and 5) facilitation of stress and anxiety regulation (Bigelow et al., 2012). For example, one study in Canada instructed a group of mothers to engage in SSC daily for the first month after birth in comparison to a control group (Bigelow et al., 2012). Mothers who participated in SSC exhibited lower depression and cortisol levels relative to the control condition. Interventions like SSC that promote maternal health and, in turn, limit maternal risk factors that compromise early attachment increase a mother's capacity to provide sensitive and responsive care for their infant.

Infant Stimulation via Maternal Movement

Maternal movement stimulates a specific set of infant behaviors known as a "transport response." This includes drawing up the hind legs, curving the back slightly, narrowing eyes, increased pain threshold, and reduced heart rate (Esposito et al., 2013). Maternal movement stimulation fosters normative development of gross motor skills, exploration behavior, and stress regulation in infants. One study of maternal movement stimulation in infants under six months measured the real-time effects of infant body movements, as well as crying and heart rate of the infant while in the crib, their mother's arms, while their mother was walking. Results indicated that carrying the infant while walking reduced crying and heart rate more so than remaining

stationary (Esposito et al., 2013). Variability of heart rate was higher among infants when being carried, which suggests that infants expect to be carried and are soothed by the associated maternal movement stimulation. Maternal voice also has shown to stimulate the infant by reducing levels of anxiety and creating a soothing environment (Provasi et al, 2021). Maternal movement stimulation and SSC both highlight the importance of physical stimulation in the early development of infant self-regulation (Feldman et al., 2002). Physical stimulation promotes the establishment of a secure attachment between mother and infant and increases maternal sensitivity to infant physical cues (del'Etoile, 2006).

Other Psychotherapies

According to the American Academy of Child and Adolescent Psychiatry (2019), psychotherapy helps children and families modify their behavior to make positive life changes. Beyond ABC, lesser-known psychotherapies that address mother-infant attachment and subsequent infant emotion regulation include Infant-Parent Psychotherapy (IPP), Psychoeducational Parenting Intervention (PPI), and Regulation-Focused Psychotherapy for Children (RFP-C). IPP helps mothers respond to and understand their infant's behaviors (Bernard et al., 2012). A study of infants with a history of abuse showed major changes in attachment style after IPP was implemented. Specifically, IPP enhanced attachment security among mother-infant dyads, which naturally reduced the presence of disorganized attachments (Suess et al., 2016). Similarly, PPI educates caregivers in their homes about parenting skills to enhance their stress management skills, problem-solving ability, and social support networks (Bernard et al., 2012). Both interventions are long-term (i.e., 12 months in length) and generally facilitate lower rates in disorganized attachment at posttreatment than control conditions.

RFP-C is a relatively new intervention to treat young children with emotion dysregulation and disruptive behaviors (Giuseppe, 2020). A common clinical target of RFP-C is Oppositional Defiant Disorder, which is characterized by irritability, angry outbursts, argumentativeness, and hostile behavior (Prout et al., 2019). RFP-C provides psychoeducation to the child and their family and strengthens the child's implicit emotion regulation system by establishing adaptive coping strategies (Giuseppe, 2020). The child's parents and siblings may be heavily involved in RFP-C sessions. Notably, RFP-C addresses emotion dysregulation and associated disruptive behaviors in childhood and adolescence that may be a consequence of early disruptions in attachment. Early intervention with RFP-C prevents the further escalation of emotion dysregulation and subsequent negative health outcomes into adolescence and adulthood (Prout et al., 2019).

Mobile or In-home Programs

There are several existing home visiting programs with proven benefits. Steps Toward Effective Enjoyable Parenting (STEEP) was created specifically for first-time parents with multiple risk factors (e.g., lack of support, stress, poverty) for developing an insecure attachment with their child (Bernard et al., 2012). STEEP promotes establishment of healthy parent-infant interactions by enhancing the caregiver's sensitivity to their child's cues and perspective-taking to understand their child's needs. Parents practice the early interactions they will experience with their child, which enhances their ability to attach to their infant and provides a foundation for an infant's socio-emotional functioning later in life (Suess et al., 2016). This intensive, long-term program is comprised of 30 bi-weekly sessions that begin with the parent individually during the prenatal period and conclude when the child reaches one year of age (Bernard et al., 2012).

