IMPACT UPON EMOTIONAL AVAILABILITY:
INFANT GERD AND INFANT MASSAGE THERAPY

by

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Impact Upon Emotional Availability: Infant GERD and Infant Massage Therapy
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ABSTRACT

This was a secondary analysis of a blinded experimental design pilot study conducted by Dr. Neu et al. concerning 6 to 10 week old infants with gastroesophageal reflux disease (GERD). Early mother-infant GERD dyads are at risk for interpersonal disruption due to infant GERD symptoms. The purpose of this study was to discover if the treatment of infants with massage therapy would have an effect upon early mother-infant GERD emotional availability (EA) as observed during the feeding experience. The methods included videotaped observations of feedings at baseline and following 6 weeks of infant massage therapy versus non-massage therapy. The videotapes were scored using EA scales (Biringen, 2009) and analyzed by MANCOVA. This study supports the use of EA assessments with very young infant populations. The results found infant massage did not have a statistical effect upon EA, yet massage and non-massage touch may have influenced significantly improved infant scores. The results suggest there dyadic relational dynamics that would benefit from further research. Unexpectedly, maternal anxiety, depression, or GERD symptoms were not correlated with EA.

The form and content of this abstract are approved. I recommend its publication.

Approved: Madalynn Neu
To Tom
My Light through the Storms

To Austin
In Gratitude for your Love

To Alyssa
In Honor of your Unwavering Hope
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CHAPTER I
INTRODUCTION

A quiet intimacy occurs during feedings as mother and her new infant co-create a duet of belonging and meaning, completely matched in pitch and rhythm in an entwined relationship of nourishing body and emotional connection...a fantasy image for mothers and infants grappling with infant gastroesophageal reflux disease (GERD).

Statement of the Problem

The majority of early life infants experience a normal physiological gastroesophageal reflux (GER) where stomach contents move upward into the esophagus (Nelson, Chen, Syniar, & Christoffel, 1997). And, although there are a considerably smaller number of infants with the pathological form of the reflux, those with the severe symptoms of the gastroesophageal reflux disease (GERD) have significant affects upon their health and well-being (Vandenplas et al., 2009). Additionally, the preverbal infant is vulnerable and unable to survive alone, instead finding their early life experiences are embedded within a holistic mother-infant relationship where the partners are inextricably entwined. Within this holistic dyad, the health of one partner influences the other, yet little is known about the effects of infant GERD upon the dyadic mother-infant emotional relationship. Additionally, the life experience of GERD may be disruptive, yet the effects are not clearly understood from the infant’s preverbal perspective.

Current infant pharmacologic treatments for infant GERD are inconsistently successful and often have side effects (Barron, Tan, Spalding, Bakst, & Singer, 2007; Halbert, 2011; Orenstein, Gremse, Pantaleon, Kling, & Rotenberg, 2005; Orentstein & Hassall, 2007; Orenstein, Hassall, Furmaga-Jablonska, Atkinson, & Raanan, 2008),
placing the young mother-infant GERD dyad at risk for chronic disruptions in healthiness. The effects of infant GERD disruptions within the mother-infant relationship are not clearly understood and infants are in need of safe and successful interventions to relieve their symptoms. As infants are required to be in relationship to survive, and as their early life experiences are paramount to future relational health (Papasouk, 2011), this study will evaluate the effects of the novel treatment of infant massage upon the mother-infant relational experience.

**Purpose of the Study**

It is essential for the future health of the young mother-infant dyad that struggles with infant GERD symptoms to find physical and emotional repair, as there are potentially negative consequences to their future emotional health. The young preverbal infant with GERD may experience many distressful experiences, such as, disrupted sleep, respiratory illnesses (Orenstein, Shalaby, & Cohn, 1996; Rudolph et al., 2001; Smith, Ziegler & Gladson, 2009), crying and irritability, recurrent regurgitation, and feeding difficulties (Heine, Jordan, Lubitz, Meehan, & Catto-Smith, 2005). Yet, given the preverbal nature of the infant, accurate understanding of the infant’s life experience with GERD is obstructed. This opacity lends to misperceptions by mother and mistaken minimization of mother-infant GERD dyadic stress by the healthcare profession. There is a dearth of knowledge concerning chronic infant GERD dyads and there are less than effective interventions available for their comfort and improved life experience. Disrupted interactions upon two relationally inchoate lives has the potential to result in a self-generation of negative cycles of relational storms of exponential proportions. These potentially distressful storms from infant GERD symptoms may disrupt the intimate
interaction that occurs during the dyadic feeding relationship. The intention of the proposed study is to evaluate the young mother-infant GERD dyad following infant massage therapy (MT) to determine if there is an improvement upon the dyadic relational experience during feedings. This proposal embraces the foundational perspective that the mother-infant dyad is holistic and one partner’s experience will affect the whole. Thus, it is anticipated that an improvement of the infant’s life experience through MT will improve the dyadic emotional connection as observed during the feeding experience.

**GERD as Dis-Ease**

GERD is a chronic disease that requires healthcare involvement and treatment. Healthcare research has addressed GERD in the premature infant, the term infant, the toddler, and the older child. However, the medical perspective of the infant with GERD has focused upon the pathophysiology, often missing the impact upon the infant experience and the mother-infant relationship. As the infant is unable to exist alone, improving our understanding of the dyadic experience within GERD will be a critical adjunct to the current GERD knowledge base and treatment.

**GERD: healthcare’s longterm dis-ease.** Infant GERD has had a history of confusion or even dismissal in diagnosis and treatment within the healthcare arena. The earlier North American Society for Pediatric Gastroenterology, and Nutrition (NASPGN) guidelines (Rudolph et al., 2001) and current North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition (NASPGHAN) guidelines on GERD treatment (Vandenplas et al., 2009) state that the majority of infant reflux subsides by 18 months of age. It is also stated that infant reflux normally subsides by 12 to 14 months of age and Nelson et al. (1997) found reflux subsides throughout the first year with a
significant decrease after 6 to 7 months of age. The NASPGHAN guidelines also state that parents are to be given information, reassured, advised to change infant formula and its thickness, or perhaps be given a prescription for pharmacologic acid-reduction therapy. Yet, these treatments have been minimally helpful, sometimes harmful, and may increase frustration in the mother living with an infant experiencing significant GERD distress (Jordan, Heine, Meehan, Catto-Smith, & Lubitz, 2006; Moore et al., 2003; Orenstein et al., 2008). There is less concern unless there are complications of recurrent vomiting, irritability, and lack of weight gain, yet incredibly, a few mother-infant dyads might experience one-and-a-half years of disruptions from reflux symptoms and there is little comment on the dyadic issue.

Some studies have suggested that symptoms of GERD may mimic other diseases and there is a risk in not having early interventions (Kabakus & Kurt, 2006; Sweetman, Ng, & Kerrigan, 2007). Yet, other research suggests ‘patience’ is the treatment of choice for reflux (Orenstein et al., 1996; Moore et al., 2003). Additionally, GER and GERD have often been used interchangeably with shared symptoms in research. However, the distinctions between each condition have begun to improve with our increased understanding and professional guidelines (Vandenplas et al., 2009). Unfortunately, healthcare’s long period of lack of clarity has delayed accurate development of infant GERD treatments and has not adequately addressed the aspect of the derailed dyadic feeding relationship. Research outside of the GERD arena finds that early interventions of the young infant dyad improve their relational difficulties (Beebe, 2003), thus, an earlier intervention of MT holds more potential for dyadic recovery than at a later age.
**GERD: dyadic dis-ease.** Comprehending the preverbal infant’s perspective is problematic, yet, it is necessary for infant and dyadic health to have maternal attunement to the infant’s needs. The relational dis-ease in infant GERD is at high risk from disrupted and confused communication by the distressed preverbal infant. Additionally, mothers are at high risk for relational disruptions as they experience early postpartum fatigue and increased health needs as they heal from the delivery experience, and are then faced with high caregiver demands. The early mother-infant relationship is in the beginning of their learning of dyadic communication and emotional connection, which increases their vulnerability to attunement disruptions. Infant GERD has been known to increase feeding difficulties (Sherman et al., 2009; Vandenplas, Salvatore, & Hauser, 2005), placing disruptions at high risk during the intimate act of the feeding relationship. The attunement of mother and infant during the feeding relationship is accomplished through verbal and nonverbal languages. Observation of these interchanges will help delineate the climate of the dyad’s emotional connection. Likewise, as the infant does not exist in isolation, neither do mother-infant dyads. These distressed dyads would benefit if healthcare also attuned to their experience of GERD and addressed the dyadic aspects of this disease through safe and successful infant and mother treatment.

**Infants and Mothers**

The early mother-infant dyad includes two partners, thus characteristics of the partners will be considered in this proposal. These individual characteristics create interplays of initiation and response within the dyadic language and are impacted by the uniqueness of the early life experience that requires explication.
Preverbal vulnerability. The infant population is uniquely vulnerable. Preverbal barriers limit the infant’s clarity of communication and their expressions may not be easily deciphered, yet survival depends upon their language being decoded. Thus, an infant requires that a caregiver be able to read and attune accurately, be able to read the underlying intentions of the infant’s preverbal attempts to communicate. Importantly, a relational disruption or lack of accurate decoding early in life may interrupt the infant’s critical developmental process of learning interpersonal trust (Erikson, 1959/2004). An early life chronic dyadic interruption will impact future interpersonal encounters.