Within STEEP, parents observe themselves in videotapes and receive guidance to recognize their child's signals, perspectives, and needs to increase their sensitivity and proclivity to respond appropriately.

Minding the Baby Home Visiting (MTB-HV) was developed to assist new parents at high risk of poverty, young maternal age, or a history of trauma with the development of a secure attachment with their children (Ordway, 2014). Visits facilitated by a collaborative team occur with the family from birth until children reach two years of age, a period of approximately 27 months. The program explicitly addresses maternal physical and mental health to mitigate long-term effects on the infant and family system. A pilot study of MTB-HV observed that infants who received the intervention were more securely attached than a control group who did not receive any intervention (Ordway, 2014). Another study analyzed the effects of MTB-HV on children one- to three-years post intervention. Results converged with findings from the pilot investigation; mother-infant pairs who received MTB-HV exhibited healthier attachments relative to those assigned to the control condition. Thus, with a healthier attachment, an infant's emotion regulation capacity can be enhanced and strengthened (Condon, 2019).

The Nurse-Family Partnership aims to improve maternal and child health after birth by providing nurses who conduct frequent home visits (Olds, 2006). This program targets first-time mothers from disadvantaged socioeconomic backgrounds and generally yields successful maternal-infant health outcomes. The Nurse-Family Partnership emphasizes the importance of prenatal health, competent and sensitive caregiving, and continuity of care with consideration of employment, educational opportunities, and future pregnancies (Olds, 2006). Results from three large-scale randomized control trials indicate that the Nurse-Family Partnership generally

improves parenting skills and the health-related outcomes of pregnancies for first-time mothers (Olds, 2006). Improvement of competent parental care then allowed for infants to better develop their emotional and language development, along with sensory functions such as vision and hearing, and decreased risk of child abuse (Kitzman et al., 1997; Olds, 2006; Olds et al., 2004; Olds et al., 1986).

The Infant Health and Development Program promotes the physical and psychological growth of premature and low birth weight infants (Ramey et al., 1992). This intervention is delivered over the first three years of an infant's life and provides comprehensive care in the home and education to caregivers. Evidence for the efficacy of the Infant Health and Development Program is robust; across eight different randomized control trials, infants who received the intervention demonstrate greater improvement in cognition (as measured by IQ), self-regulation capabilities, and health-related outcomes than their control-group counterparts (Ramey et al., 1992). Further, a longitudinal study of the Infant Health and Development Program was completed to evaluate its long-term effectiveness. At age 18, children who were part of previous trials completed structured assessment of their academic achievement, behavior, and physical and cognitive development (McCormick et al, 2006). Results parallel the findings of these children when they were eight years old: low-birthweight (LBW) infants who received the intervention outperformed their control counterparts in intellectual, cognitive, and physical development (McCarton et al., 1997; McCormick et al., 2006). Thus, the Infant Health and Development Program both mitigates risk factors for LBW infants and promotes later physical and mental health outcomes.

Chapter 3

Discussion

During the first interactions between a mother and her infant, an infant develops internal working models of self and others which establish the foundation for forming attachments later in life (Trombetta et al., 2021). As discussed earlier, these attachments heavily influence the regulation strategies and cognitive processes of the infant as they grow (Bowlby & Ainsworth, 1992). At present, multiple interventions that promote secure attachment between caregivers and their infants are available. All interventions reviewed in the current analysis cover a wide range of perspectives aimed at promoting normative cognitive and social development in infants. Most of these interventions are designed for prenatal or early postnatal implementation to mitigate the primary risk factors for attachment difficulties.