An early life disrupted dyadic relationship has the potential of impacting the infant’s sense of self (Stern, 2000), emotional regulation (Crugnola et al., 2011; Wolfe & Bell, 2006), and future relational health (Ghiassi, Dimaggio, & Brune, 2010; Mantymaa et al., 2009). The early life experience specifically marks future emotional and regulatory health in the life of the infant (Ham & Tronick, 2009; Newman, Harris, & Allen, 2011) and the effects may extend far beyond the mother-infant experience (Biringen, 2004; DiCorcia & Tronick, 2011; Emde, Biringen, Clyman, & Oppenheim, 1991; Fonagy, Luyten, Strathearn, 2011; Lupien, McEwen, Gunnar, & Heim, 2009; Meaney, 2010; Panksepp, 2001; Stern, 1998; Trevarthen & Aitken, 2001). As such, the infant with GERD is at risk for a myriad of health and relational issues.

Trevarthen’s (2005) words submit an example of the opaqueness of the preverbal infant interaction within the adult world as he wittily writes of the infant’s notoriously poor ability to be engaged in research. Yet, newer understandings of infant body language during moments of communication with adults suggest that they are seeking to communicate instead of imitate (Nagy, 2008). The young infant watches their partner’s
eyes and mouth, reaches forward while listening, and mirrors the communication pattern of their partner with a seeming attempt to learn the language (Trevarthen & Aitken, 2001). This perspective of infant communication suggests the infant embarks upon a significant task to learn the adult’s “senseless vocal expression of motives and feelings” (Trevarthen, 2005, p. 94). The infant seeks to emotionally connect with adults through incredible expenditures of intentional effort on behalf of this relational venture.

However, relational conflicts due to impaired homeostasis will add to the burden of distress for the infant with GERD. Maternal anxiety or depression is known to impact feeding disorders (Coulthard & Harris, 2003; McDermott et al., 2010), and in later childhood, feeding disorders have been considered to be relationship disorders (Atzaba-Poria et al., 2010). It has been demonstrated that the parental response to infant crying may increase the infant’s frequency and volume of reflux, irritability, discomfort, and back-arching (Nelson et al., 1997). An infant’s health is impacted by the mother’s experience of fears, anxieties, and insecurities that manifest in worry and stress. Dyadic relational health has significant implications for infant health (Tronick et al., 1998; Trevarthen & Aitken, 2001).

Although it is difficult to access the experiential preverbal world of infant GERD, this review will address literature that explicates the experienced world of the young infant. The infant perspective is needed for mothers to be able to attune with their infants, and understanding the infant perspective by healthcare will inform the development of accurate and successful mother-infant GERD interventions. Gadamer (1976/1999) describes the scholar as one who uses imagination to question and expose what is not yet understood and there have been scholarly attempts to understand the experienced world.
studied the infant’s perspective and is one such scholar that has attempted to describe the
actual experience of the infant. Stern has dedicated his work to provide a way to increase
adult appreciation of the infant’s rich, creatively tasted, and intensely experienced
preverbal life.

According to Stern (1998), the infant’s early life includes receiving global
perceptions of qualities of shapes, movement, intensities, and temporal patterns of
sensations that defy the tightly separate set of adult-labeled senses of sight, sound, or
touch. The infant ability of ‘amodal’ transference of one sense with another, such as
seeing voice or smelling touch, offers the infant a more holistic linkage to the underlying
essence to read another’s intentions, and offers a more comprehensive sensation of the
experience within. The infant experience of this intuited intense collision of senses has
been depicted by Stern’s created image of an infant being hungry, “A Hunger Storm”:

The march of the clouds across the sky breaks apart. Pieces of sky fly off in
different directions. The wind picks up force, in silence…The world is
disintegrating…The pulsing waves swell to dominate the whole weather-scape.
The world is howling. Everything explodes and is blown out and then collapses
and rushes back toward a knot of agony that cannot last—but does (Stern, 1998,
pp. 31-32).

It is with this level of sensitivity and attunement that the subject of infant GERD needs
to be theoretically and ethically approached by researchers and healthcare. This
sensitivity is important as there is no other infant language beyond crying to be able to
express how severe reflux may feel and how this spills over into their life experience.

**Maternal vulnerability.** Schore (2009) describes the mother’s intentional
communication with her infant as incorporating visual-facial, auditory-prosodic, and
tactile-gestural efforts (Trevarthen, 2005; Trevarthen & Aitken, 2001). Schore’s
hyphenated words help explicate the differences between mother-infant communication, and this melded description of the dyadic language demonstrates the need to connect and attune from differing world experiences. Although there may be intentional efforts by a mother to emotionally connect with the world of her infant, the dyad is still vulnerable to conflicts that normally arise. In fact, repair within the relationship is a necessary developmental task that mothers need to teach their infants. The experience of mother-infant relational repair improves dyadic and individual emotional healthiness (Schore, 2009). Yet, it is unknown if mothers who are vulnerable to a myriad of conflicts from the life experience of postpartum and infant GERD find themselves unable to (re)align with their infant and instead of relational repair, have added emotional disruption.

It is conceivable that the mother who is unable to soothe her irritable infant may experience this as a personal rejection and withdraw from repairing the relationship or prevent initiation of connective gestures. Also, if a mother experiences her caregiving as deficient, this affects her confidence (Hofacker & Papousek, 1998) and her perception of her infant (Atzil, Hendler, & Feldman, 2011; Ham & Tronick, 2009; Middlemiss, Granger, Goldberg, & Nathans, 2011; Rosenblum, McDonough, Muzik, & Sameroff, 2002; Tronick & Beeghly, 2011). Additionally, deprivation, anxiety, loneliness, or depression may thwart a mother from connecting positively with her child (Douglas & Hisock, 2010).

During postpartum a mother is also at risk of heightened vulnerability to unconscious memories from disrupted childhood relationships, setting in motion additional negative responses towards her infant of which she may be unaware or unable to control (Beck, 2009; Bowman, Ryberg, & Becker, 2009; Siegel & Hartzell, 2003).
Maternal distresses diminish her capacity to read her infant’s cues (Barlow & Svanberg, 2009; Beebe, 2003) and this reduced capacity to attune has the potential to recursively shrink infant emotional engagement (Nagy, 2008). With all of the possible emotional disconnections, mothers of infants with GERD may grieve the fantasy of their ideal experience, plunging the developing dyadic relationship into a chronic negative turbulence of emotional dysynchrony.

Conversely, it is also conceivable that the emotionally and physically healthy mother may be able to initiate the repair of a relational disruption from infant GERD distress and improve the infant’s experience of health. The maternal response to the infant plays a crucial role in early experiences of infant emotions (ZERO TO THREE, 2005; Barlow & Svanberg, 2009) and reflux (Nelson et al., 1997). Although mothers and preverbal infants are vulnerable in this chronic storm of infant GERD, mothers wish to be recognized for intuitive and sensitive caregiving (Papousek, 2011). Thus, the greatest underdeveloped concern for infant GERD health is the maternal response to infant distress and how the mother’s healthiness may diminish the fallout of looming negative effects from infant GERD. Research is still needed to adequately explain the maternal effects upon the infant GERD dyad so appropriate interventions may be discovered.

**Rationale for Dyadic Advocacy**

GERD is a conundrum for the healthcare community to diagnose and treat, creating dis-ease concerning the disease. Disrupted mother-infant dyads experience a bidirectional process of impact (Ham & Tronick, 2009; Newman et al., 2011). Although infant GERD has been the primary diagnosis investigated in the parent study of this proposal, the mother is an integral factor in the infant GERD disease experience. This is a
disease of the preverbal infant, yet it is less of an individual disease than a dyadic disease experience. Thus, the greatest dis-ease that cries for treatment in infant GERD is the chronically disrupted vulnerable mother-infant relationship. The feeding relationship portrays an intimate relational interaction that may expose the dyadic difficulties impacted by GERD, and the distress of one partner has the potential to agitate emotional disruptions to ripple beyond the moment into future turbulent waves of relational illnesses. Therefore, an intervention of infant massage therapy may improve the feeding which may pervasively positively impact the mother-infant relational health.

Asymmetrical Belonging

This study is complex in that it involves physical disease, emotional impacts, and the convergence of two lives. A specific uniqueness of this inquiry is the study of the ill preverbal infant embedded within the entwined holistic relationship with mother. The early infant has been at risk of being dismissed as not-yet-being, yet the infant world fully exists, creates meaning, and connects to others long prior to the language that is able to express its reality. One example of a formal shift towards increased awareness of the infant world is found in the more recent understandings of infant pain and communication (Puchalski & Hummel, 2002). It is ethical to inquire and intervene on behalf of the vulnerable preverbal infant and mother. The conceptual framework proposed for this study is ethical and holistic, recognizing that no infant exists without mother, and motherhood exists only through her infant. The two Belong and are impacted by each other.

Belonging, or connectedness with others, is a basic human need (Maslow, 1962/2013) that is exemplified through the mother-infant relationship. However, the
healthy infant survives through an asymmetrical caregiving relationship with mother. The relationship is considered asymmetrical as a mother does not belong to her infant in the exact way the infant belongs to her; mother is the caregiver and the infant receives care. The caregiver mother is able to foster Belonging by being emotionally available to attune to her infant’s needs and the infant is predisposed to be emotionally available to the caregiver so survival may occur. As such, the young infant will attempt to keep the communication open unless the caregiver disrupts the pathway (Nagy, 2008). An asymmetry in the ethical responsibility for the relationship also exists as the young infant is not responsible to generate the relational connection to mother, but mother is ethically responsible to intentionally create Belonging.

From the nursing perspective, Watson’s Caring Science (CS; 2008) is an ethical transpersonal philosophy that embraces Levinas’ (1961/2005) and Logstrup’s (1997/2007) philosophies of asymmetrical Belonging. CS promotes the authentic relationship within each moment of human interaction and views interactions through a deeper ethical and spiritual lens. The CS perspective of caregiving recognizes there is an asymmetrical responsibility to promote health in another through human Belonging (Levinas, 1961/2005; Logstrup, 1997/2007; Watson, 2008). This philosophical lens undergirds the ethics of the caregiver dyad and is fitting for use in a study evaluating the caregiver mother with her infant as elucidated through the holistic mother-infant relationship.

CS also suggests mind-body-spirit self-care is ethically required for caregivers to be open for engagement; this is analogous to the foundational concept that the mother’s level of mind-body-spirit health determines her capacity to be caregiver for her infant.
Through CS knowledge it has become clarified that the caregiver and care-receiver experience transformative life moments as each person becomes the other’s history and the present experience becomes foundational to the future, thus delineating the significance of relational interactions. CS considers the complexities of relational ontology are experienced through tone of voice, affect, touch, and intentions of care as the caregiver becomes the environment of healing for another by attuning to and addressing nonverbal needs through embodied care. This is a script written for nursing the infirm, yet it is just as fitting as a model for mother-infant relational care needed within the GERD experience.

The early mother-infant life also finds improved understanding through Heidegger’s (1962/1999) expose upon the philosophical ontology of Being, or existence. Every person is ‘thrown’ into the existent world of ‘Daesin’, the implicit life background that creates and impinges upon the person unawares. Thus, mother may be considered the Daesin of implicit non-conscious development of her infant, embedding culture, interactions, and language. Yet, Being is unable to exist without first Belonging (Levinas, 1969/2005) and is profoundly illustrated through the care-receiver world of infancy. An infant must *a priori* Belong to someone in order to survive to a state of Being. Also, supporting the premise of the caregiver, Belonging is articulated by Levinas as being an asymmetrical ethical demand to acknowledge Others’ needs; “The nakedness of the face is destituteness. To recognize the Other is to recognize hunger. To recognize the Other is to give” (p. 75). Levinas’ philosophy of ethics has been reframed by Perpich (2008) as how an infant must reach for something beyond their grasp through someone else’s hands. The dyad is a foundational piece of the infant GERD conundrum.
Logstrup (1997/2007) considers that humans vulnerably constitute one another’s world and that trust is essential, undergirding the significance of the development of early trust as submitted by Erickson (1959/2004). Logstrup considers there to be a ‘radical demand’ to care for another without or beyond the prescriptive requirements of social norms. Yet, if the underlying trust is ignored, or worse abused, the disappointment becomes distrust and trust is then neutralized in advance of future encounters.

Significantly, Logstrup purports how the child is only able to trust without reservation. The infant/child must trust their existence to others, yet this creates a vulnerability leaving them open to harm without protection (1997/2007; 1961-1982/2007). The mother-infant Belonging in asymmetrical caregiving and care-receiving is able to either build or destroy future trust in relationships. Trust allows Belonging and is invited through ethical caregiving so the infant is able to become Being, or exist.

Theoretically seating this study within the perspective of the infant, the mother, and their co-created contextualized relationship demands an appreciation of the underlying nonverbal communication that occurs in the space between. The interactive communication between two individuals is entwined far beneath words, as “the inner infinity of the dialogue… progress[es] between every speaker and their partner” (Gadamer, 1976/1999, p. 346). Empathic understanding of the infant GERD experience asks that research search beneath and beyond the infant’s physical symptoms.

Professionals have distanced themselves from the spirit of the GERD experience as they have considered only treatment of physical symptoms while, unconsciously or consciously, dismissing the underlying infant GERD experience, and also dismissing the
dyad. Missing this perspective has allowed clouds and storms to gather that disrupt the early life experience of Belonging and Trust.

**EA Weather: Language of Love**

The theoretical asymmetrical framework of this study is exemplified through the dyadic work of Emotional Availability (EA). EA is the ‘Language of Love’ (Biringen, 2009) within a scientific framework and is congruent with this study of caregiver and care-receiver. EA recognizes the subtle language of interpersonal interactions and is able to discern the underlying quality of connectedness. Everyday life is filled with changes in the weather of relationships, yet EA is able to assess the pervasive climate of the relationship through nonverbal and verbal interactions. The preverbal infant with GERD symptoms has compromised communication options with their mother, yet there is the potential to understand their expressions through EA language. Through EA, mother (and healthcare) may gain understandings of the infant language, ‘see’ the individual infant’s amodal experience of GERD, and recognize their entwined and vulnerable climate in the relationship. At this time, it is uncertain how the relational climate is experienced in the young mother-infant GERD dyad.

**Specific Aims and Hypotheses**

The infant with GERD exists within a holistic dyadic relationship, where the health of one partner affects the other. The purpose of this study was to evaluate the benefit of an infant MT intervention on the mother-infant dyadic relationship when the infant has GERD. Within the proposed dyadic framework, was the intention of this study to gain understanding of the GERD infant experience in relationship with mother and it is hypothesized that after 6 weeks of infant massage therapy, the mother-infant interaction
will be improved during a feeding observation. EA was compared between mother-infant dyads in which the infant received MT to a control group of infants who received a sham-touch non-massage therapy (NMT). The mother’s emotional health was evaluated concerning anxiety and depression (Atzaba-Poria et al., 2010; Coulthard & Harris, 2003; McDermott et al., 2010), as they might have an additional impact upon the dyadic emotional availability (EA; Biringen, 2008). The research questions underlying this study were:

1. Do mother-infant GERD dyads 6 to 10 weeks of age display better Emotional Availability following 6 weeks of infant massage therapy (MT) as compared to non-massage therapy (NMT) when controlling for the effects of maternal anxiety and depression?

2. Do high levels of maternal anxiety predict lower levels of dyadic Emotional Availability?

3. Do high levels of maternal depression predict lowered levels of dyadic Emotional Availability?

4. Is there a correlation between infant GERD symptoms and Emotional Availability?
CHAPTER II
REVIEW OF THE LITERATURE

Inquiries of infant gastroesophageal reflux disease (GERD) have been conducted in all stages of infant life, from the premature population (Malcom & Cotton, 2011; Silberstein et al., 2009) to infants over 6 months of age (Martin et al., 2002; Nelson, Chen, Syniar, & Christoffel, 2000; Ruigomez et al., 2010). However, infant GERD has predominantly been investigated through a pathological lens looking at treatment of the individual and missing recognition that the infant experiences life dyadically, and there is little knowledge concerning the maternal-infant dyadic interaction when young infants have symptoms of GERD. In this literature review, the current understandings of infant GERD and existing treatment modalities will be examined. Second, the dyadic relational aspects of the preverbal infant and mother will be considered with an investigation of how GERD might manifest within this emotional relationship. Third, the dyadic lens of Emotional Availability (EA; Biringen, 2004, 2008) will be reviewed for its applicability within this research. Fourth, the massage therapy literature will be evaluated for the current state of knowledge and consider how it might improve infant GERD symptoms and the dyadic experience.

Infant GERD

In order to discuss infant GERD, it is necessary to understand that the non-pathological infant gastroesophageal reflux (GER) is a physiologically normal function of gastric contents moving into the esophagus (Camponozzi et al., 2009; Diaz et al., 2007; Nelson et al., 1997; Osatkul, Sriplung, Puelpaiboon, Junjana, & Chamnongpakdi, 2002; Osatkul, 2004). Infants have immaturity of the esophagus and stomach musculature
(Henry, 2004) and are fed a liquid diet for the first months of life (Hassall, 2012). As infants are moved, reclined, and sat upright following feedings when their stomach is full (Costa, Silva, Gouveia, & Filho, 2004; van Wijk, Benninga, Davidson, Haslam, & Omari, 2010), reflux becomes more likely in younger infants than older infants, children, or adults. Normal infant refluxing usually resolves within 12 to 24 months of age after a peak intensity of occurrence at 3 to 4 months of age (Martin et al., 2002; Nelson et al., 1997), followed by a steady decrease in symptoms until 12 months of age (Van Howe & Storms, 2010). Normal GER is not what this study is investigating.