Broad preventative health measures promote healthy lifestyles among patients, and models of prevention can be applied to mother-infant dyads who experience early attachment difficulties. Nursing is a widespread specialty that implements prevention strategies in routine patient care. Five main prevention strategies are used for preventing negative health outcomes in the nursing specialty (Kisling & Das, 2021). Primordial prevention focuses on risk factor reduction at the population level by taking into consideration relevant social and environmental conditions. Primordial prevention could be helpful in identifying environmental and interpersonal risk factors that compromise early maternal-infant bonding. Primary prevention focuses on averting negative health outcomes by targeting identified risk factors and instituting activities that decrease exposure to potential hazards in a patient's lifestyle. Primary prevention emphasizes the importance of education and teaching vulnerable individuals about potential

health hazards. For example, a nurse is using primary prevention when she teaches a mother about the negative short- and long-term effects of smoking while pregnant on her and her developing fetus. Secondary prevention is initiated when risk factors are identified in a patient through emphasis of early detection. Screening measures for maternal-infant bonding difficulty and associated risk factors constitute an example of secondary prevention. Tertiary prevention is implemented when a condition is present in an attempt at rehabilitation and further prevention of disability. In application to maternal-infant bonding, tertiary interventions target the reestablishment of a secure attachment amid the presence of insecure or disorganized attachment. Lastly, quaternary prevention ensures that people undergoing medical interventions are protected, and the services are not causing additional injury (Kisling & Das, 2021).

Many of the interventions reviewed target secondary or tertiary prevention. The Attachment and Biobehavioral Catchup (ABC) is an example of an intervention applied at the secondary or tertiary level. After identifying infants at risk, such as those who have faced adversity, ABC promotes attachment formation to prevent further disability and enhance mother-infant coregulation of emotions (Dozier et al., 2014; Dozier & Bernard, 2017). of the other identified psychotherapies similarly constitute tertiary prevention. For instance, Regulation-Focused Psychotherapy for Children (RFP-C) is effective for children with emerging emotion regulation dysfunction and aims to address coping strategies on an individual basis (Giuseppe, 2020; Prout et al., 2019). In comparison, Psychoeducation Parenting (PPI) and Infant-Parent Psychotherapy (IPP) intervene at the caregiver level to mitigate caregiver risk factors through psychoeducation and parent training in responsiveness (Bernard et al., 2012; Suess et al., 2016).

Skin-to-skin contact (SSC) acts as a primary prevention strategy that emphasizes the importance of bonding through physical stimulation. Other reviewed mobile and in-home programs are optimally delivered prenatally and similarly emphasize early psychoeducation and parent training, which constitutes primary prevention. For example, Steps Toward Effective Enjoyable Parenting (STEEP) highlights the importance of instruction in positive parenting to increase responsiveness to infant cues (Bernard et al., 2012; Suess et al., 2016). Alternatively, some mobile home programs represent secondary or tertiary prevention for identified at-risk families. For example, the Minding the Baby Home Visiting Program (MTB-HV) increases the likelihood that at-risk parents (e.g., living in poverty, young maternal age, history of trauma) form a secure bond with their infant.

According to prior research, early identification of risk factors for attachment difficulties and subsequent intervention is crucial to promote the healthy development of maternal-infant attachment (Benoit, 2004; Erozkan, 2016). Prevention of insecure attachment development requires attention to factors that impede healthy maternal-infant bonding. Preliminary screenings of maternal status and more comprehensive assessment, if indicated, during routine prenatal visits may assist in the identification of risk factors for compromised attachment to guide intervention implementation. This would allow for the implementation of secondary prevention prior to the child's birth, which may protect against the later development of emotion regulation difficulties in the developing child (Bowlby & Ainsworth, 1992).

Since parental contribution to attachment is fundamental for a child's development, the early identification of risk factors for poor parenting during routine prenatal care is critical, especially for first-time mothers (Trombetta et al., 2021). Proposing the idea of "pre-natal