**Diagnostic Complexities and Symptoms**

Gaps in understanding infant GERD are embedded within an elusive and confused journey that has been experienced within the professional arena as uncertain determinations of normal infant reflux and diagnostic variances have occurred within the knowledge development of infant GERD (Bharwani, 2011; Khan & Orenstein, 2006; Sherman et al., 2009; Van Howe & Storms, 2010). Gaps in understanding the illness and the treatment of complications of infant reflux have also been impacted by the impediment of assessing the preverbal infant. The preverbal infant is unable to discuss the symptoms of their distress, is unable to express an origin of their troubles, and is unable to request a way of relief. Mothers are then left with an obscured interpretation to share with the healthcare provider concerning their infant’s reflux. It is also unknown if a mother’s perception of her infant’s distress is accurately attuned in the preverbal experience of GERD.

Symptoms of infant GERD include vomiting, regurgitation, irritability, feeding problems, hematemesis (Rudolph et al., 2001; Ruigomes et al., 2010; Vandenplas et al.,
2009), or sleep disturbances (Sherman et al., 2009) that may result in poor infant growth (Rudolph et al., 2001; Vandenplas et al., 2009). It has been found that complications of GERD have led to infant apnea or life threatening events that required hospitalization (ALTE; Doshi, Bernard-Stover, Kuelbs, Castillo, & Stucky, 2012). And, other infrequent and controversial concerns of reflux complications include respiratory symptoms (Orenstein et al., 1996; May et al., 2011), hoarseness, cough, congestion, otitis media (McCoul et al., 2011; Miura, Mascaro, & Rosenfeld, 2012), esophageal problems, or airway sequelae (May et al., 2011). However, most significantly, these disturbing symptoms occur within the burgeoning holistic mother-infant life experience, and more critically, there is scant understanding about these dyadic impacts within infant GERD.

The North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition (NASPGHAN) and the European Society for Pediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN) international panel state there is no symptom profile that is diagnostic of infant GERD. They encourage practitioners to offer parental anticipatory guidance about the normalcy of irritability and reflux in their infants (Vandenplas et al., 2009), yet experiencing reflux with irritability may affect the health and well-being of the infant. In fact, the symptoms of irritability and reflux also fit within the diagnosis of the more pathological reflux, GERD, thus the conundrum of normalcy versus complicated reflux pervades.

Further complexities have emerged that hamper diagnosing infant GERD through acidic reflux of pH < 4.0. The acidic pH that aids diagnosis and treatment of the adult population with GERD adds confusion to infant diagnostics as infants have a higher likelihood of having a normal pH. Research demonstrates that the severities of infant
GERD symptoms do not correlate well with acidic pH (Vandenplas et al., 2009). However the tests for pH may continue as acidity may be associated with other than GERD infant disease processes and the result of a positive acidic reflux test may support the use of an antacid pharmaceutical in the treatment (Rudolph et al., 2001). Other assessments able to evaluate the severity of infant reflux include recording the number and length of time reflux episodes occur through esophageal impedance monitoring (Kahn & Orenstein, 2006; Vandenplas et al., 2009). Impedance monitoring has found there is an increased association of cough symptoms with the act of reflux (Salvatore, Arrigo, Luini, & Vandenplas, 2010). Also, impedance monitoring that has been combined with pH evaluation through the multichannel intraluminal impedance monitor, MII-pH, has demonstrated that infants have more extra-intestinal events of retrograde reflux while maintaining a normal or weakly acidic pH (Khan & Orenstein, 2006; Pilic et al., 2011).

It is reasonable to consider how the elusiveness of diagnosing infant GERD might be improved by evaluating the actual tissues affected by reflux. However, the evaluation of reflux changes of mucosal membranes from erosive esophagitis through an endoscopy had only a 40% level of accuracy (Venkatesh et al., 2009). Another technological advance considered able to determine reflux sequelae includes the newer confocal laser endomicroscopy that discerns cellular changes of hyperplasia below the surface of the esophageal tissue. Through confocal laser diagnosing there is the possibility of instituting earlier treatments (May et al., 2011). Although a life threatening event (ALTE) is considered to rarely be caused by reflux (Vandenplas et al., 2009), the confocal laser may be able to discern the underlying cause of infant ALTE. Nevertheless, the use of such technology is unlikely to be found in regular assessments of the young infant with reflux.
and irritability, particularly as reflux is predominantly considered a normal physiological process.

Since studies suggest that infant reflux is not correlated with acidic pH (Chen et al., 2012; Moore et al., 2003), it has been questioned whether pain is underlying infant irritability (Douglas & Hiscock, 2010; Orenstein et al., 2005). Yet, pain is difficult to decipher in the young infant and crying or irritability may be a symptom that communicates the preverbal infant is in pain (Neu & Fuller, 2003). Infant crying may occur from GERD or it may express some other discomfort mothers and practitioners are unable to determine. A theme maintained throughout this study has been to highlight the added confounding issue of the young infant’s lack of a clarifying language. The young preverbal infant is vulnerable to interpretation by the professional or parent, yet the veracity of this interpretation remains obtuse. When older children were able to verbalize their distress from GERD, a factor analysis of their GERD symptoms determined they experienced epigastric/abdominal pain, heart pain, nausea/vomiting, and burping/belching (Malaty, O’Malley, Abudayyeh, Graham, & Gilger, 2008; Salvatore et al., 2010). Interestingly, Nelson et al., (2000) found older children self-reported higher levels of negative symptoms from reflux as compared to their parents. Such a discrepancy between the parental perception and the child experience of reflux also highlights how distressed dyadic partners may have difficulty attuning accurately.

The complexity of infant GERD has been difficult to define, and professional perspectives of infant GERD have differed (Vandenplas et al., 2009). Golsky et al. (2010) reported that the specific discipline of a physician’s training supplanted their determinations of the diagnosis of GERD. And, although it has been controversial and is
considered rare, May et al. (2011) reported infant GERD sequelae may include esophageal edema presenting as stridor, cough, recurrent respiratory illnesses, and even failure to thrive. Miura et al., (2012) found an association with childhood GERD and the experience of chronic or recurrent otitis media, yet this association has not been fully embraced throughout the professional arena (May et al., 2011; Vandenplas et al., 2009). Nonetheless, if there is possible swelling of esophageal tissues or congestion of the ear canals from reflux, infant feedings may be significantly affected due to their smaller upper airway structures and the need to recline while feeding.

Essentially, this review has highlighted the specific bind into which the young infant with GERD finds her/himself. There are few measurable diagnostic options to assist in treatment planning and the infant is unable to clearly communicate the significance of their experience. Additionally, synchronous attunement by others is a challenge. All the while, the medical community has had to untangle the pathophysiology versus normalcy of infant reflux and has not adequately addressed the dyadic impact of the infant GERD compromise. Irritability in the preverbal infant confuses diagnosis and treatment of GERD, yet dismissing the distress does not improve infant health or dyadic dynamics. The infant is in a most vulnerable experience.

**Incidence.** Cultural and geographic variables influence the incidence and severity of reported reflux as these factors also determine the definition of GERD. Yet, the majority of knowledge concerning infant reflux is related to normal GER and not GERD. In the United States, Nelson et al. (1997) found that normal physiological reflux peaks with an incidence of 67% in 4 month olds and decreases to 5% in 10-12 month olds, with recovery expected by 12 to 18 months of age (Vandenplas et al., 2009). In the United
States, the determination of GERD has been historically confused, but the current guidelines define GERD as diagnostic when infant reflux impacts well-being or health through troublesome symptoms (Sherman et al., 2009; Vandenplas et al., 2009). Determining GERD incidence is less clear due to the discrepancies in criteria and the use of the terms GER and GERD within peer-reviewed articles are still confused. Nelson et al. (1997) studied GERD prior to the development of the current diagnostic guidelines and found that 14 to 23% of mothers experienced their infant’s reflux to be troublesome. External causes affecting GERD diagnosis also include the particular professional’s trained orientation towards infant reflux (Golsky et al., 2010), the contextualized professional arena (Campanozzi et al., 2009), as well as the mother’s interpretation of the infant symptoms.

Thailand infants had an earlier increase in the incidence of daily reflux, 33% at one month of age, yet infant reflux then decreased to 2% by 6 months in a much quicker drop in incidence as compared to those in the United States (Osatkul et al., 2002). A study from Italy (Campanozzi et al., 2009) found 12% of their infants were diagnosed with regurgitation, and after 12 months 88% had no symptoms. Only 1 patient of the original cohort of 313 infants was diagnosed with GERD according to the Rome II guidelines, culturally seated for Italy, and the diagnosis was verified by endoscopy and histological assay showing esophagitis. Although there has been confusion, the medical community has recently convened to gain greater agreement in diagnostic criteria concerning infant GERD and have determined that health or well-being of the infant is of priority for determining the diagnosis (Sherman et al., 2009; Vandenplas et al., 2009).
**Current treatment.** The treatment of GERD includes interventions that are non-pharmacologic, pharmacologic, and surgical. A surgical intervention for infant GERD is considered a last option, yet it may become necessary for such treatment for significant health compromise (Halbert, 2011). Treatment should be considered conservatively, yet on the other hand, over time it became clear that healthcare providers and mothers were frequently interpreting all infant reflux as an illness that required treatment with pharmacologic interventions. Prescriptions to treat infant GERD skyrocketed (Barron et al., 2007), and these medications have been implemented with minimal empirical or clinical support (Diaz et al., 2007; Hassall, 2012) and were begun as early as one to four months of age (Barron et al., 2007).

Moore et al. (2003) evaluated the successfulness of the proton pump inhibitor medication (PPI), omeprazole, for infants 3 to 12 months of age with symptoms of GERD. All infants were placed under general anesthesia to obtain a biopsy specimen for determining tissue changes from reflux and all had placement of an intra-esophageal tube for pH monitoring. The results showed no esophagitis and 29 of 64 were completely normal biopsies. All infants were given an intervention: prokinetic (87%), H2 receptor antagonist (73%), antacid (67%), or a thickening agent (20%). This was a double-blind cross-over study and it was observed there was a significant drop in acid reflux with a PPI after 2 weeks. However, there was no difference in infant irritability with PPI use and all infant groups experienced decreased irritability over time.

H2 receptor antagonists (H2 blockers) have also been frequently used for treatment of GERD. The safety of nizatidine (Orentstein et al., 2005) was trialed in a population aged 5 days to 18 years of age diagnosed GERD. Out of the 21 infants treated
that were less than 12 months of age, one 11 week old developed sickle cell anemia 1
week after starting the medication and the infant’s condition continued to worsen 18-days
after the medication was stopped. The study had no control group to give perspective on
the actual incidence of these medication effects, nonetheless, the research supported the
safety of the medication and the use continued to grow.

All uses of PPI in infants less than 1 year of age are not currently approved by the
FDA, yet as previously mentioned, there was a sudden awareness of a 7.5-fold increase in
prescriptions among infants and concerns were raised by Orenstein and Hassall (2007).
Then in 2008, Orenstein et al. (2008) evaluated infant responses to lansoprazole, a PPI,
versus placebo in 162 infants and the results demonstrated there were no differences of
improvement of GERD symptoms with medication or placebo. The study was an
experimental design that included infants who were determined to have GERD if there
was crying in relation to meals after failing non-pharmacologic interventions. Side effects
of the PPI use was seen as lower respiratory infections in 62% of those treated versus
46% of those not treated. There continued to be a closer look at symptoms from
medications that had been dismissed as normal infant illnesses, and the question of
benefit versus risk began to be queried.

Higginbotham (2010) followed suit with a review of PPI use that amplified the
conclusions that infants may have sequelae from pharmaceuticals and voiced how
physiological reflux would naturally subside on its own without medications. Non-
pharmacologic interventions were considered the first line of treatment for infant GERD.
van der Pol et al. (2011) also conducted a systematic review on the use of PPI and found
that the literature did not support its effectiveness in treatment of infants. Ruigomez et al.
(2011) determined primary care providers in the United Kingdom were using more conservative approaches towards GERD, yet there was no mention of care for those less than one year of age. It cannot be assumed that the young infant has the tolerance of an older child and yet the amount of research concerning the young infant is glaringly less than other populations.

Malcom and Cotton (2011) reviewed GERD treatments, and although it was based upon the NICU infant after discharge, the investigation included a thorough explanation of the side effects found in reflux agents that have been prescribed for infants. These authors found thickeners decreased regurgitation, yet the additives of sodium and magnesium alginate, and the risk of intestinal obstructions were of concern. Additionally, adding a thickener precludes a mother’s ability to directly breastfeed. Prokinetics were reviewed for their ability to increase gastric motility, yet side effects were recognized, such as dystonia, irritability, restlessness, drowsiness, and possible tardive dyskinesia (D2 receptor antagonists) or possible cardiac and neurologic side effects (5-HT4 agonists). One prokinetic medication was subsequently withdrawn from the US market for adult and child safety issues. Medications that reduce acid also have possible side effects of calcium disturbances that may affect bone marrow, cardiac bradyarrhythmias, or infections.

Recently, Chen et al. (2012) reviewed the use of PPIs and determined that there needs to be verification of acidic pH reflux prior to prescription, as the efficacy of PPI use has not yet been determined and there has been lack of clarity that infants have acidic reflux. Additional concerns highlighting the use of PPIs in infants with minimal supportive research include: unqualified subsequent symptoms of the upper respiratory
tract, possible rebound pH acidity, and long-term safety issues in the risk of cancer in the gastrointestinal system. Furthermore, Neu, Corwin, Lareau, and Marcheggiani-Howard (2012) reviewed research concerning non-surgical treatment of infants with GERD. These authors found that pharmacologic treatment of GERD evidenced a decrease in infant irritability; however, placebo or non-pharmacologic treatment was as effective as pharmacologic treatment. There was also consideration that although pharmacologic adverse events are minor, such events may still exacerbate this stressful period of disrupted health. Chen et al. (2012) reported that improved infant positioning, changes in diet, and evaluation of a milk allergy should be the first levels of care for problematic reflux. And Neu et al. (2012) also concluded that conservative non-pharmacologic methods without adverse effects may be just as effective. It is clear that the current options for treatment of infant GERD are lacking and the dyadic perspective has received scant attention.

Summary

GERD is a chronic infant illness that has had confused recognition and has less than desirable treatment in the healthcare arena, yet infant GERD has a potentially significant negative impact upon the early mother and infant quality of health and relationship. Traditional medical treatments have focused on curing the infant of GERD and the lack of diagnostic criteria has led to over-pharmacologic treatment; however, recent awareness of the side effects urges the need for safer alternatives. In conclusion, the diagnosis of GERD is significantly impacted by the healthcare response and a non-invasive safe successful treatment is needed to improve the mother-infant GERD
experience. Also, there are misperceptions by mothers and healthcare providers as to the underlying cause of infant irritability, and the infant has no voice of clarification.

**The Dyadic Experience**

The discussion has addressed the diagnostic complexities of GERD, the incidence, and the treatment modalities. Yet, explication of the dyadic experience of living with infant GERD is needed for improved understanding. Moore et al. (2003) considered crying and irritability were predominant symptoms for inclusion into a research study of reflux and esophagitis treatment, and the current criteria for diagnosis of GERD are symptoms that are troublesome or worrisome (Sherman et al., 2009; Vandenplas et al., 2009). Yet significantly, there is little mention of the distress of crying, irritability, symptoms that are troublesome, or symptoms that are worrisome in the literature about GERD, and there is even less about the relational difficulties that would be an outcome of such a turbulent early life experience. Additionally, healthcare providers also experiences difficulties with infant GERD as they interface with the GERD dyad. Yet, the provider literature is absent about the infant’s perspective and quiet about the mother’s perspective of living with GERD.

Treatment decisions by providers may be clouded by the difficulty of evaluating the preverbal infant. Wessel’s “rule of three” (as cited by Herman & Le, 2007), developed in 1954, has been used as one guideline to determine how much infant fussing is too much. According to this tenet, infants who cry for 3 hours, at least 3 days per week, for at least 3 weeks are experiencing excessive crying. Rudolph et al. (2001) and Vandenplas et al. (2009) have considered it normal for infants to cry an average of two hours per day.
Herman and Le (2007) acknowledged that pediatricians and emergency room (ER) physicians often see mothers who seek healthcare interventions for the perception of excessive infant crying. In this article, the ER providers were reminded to consider other differential diagnoses and not just quickly diagnose the infant with gastroesophageal reflux disease (GERD). The physician was encouraged to provide education and counseling for parents concerning normal infant care. Doshi et al. (2012) reviewed emergency room admissions for life-threatening events of 2 month old infants; 49% received a diagnosis of GERD upon admission, 86% had a discharge diagnosis of GERD, and 13% were given upper gastrointestinal and pH probe studies for confirmation of the diagnosis. A visit to an emergency healthcare facility concludes in dismissal due to healthiness or admission for a life threatening event. Yet, either outcome is likely to have been experienced by the mother-infant dyad as a crisis. The profound emotional impact upon the dyad of the GERD life experience has little exposure in the healthcare literature.

**Chronic Infant Distress Cycle**

The very young infant of 6-10 weeks old is not able to clearly express symptoms of GERD, yet this preverbal status does not negate that an experience has occurred. It may be observed that these infants are distressed with recurrent vomiting (Heine, Jaquiyer, Lubitz, Cameron, & Catto-Smith, 1995), feeding disruptions, respiratory symptoms (Orenstein et al., 1996), and likely relational disruptions. Pointedly, the GERD infant does not experience one bout of distress, but rather experiences a chronic distress cycle leading to many potential hidden waves of suffering.