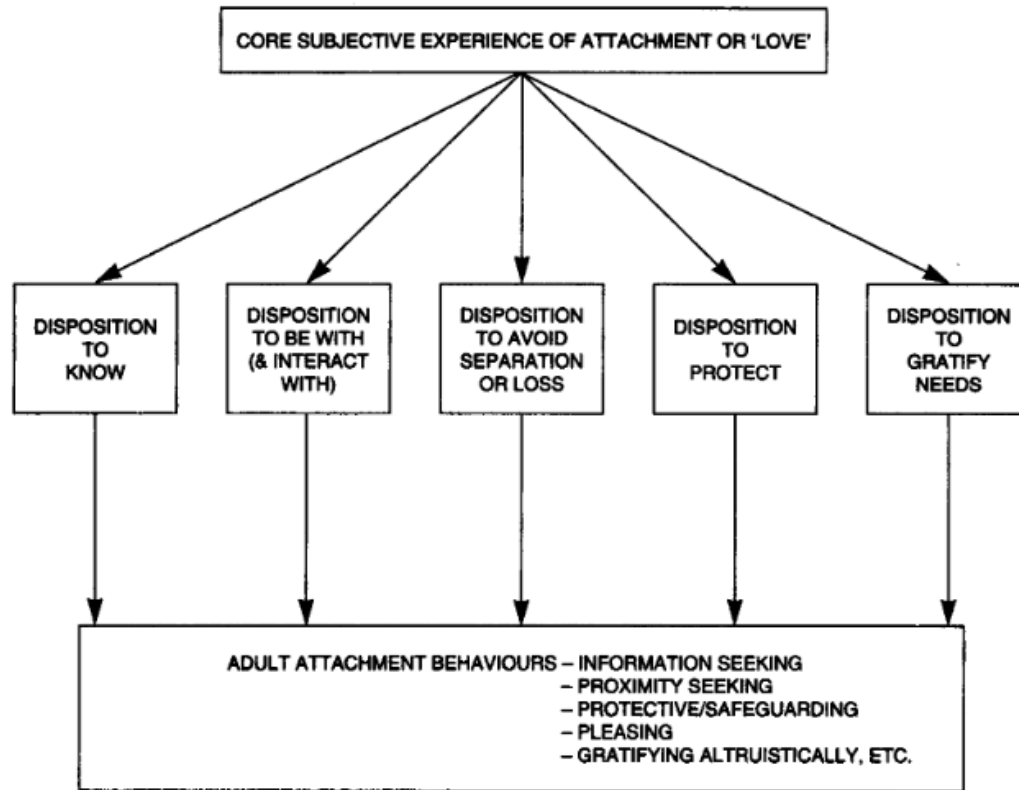
attachment,” Cranley et al. (1981), suggested that attachment can be predicted by the feelings a mother has toward her baby during pregnancy. They developed the first Maternal-Fetal Attachment Scale was then created to measure maternal-fetal attachment across six different domains: differentiation of self from the fetus; interaction with the fetus; attributing characteristics and intentions to the fetus; giving of self; and role-taking (Cranley, 1981). These domains constructed from frequent statements made by mothers about themselves and their fetuses that represented attitudes of affection and emotion, which resulted in a 24-item scale to assess the early attachment formation between a caregiver and their infant. Early evaluation of this tool in mothers in their third trimester revealed that maternal behaviors toward the unborn child predicted patterns of parental behaviors after birth (Cranley, 1981).

From there, other various measures were created to assist with early identification of parenting characteristics that compromise early attachment. Müller (1993) created the Pre-natal Attachment Inventory (PAL), a 21-item scale that assesses the relationship between a woman and her fetus during pregnancy. Müller (1993) believed that a single tool to assess prenatal attachment was insufficient, and the Maternal-Fetal Attachment Scale did not comprehensively assess the construct of prenatal attachment since it focused more on the women’s attitude toward pregnancy.

Postnatal assessments of parent-infant attachment also began to emerged in confluence with empirical investigations that observed attachment as a critical foundation for normative child development. Some postnatal assessments focused on the infant’s behaviors and sense of security and safety toward their caregiver (Zimmerman & Doan, 2003). Condon (1993) proposed the idea that maternal emotional investment toward the fetus stems from adaptation and role

attainment during pregnancy. His model of adult attachment posits that different subcomponents of the 'core subjective experience of attachment' contribute to parenting behaviors. This conceptualization of the mother-infant relationship emphasizes the emotional bond experienced by the parent toward the infant and associated sensitivity cues, which informed subsequent assessment measures of postnatal attachment (Condon, 1993).