Amidst chronic distress, the early infant is co-creating a history of preverbal relational language with mother, a language that could negatively impact belonging
through a decrease in the quality and quantity of the emotional connection (Biringen, 2009). Stern (1998) identifies how relational development is established through an implicit, non-conscious process and articulates how the ‘now moment’ is an interpersonal meeting that changes both lives of the dyad through a deeper synchrony. In the preverbal world, Emde et al. (1991) have considered this underlying process as procedural knowledge which is gained without awareness. Unconscious or procedural knowledge increases an internal sense of coherency and ownership of self, as opposed to declarative knowledge that is gained explicitly from language; infants are embedded in procedural knowledge development and it matters how the experience unfolds. Non-conscious experiences are the building of emotional connection and self-development within the infant. This constructive experience requires an emotionally available caregiver to attune and respond sensitively through mirroring the preverbal communication. Yet, it is unknown how this unconscious co-creational connection with mother develops when the infant is chronically diverted with severe unrelieved storms of distress from symptoms of GERD.

An infant develops a self-narrative through language after 18 months of age, yet this is long after the infant has begun experiencing a sense of self-embedded meaning through others. Bowlby’s attachment theory research (1982) studied the infant’s need for proximity for protection and describes how this is needed more than food (Ainsworth & Bowlby, 1991). This need for protection is considered to be life-long and is actively, not passively, stirred when there is a separation from an attachment figure. Bowlby and Ainsworth found the need for protection could be terminated only by the attachment figure, and if there is insecure attachment the infant would either avoid or cry louder for
the mother. It is possible the inconsolable infant with GERD distress may feel that there is not protection from the symptoms and may be especially sensitive to whether mother shuts down emotionally from the relationship.

However, the theory of attachment for protection misses the more comprehensive proto-conversation (Trevarthen, 2005) that occurs as the preverbal infant seeks to communicate beyond the need for protection, but rather to gain a sense of emotional connection. In fact, secure attachment is built through emotionally available communication (Biringen, 2004). The preverbal conversation of the infant is observed through gaze, body language, and autonomic responses such as breathing or reflux (Papousek, 2011). The infant is built for a preverbal language of interpersonal connection from birth onward as this is their means of survival, yet adults need to be attuned to this physiological language for successful communication; this language becomes confused as the infant cries and is physiologically distressed without being comforted.

This desire for connection may be seen in the young infant reactive to social disruption within 3-96 hours of age (Nagy, 2008). Nagy evaluated term infants with the Still Face procedure, which means the researcher did not respond to the infant for a prolonged period of 180 seconds, an accommodation to the slower newborn response time. The infants were found to have expressions of increased distress, increased crying, and decreased eye contact versus those that were not exposed to the Still Face. It was also noted that there was a residual effect of infant withdrawal when the researcher attempted to re-engage. Clearly, the very young infant reacts to dyadic contexts of emotional withdrawal. And, infants with chronic GERD distress may experience maternal emotional withdrawal over time, likewise being affected to the point of their own emotional
disengagement. In other words, the quality of the emotional language of the infant and mother is vital to evaluate in the GERD disease process.

Trevarthen and Aitken (2001) developed a model, *Theory of Companionship*, to explicate infant self-development within three emotional domains of relationship: bodily emotions with self, aesthetic emotions with objects, and moral emotions with others. This model misses the maternal dyadic experience within the infant world, yet an infant experiencing GERD symptoms would be considered disrupted in bodily emotions with self and moral emotions with others. The intensity of the infant’s observance skills and their desire to connect emotionally also ensures that the infant with GERD may be quite aware of and affected by a distressed mother.

The GERD infant’s possibility of chronic disruption looms large and has significant social implications due to their poor ability to be soothed. Given that this is a chronic condition, chronic social disconnection has been implicated in activating the same physiological stress responses as fear or threat (Eisenberger & Cole, 2012). Additionally, the stress hormones, glucocorticoids, catacholamines, and nerve growth factor stimulated from the hypothalamic-pituitary-adrenal (HPA) and sympathetic nervous system (SNS) affect the immune and inflammatory systems (Eisenberger & Cole, 2012; Hansel, Hong, Camara, & von Kanel, 2010; Miller, Cohen, & Richie, 2002; Padgett & Glaser, 2003). These neurobiological changes from stress also interact with the gastrointestinal system (Overman, Rivier, & Moeser, 2012; Skaper, 2001; Sperling, Kreil, & Biermann, 2012) and may increase symptoms of GERD.

Developmental infancy research acknowledges the mutual dance of dynamic preverbal communication constructed with mother (Papousek, 2011) and explicated
through embodied emotional interactions (Trevarthen, 2005; Montague, 1986).
Interactive communication is built upon bidirectional adjustments of infant and mother
(Beebe, 2003) and the healthy infant develops trust through an evolving process of
anticipation that mother will respond in an expected embodied way (Trevarthen, 2005).
Yet, the mother who does not mitigate distress (Feldman, Singer, & Zagoory, 2010) may
negatively impact the infant. The infant’s repeated interactions build social expectations
(Feldman, 2007; ZERO TO THREE, 2005), yet the young infant with unmitigated
distress with GERD will have affects upon their future.

**Chronic Maternal Distress Cycle**

While access to the preverbal infant’s subjective experience is less tangible,
access to the subjective maternal experience is possible. Mothers are the initial step in
diagnosing infant GERD, thus improved understanding of a mother’s experience is
paramount to treatment and recovery. The pregnant dyad is separated at birth, yet
following this cleft they rejoin through daily embodied experiences, such as feedings.
Benner (1989) reasoned that embodied knowledge does not easily surface until it is
disrupted, yet if a mother experiences her relationship with her infant as disrupted from
GERD since birth, she may have a diminished capacity to recognize the disruption.
Evaluation of the dyad’s preverbal embodied language as observed through the mother-
infant interactions during feedings (Chatoor et al., 1997) may provide a perspective into
their relational health.

The experience of the mother may include the intensity of a life-threatening event
that brings her new infant to an emergency room (Doshi et al., 2012), or as many others
experience, she and her infant may be seen in the provider’s office. As one mother who
experienced having two infants diagnosed with GERD stated, “Some doctors love the challenge of pediatric GERD and others hate it. Treating GERD is part art and part science. GERD is rarely life-threatening and it isn’t sexy. It is messy, it is time-consuming, the patients and parents are often highly distressed and sometimes demanding…” (Pulsifer-Anderson, 2009, p. 50). This mother’s personally difficult journey led her to develop a parent support organization; the Pediatric Adolescent Gastroesophageal Reflux Association, created in 1992. Another mother described a very distressful journey when seeking healthcare for her daughter’s severe infant reflux (Roche, Martorana, Vitello, Eicher, & LaCour, 2008).

It is known that mothers seek medical support when their infant is irritable (Herman & Le, 2007), distressed with increased crying, back-arching, and perceived high volumes or high frequency of regurgitation (Nelson et al., 1997). As mothers become exhausted from attending to a baby that is not easily consoled, they experience increased worry and concern (Henry, 2004). They frantically search for validation and relief for their distress from their healthcare providers, yet also wish to be recognized for having insight into their child’s needs and not become discounted (Pulsifer-Anderson, 2009; Roche et al., 2008).

Mothers of crying infants experience higher levels of stress (Miller-Loncar, Bigsby, High, Wallach, & Lester, 2004) and mothers who are unable to satisfy their infant’s needs may experience added burdens of fear of falling short as a competent caregiver (Haas & Maune, 2009; Papousek, 2011), increasing any previously embedded anxieties or insecurities. Mothers may have clouded perspectives of their distressed infants as they experience increased anxiety, stress, or depression (Jordan et al., 2006;
Heine et al., 1995; Herman & Le, 2007; Malaty et al., 2008). This clouded perspective is concerning, considering it is her perception that determines if the infant has troublesome symptoms.

Additionally, mother’s perception may be skewed by her own experiential history and mental health status (Beebe, 2003; Siegel, 2012). Every mother brings her psychoemotional history into the experience with her infant, and disturbed childhood relationships potentially may disrupt her relationship with her new infant (Leiberman & Van Horn, 2011). Hofacker and Papousak (1998) found that 33% of young infants experiencing regulatory disorders had feeding issues and that the mother’s past adverse psychoemotional experiences negatively affected her intuitive parenting. A mother’s historical relational experiences affect her current ability to read the cues of her young infant accurately (Salmonsson & Sandell, 2011), and a relational disruption between mother-infant may lead to the vulnerable child syndrome (VCS) of exaggerated parental anxiety and fears potentiating a child’s illness (Snyder, Goodlin-Jones, Pionk & Stein, 2008). Hence, there is legitimate concern for the dyadic infant GERD inquiry and it has been important to consider if maternal anxiety or depression impact the dyadic emotional relationship.

**Significance of mother-infant daily interactions.** It will be useful to understand the dyadic language of mother-infant dyads to determine if and how GERD has impacted them. It has been demonstrated that a distressful individual experience affects both partners physiologically (Ham & Tronick, 2009; Middlemiss et al., 2011) and psychoemotionally (Guedenay, 1997). Yet, although this study maintains the perspective of the
holistic mother-infant dyad, there must also be consideration for the uniqueness of each partner and the differing role of caregiver and care receiver.