Figure 1: Hierarchical Model of Parental Attachment (Condon, 1993)



Condon thus designed two questionnaires: the Maternal/Paternal Antenatal Attachment Scale (MAAS, PAAS) and the Maternal/Paternal Post-natal Attachment Scale (MPAS, PPAS; Condon, 1993; Condon & Corkindale, 1998). Both demonstrated substantial predictive validity for parental behaviors toward the fetus during pregnancy and infant after birth. Notably, both measures also assess paternal behaviors, which may play a larger role in infant attachment than previously thought (Condon & Corkindale, 1998). Additional self-report instruments that further assess the cognitive and affective dimensions related to Condon's framework are listed in the table below (see Trombetta et al., 2021).

Table 2. Measurement of Parent-to-Infant Attachment (Trombetta et al., 2021).

Measurement	Attachment	Characteristics	Subscales	Description
How I Feel About My Baby Now (FAB; Leifer, 1977)	Parent-to-infant	Self-report; 10 items, 4-point Likert scale	None	- Maternal/paternal feelings that represent affection toward the child are evaluated - Sample items: positive statements (“I feel tenderly toward my baby”), negative statements (“I feel disinterested in my baby”)
Avant’s questionnaire of mother-infant attachment behaviors (Avant, 1982)	Mother-to-infant	Observational	Not applicable	- Three groups of maternal behaviors (emotional, proximity, and caring behaviors) during interactions with the child are evaluated - Behaviors are observed in first 30 s of each minute, then recorded; each behavior recorded once per minute
Maternal Attachment Inventory (MAI; Müller, 1994)	Mother-to-infant	Self-report; 26 items, 4-point Likert scale	None	- Maternal activities and feelings that indicate affection are evaluated - Sample items: “I feel love for my baby”; “I look forward to being with my baby”
Maternal Post-natal Attachment Scale (MPAS; Condon & Corkindale, 1998)	Mother-to-infant	Self-report; 19 items, variable response options	1. Quality of attachment 2. Absence of hostility 3. Pleasure in interaction	- Maternal thoughts, feelings, and behaviors toward the child are evaluated. - Sample items: “Over the last 2 weeks I would describe my feelings for the baby as: dislike (1) – intense affection (5)”; “When I am caring for the baby, I get feelings of annoyance or irritation: very frequently (1) – never (5)”; “When I have to leave the baby: I usually feel rather sad (1) – I usually feel rather relieved (5)”
Post-partum Bonding Questionnaire (PBQ; Brockington et al., 2001)	Mother-to-infant	Self-report; 25 items, 6-point Likert scale	1. Impaired bonding 2. Rejection and anger 3. Anxiety about care 4. Risk of abuse	- Maternal feelings, cognition and behaviors experienced during interactions with the child are evaluated - Sample items: “The baby does not seem to be mine”; “I feel distant from my baby”; “My baby makes me feel anxious”; “I have done harmful things to my baby”
Mother-to-Infant Bonding Scale (MIBS; Taylor et al., 2005)	Mother-to-infant	Self-report; 8 items	None	- Adjectives that describe mother’s feeling toward the infant are presented - Sample items: loving, resentful, neutral or felt nothing, joyful, dislike, protective, disappointed, and aggressive
Post-partum Bonding Questionnaire (PBQ-16; Reck et al., 2006)	Mother-to-infant	Self-report; 16 items; 6-point Likert scale	None	- Maternal feelings, cognition and behaviors experienced during interactions with the child are evaluated - Sample items: “I feel distant from my baby”; “My baby irritates me”; “My baby is easily comforted”
Pictorial Representation of Attachment Measure (PRAM; van Bakel et al., 2013)	Parent-to-infant attachment	Projective; score is distance between “self”	Not applicable	- Parental non-verbal representations of feelings of attachment and connectedness to the child

		and “self-baby” circles		- Parents queried: “Where would you place your newborn baby in your life right now?” Then, parents place a symbolic sticker between “self” and “self-baby” circles.
Pre-natal and Post-natal Bonding Scale (PPBS; Cuijlits et al., 2016)	Mother-to-infant attachment	Self-report; 5 items, 4-point Likert scale	None	- Maternal feelings toward the child are evaluated - Sample items: “During the last four weeks, I could describe my feeling toward my baby the best as to be loving” (item 1), “happy and joyful” (item 2)

Current measures of attachment predominantly query prenatal and postnatal predictors of attachment, which often include parental feelings towards the child, connectedness to the child, and affectionate behaviors (Trombetta et al., 2021). While these measures have proven useful in the early identification of at-risk caregivers, the extant literature on factors that compromise early attachment remains limited to some degree. For instance, more research is required in mothers with non-normative pregnancies, which may constitute a vulnerable population at exceptionally high risk for impaired attachment. Additionally, few assessment tools in this domain have been validated across varying ethnic groups, ages, and education levels (Trombetta et al., 2021). It is also in question as to whether observational methods, versus self-report, yield more accurate information regarding the prediction of parent-to-infant attachment and other parental need (Trombetta et al., 2021). However, current measures provide a robust foundation for a stepped-care approach to mother-infant bonding, wherein concise assessment informs selection of the appropriate preventative strategy.

Chapter 4

Conclusion

Recommendations from contemporary literature suggests that combined intervention approaches offer the greatest benefit for mother-infant pairs. Risk determination is best guided by early assessment during routine prenatal care, which, in turn, informs intervention selection and implementation prenatally or postnatally to promote secure attachment behaviors. Given the severe developmental consequences of impaired attachment, dissemination of a comprehensive assessment and intervention framework to promote maternal-infant bonding is crucial (Trombetta et al., 2021). Yet, the widespread, uniform assessment of prenatal attachment has not been implemented, despite the availability of several validated measures. More research of these measures in clinical settings is desperately needed to establish the assessment of attachment as a standard prenatal care practice. Areas of emphasis for this research include the optimal timing and frequency to administer such measures, as well as the predictive validity of attachment measures across varying racial/ethnic groups.

Another indication for the potential need to implement uniform attachment assessment is the predominant reliance on objective data during prenatal assessments. This includes physical assessment of blood pressure, glucose levels, weight, and genetic testing (Office on Women's Health, 2022). Implementation of attachment assessments, either observational or self-report in methodology, permits a more holistic view of the patient by providing information about mental health functioning. This patient-centered practice is often lost amid the impersonal nature of

routine physical examinations. With rapid advancements in technology, the electronic administration of attachment measures and, quite possibly, the implementation of attachment-focused interventions via telehealth may offer a medium for seamless integration into prenatal care to enhance accessibility and reduce patient burden.

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Erie, PA

Spring 2022

Spring 2022

Fall 2021

Spring 2021

Spring 2021

Fall 2020

Fall 2020

LEADERSHIP EXPERIENCE

Leadership Plunge | Leadership Luncheon | National Student Nurses' Association Member

Student Nurses' Association of Pennsylvania (SNAP)

Center for Organ Recovery and Education (CORE) Liaison

Alpha Sigma Alpha, Epsilon Theta Chapter

Erie, PA

Fall 2020

Erie, PA

Spring 2021-

Present

Vice President of Alumnae & Heritage

Vice President of Programming & Ritual

Lion Ambassadors

Treasurer

Membership Chair

Spring 2020-2021

Erie, PA

Spring 2021-2022

Spring 2020-2021

Behrend Benefitting THON

Special Events Captain; Moral Captain

Erie, PA

Spring 2018-2020

HONORS & AWARDS, ACTIVITIES & INTERESTS

- Dr. and Mrs. Arthur Phillips Scholarship for Schreyer Scholars
- Council of Fellows Leadership Scholarship

- Behrend Honors Association Scholarship
- A. Herbert Sweny Scholarship for Nursing
- Western Pennsylvania Firemen's Association Scholarship
- Community Foundation of Quality Life Services Scholarship

- Kiski Area Education Foundation Scholarship
- Firemen's Association of the State of Pennsylvania Scholarship
- Behrend Excellence Award
- Kochel Lion Ambassador Fund

- Experience in documentation in Cerner, Surginet, and Epic Documentation systems
- UPMC Campus Ambassador for Penn State Behrend