An evaluation of the tenor of continuous daily dyadic activities is a way to portray the underlying intentional language of emotional connection between a mother and her infant. These daily interactions are able to clarify the level of maternal sensitivity to infant cues (Hertenstein & Compos, 2001), and the infant responses become the gauge of success within the relationship (Biringen, 2004). Yet, the empirical literature is scant concerning the dynamics of the young infant with GERD and their mother, leaving a gap in this knowledge.

Mothers with less sensitivity to their infants reported more problematic infant behaviors, and those infants with feeding difficulties were later found to have differences in infant temperament, as well as maternal sensitivity (Hagekull, Bohlin, & Rydell, 1997). Hertenstein and Campos (2001) established that mother is able to modulate or elicit emotions within her infant; in other words, she is able to ‘co-regulate’ her infant. Co-regulation is a term used in mother-infant dyadic literature that recognizes the mother acts as an external assistant of her developing infant’s internal regulation of behavior and emotions. This is produced through an embodied experience of physical proximity, touch, and emotional interactions (Feldman, 2007; Tronick et al., 1998). Co-regulation occurs daily through the myriad of frequent infant cares, such as soothing, changing of diapers, bathing, feeding, playing, or bedtime care (Hofacker & Papousek, 1998). However, if maternal insensitivity is correlated with more negative infant behaviors, her impact may not have been one of co-regulation, but rather an act of infusing increased disruption. It is
unknown how the mother-infant GERD dyad co-creates their co-regulation relationship during the experience of feeding.

**The beginning of feeding disorders.** The feeding experience within dyads is more empirically clarified in other disrupted infant feeding conditions than GERD. “The relative stability of feeding problems in a normal group of infants during the first 2 years underlines the importance of focusing on early feeding problems in research and clinical practice” (Hagekull et al., 1997, p. 104). However, the majority of infant feeding research does not address dysfunctional feeding until after 6 months of age or later and clearly validates that feeding disruptions are found at 6 months of age (Van Howe & Storms, 2010). The beginning of feeding concerns is less understood and this study helps determine the functioning of the feeding relationship in the early weeks of life.

It has been demonstrated that prolonged food refusal is correlated with maternal anxiety, depression, increased age, and negative perspectives of the baby (Coulthard & Harris, 2003; McDermott et al., 2009). However, maternal anxiety and depression were seen as reactionary to feeding difficulties and not causal of food refusal (Coulthard & Harris, 2003). It has also been found that an infant’s negative response to fluid/food in the mouth may occur as a sequelae of reflux, gagging, choking, or medical procedures that stir a post-traumatic feeding disorder (Benoit & Coolbear, 1998). It is unclear whether the infant with GERD re-experiences discomfort from reflux that culminates into an increasingly traumatic emotional and behavioral response. The paucity of knowledge of the early life experience of these infants has led to lack of clarity and lack of understanding.
A study of the failure to thrive feeding disorder (FTT; Coolbear and Benoit, 1999) found maternal-infant attachment was diminished in this population versus those without FTT. The Adult Attachment Interview (AAI: George, Kaplan, & Maine, 1985) found mothers of FTT infants had ‘non-autonomous’ responses during the caregiving of their infants, or emotional responses displaying their own early life disrupted attachments. Autonomous mothers have early life relational experiences that are coherently recalled with a healthy perspective, whereas non-autonomous mothers either dismiss the significance of the infant relationship or become preoccupied with memories of the past and are emotionally absent when with their infants. The FTT mothers were disengaged, had distorted perspectives, or aversion towards their infant. The dyadic feeding relationship was less reciprocal, had less eye contact and less positive exchange; however, there was still maternal contingent communication and less dyadic conflict or struggle during the feeding. This study, as in many other studies, included infants from 4 to 36 months of age, yet did not address the very different developmental feeding and dyadic needs within the wide age range. The early infant needs focused attention in order to increase knowledge and understanding.

**Nonverbal embodied caregiving.** The dyadic language begins in the womb and has implications for how dyadic communication will ensue soon after birth. Touch is one avenue of nonverbal communication observed in new mother-infant dyads (Feldman, 2007). An observed nonverbal language between mother-infant dyads aged 9 months to 34 months with infant feeding disorders found there was a pattern of ‘touch aversion’ with both partners, and significant reductions in attachment. Mothers had a pattern of decreased proximity, were less affectionate with their infant, and the infants were more
withdrawn and avoidant of touch (Feldman, Keren, Gross-Rozval, & Tyano, 2004). Moreno, Posada, and Goldyn (2006) evaluated mother-infant communication and concluded that the subtest qualities of touch significantly improved the mother-infant connection. Feldman et al. (2010) found dyadic touch decreased activation of the infant stress system of HPA cortisol, improved vagal tone, and improved dyadic recovery time after the relational communication was disrupted. Hane, Henderson, Reeb-Sutherland, and Fox (2010) evaluated the quality of maternal caregiving during daily embodied tasks in infancy and found that later childhood behavioral effects of social dysregulation, aggression, anger, and EEG asymmetry of the R-prefrontal cortex were related to their early caregiving experiences. Proximity, touch initiation and acceptance, gaze patterns, and mother’s intrusiveness during feedings (Feldman et al., 2004) are important cues that were assessed during the infant GERD feeding relationship with mother.

**Dyadic Emotional Availability (EA)**

This review has placed the infant GERD experience as seated within a dyad perspective, and as such, a dyadic lens of assessment is necessary. Emotional Availability (EA: Biringen, 2004; 2008; 2009) is a way to understand the dyadic emotional language of the preverbal infant and their caregiver mother. The climate of dyadic interactions may be observed through the verbal and nonverbal language of emotional availability. EA was developed from an integration of mother-infant attachment research (Ainsworth & Bowlby, 1991) and historical concepts found within the psychotherapist-client relationship (Emde, 1983; Mahler, Pine, & Bergman, 2000).

Emde and Easterbrook (1985) defined emotional availability as the degree of emotional expressiveness and responsiveness of each partner toward the other. EA is a
dyadic construct of being ‘available’ or ‘receptive’ to communication through sending and receiving nonverbal and verbal signals over time. Continued communication increases responsiveness that adjusts to a range of emotions (Emde, 1983), creating a healthy dynamic dyadic experience. However, healthy mother-infant interactions may become derailed from disruptions that shut down communication and decrease emotional connections. Infant GERD symptoms may cause disruptions of communication to derail the mother-infant emotional connection. A review of EA literature will assist determination of its appropriateness to be used within this proposed research concerning the mother-infant GERD feeding relationship.

**EA essentials.** Emotional Availability (EA; Biringen, 2009) is a concept, an intervention, and a measurement tool that recognizes the significance of the emotional connection between dyads (EA scales; Biringen, 2008). EA considers the success of a specific interpersonal relationship by evaluating the quantity and quality of the emotional verbal and nonverbal interactive language. An imbalance in the dyadic emotional connection occurs if the emotional language may be of exceptional quality, but experienced too infrequently, or large quantities of time may be spent together within a connection of poor quality (Biringen, 2004; 2009). Either experience has the potential to negatively affect dyadic emotional connection.

EA has been described by Pipp-Siegel and Biringen (1998) as embracing the concept that an emotionally open communication is healthy. High level EA parents are able to accept a wide range of infant/child emotions during the development of a secure base of trust. The emotional needs of infants are met through flexible maternal responses of empathy, warmth, and acceptance to infant cues. EA has also been considered to be a
connective tissue or an emotional dialogue (Easterbrooks & Biringen, 2000) found within the preverbal mother-infant relationship.

In EA the preverbal infant is considered to be an individual capable of intentional independent communication and response to mother. The infant is also considered to be the barometer of the successful emotional connection within the relationship. Although there are domains of evaluation to observe within the dyadic language, it is also considered important to gain an overall global sense of the dyadic climate (Biringen, 2008, 2009). EA includes evaluation of the embodied interactions of touch and nonverbal emotional connections normally experienced between the dyad. Quality embodied maternal caregiving is crucial for the young infant’s development, as future social contexts are impacted by early life experiences (Hane et al., 2010). A mother offers EA through the way she holds and touches her infant, uses her tone of voice, and feeds her infant (Biringen, 2009). These concepts are congruent with the proposed study of infant GERD and EA would theoretically be able to evaluate the tenor of the dyadic embodied interactions occurring during the feeding relationship.

**Unique populations.** Fraser, Harris-Britt, Thakkallapalli, Costes, and Martin (2010) found EA revealed patterns of the holistic quality within individual dyadic relationships. Dyadic emotional connections are unique, yet there are also unique patterns of communication that may be uncovered within specific populations. Explicating patterns of relational communication among certain dyadic populations increases the accuracy of understanding specific dyadic needs when developing and choosing appropriate interventions. EA is able to increase awareness of specific infant needs within diverse populations and evaluate how the mother-infant emotional language impacts the
relationship (Easterbrooks & Biringen, 2010). It is possible that the young mother-infant GERD dyad population may also experience a unique pattern of communication that has yet to be explicated.

The use of EA has improved understanding of the emotional climate of parent-infant populations of the hearing impaired (Pipp-Siegel & Biringen, 1998; Pressman, Pipp-Siegel, Yoshinaga-Itano, Kubicek, & Emde, 1998) visually impaired (Campbell & Johnston, 2009), Down Syndrome (de Falco, Venuti, Esposito, & Bornstein, 2009), Autism Spectrum Disorders (ASD; Dolev, Oppenheim, Koren-Karie, & Yirmiya, 2009; van Ijzendoorn et al., 2007), and substance abusing mothers (Salo et al, 2009; Fraser et al., 2010). However, the mother-infant GERD dyad has not yet been viewed through the observational lens of EA.

An example of a specific population with unique dyadic patterns of relating that was explicated by EA includes the study by Salo et al. (2009). The authors found that mothers who abused substances during pregnancy had a negative cycle of experiencing less sensitivity and more hostility towards their 3-year old children. However, the mothers were not intrusive, unlike previously cited research of mothers who use substances. The children were lower in their responsiveness to mother and lower in seeking maternal involvement. This population of children had experienced early and multiple placements outside of the home that disrupted their dyadic relational development; the less maternal intrusiveness may have been due to less actual involvement with their child in frequent out-of-home placements.

Fraser et al. (2010) compared mothers who used substances to mothers who did not use substances and evaluated their EA dyadic interactions. The substance-using
mothers experienced significantly higher depressive symptoms and psychological stress, high EA hostility scores, decreased sensitivity scores, and overall lower EA scores. However, there was no significant difference in EA scores between the groups and the dyads in both groups had decreased infant responsiveness. This study demonstrates the contextual constraints of the mother-infant populations and EA is able to provide information about specific dyadic interactions as well as patterns of EA within unique populations that will guide intervention development.

**Relational repair.** Another important aspect of EA evaluations is whether the dyad is able to successfully negotiate relational conflicts (Biringen, 2005; 2009), as repair is an important aspect of healthy infant development (Tronick et al., 1998). Yet, mothers struggling emotionally or psychologically may not recognize how relational conflicts are successfully negotiated and may not be able to implement such a relational repair. During an EA assessment it was noted that mothers with depression had the inability to play a full 30 minutes with their infants 3 to 6 months of age, as opposed to those that were not depressed (Vliegen, Luyten, & Biringen, 2009). Yet, Vliegen (2006) used EA concepts and observations as treatment to repair the mother-infant relationship. These psychiatrically hospitalized depressed mothers were emotionally blunted, felt incompetent, and were unaware of how to have an emotional connection with their infant and were unsure of what it meant to play with their child. Treatment occurred as the mothers individually reviewed their videotaped mother-infant interactions with the author. The mothers gained new avenues of self-awareness, infant preverbal language, and the understanding of how to co-create an emotional communication. This process
began the healing of emotional disconnections experienced between these mother-infant dyads.

EA is able to measure the strengths and weaknesses of the mother (Pipp-Siegel & Biringen, 1998), particularly the mother’s ability to perceive and interpret infant emotions accurately and appropriately (Easterbrooks, Chaudhuri, & Gestsdottir, 2005). However, in the infant GERD dyad, the distressed mother may find it difficult to discern her infant’s confused cues and may experience her infant’s crying as intolerable. Relational repair may be difficult when mothering an infant that resists being soothed, perhaps diminishing her empathy and causing her to disengage from the turmoil of the relationship. The connective tissue of EA may become disrupted, stimulating a deleterious cycle of dyadic communication and adding to the mother’s sense of failure as a parent (Hofacker & Papousek, 1998). Accordingly, EA may be able to analyze this relational disconnection and support the need for specific improvement through interventions that the mother may institute for relational repair.

**Early infants using EA.** There are few studies concerning the use of EA in very young infants, 6 to 10 weeks of age. The study by Fraser et al. (2010) investigated mothers with infants 2 to 5 months of age. Mothers who used substances were compared to a similar population of mothers who did not use substances. These authors did not use the child involvement scale, suggesting that the infants were too young to initiate involvement. However, it is known that the newborn preverbal infant has autonomous interpersonal responses (Nagy, 2008). EA assessment has shown that infants initiate intentional connective behaviors towards certain caregivers and not others, even at the young age of 3 months (Zimmerman & Fassler, 2003). Also, infants 3 to 6 months old
demonstrated they developed more positive affect, body tone, and interest in engagement with their non-depressed fathers or childcare providers than their emotionally depressed mothers (Hossain et al., 1994; Pelaez-Nogueras, Field, Cigales, Gonzales, & Clasky, 1994).

It was clear in the literature review that not all studies use the six EA scales; at times it was stated that certain scales were not considered useful to the population. However, using all the scales clarifies complex dynamics within the dyadic relationship and offers greater insight into the dyad and their treatment needs. Murray-Kolb and Beard’s study (2009) used all scales and discovered that low maternal iron deficiency left untreated at 10 weeks postpartum led to lower EA scores at 9 months. The maternal effects of having deficient iron levels included increased hostility, less structuring, and less sensitivity for their infants.

Pairing contextualized knowledge with all scales of EA provides a basis for understanding patterns and the subsequent needs for intervention, as found within the postpartum population. Teen mothers (Easterbrooks et al., 2005) were assessed by all EA scales in their interactions with their 10 month old infants. The patterns that surfaced included the amount of family support, the teen’s ability to focus upon infant care, and the teen’s prioritization of self-growth as variables that affected their maternal interactions. However, in another study, only the maternal sensitivity scale was used to assess a bathing video with mothers and their 1 to 11 month old infants. The results revealed dyadic patterns related to the contextual factors of education, feelings of parental incompetence, and family income (Van Doesum et al., 2007). However, the
study missed the complexity of the dyadic emotional connection and the results diminished the preciseness of needed interventions, as only sensitivity could be treated.

Inner city physicians (McCarthy et al., 2000) observed mother-infant dyadic interactions during well-child health visits at 2-weeks, 6, 15, and 24 months of age and found the level of EA observed predicted later mother-ill infant interactions. Additionally, the impoverished living conditions of the inner city, poorer dyadic interactions, and mother’s anxiety predicted the physician’s perceptions of the severity of the infant’s illness. The severity of the infant’s diagnosis influenced the use of more healthcare resources than necessary. However, this study only used 3 of the 6 scales: maternal sensitivity, non-hostility, and infant responsiveness. A more holistic view using all scales may have shown a lack of maternal structure or increased maternal intrusion and determine a lower level of infant inclusion. It is uncertain how assessing only pieces of the comprehensively created EA language affects the interpretation of the whole. Not using all scales leaves gaps in knowledge that would have otherwise provided increased clarity of the relationship and discover what specific treatments may be useful.

It is not clearly known how very young infants will respond with all EA scales, yet, Zelkowitz, Papageorgiou, Bardin, and Wang (2009) found there were correlations of emotional responses over time. Mother-infant dyads were recruited from an NICU and the mothers were evaluated for their level of anxiety at the time, yet the infants were not assessed until 24 months of age. Maternal anxiety in the NICU was significantly related to 4 of the 5 EA scales used. Higher maternal anxiety was correlated with increased sensitivity, decreased structuring, increased intrusion, and decreased child involvement at the two year assessment. As not all scales were used and there was not an implementation
of EA evaluation beginning in the NICU, there are clear opportunities missed in understanding child responsiveness and maternal hostility.

The frequently reported research practice of deleting the child involvement scale for very young infants was evaluated by Bornstein et al. (2006). It was discovered that by observing the 5 month old mother-infant dyad for one hour, as opposed to less time, that the infant was observed to increase their nonverbal maternal involvement, suggesting they may be sensitive to the amount of time spent dyadically. Young infants seem able to organize, inhibit, or initiate responses towards specific partners or in certain situations, yet, in early infant life the relationship with mother is monogamous and dependent, vulnerable to whatever dyadic state of consciousness mother offers (Tronick et al., 1998).

Summary

Understanding the mother-infant dyad is paramount to health development within the young 6 to 10 week old GERD infant. Empirical data is missing evaluations of the mother-infant quality of emotional connection during an observed feeding relationship when the infant experiences GERD. EA includes assessment of unique dynamics within a specific relationship and discovery of patterns within specific populations who experience compromising illnesses or conditions (Biringen, 2005; 2009). As there is scant research using EA in the very young infant 6 to 10 weeks of age and none evaluating the infant GERD dyad, the infant GERD population would benefit from EA evaluations of the dyadic emotional connection.

Infant Massage Therapy

Infant massage therapy (MT) is the intentional and skilled manipulation of soft tissue for therapeutic purposes (Field, 2000). Research indicates that infant MT may
improve the infant response to pain, improve gastric motility, enhance the immune system (Field, 2003; 2006), and decrease infant distress (Hernandez-Reif et al, 2007), suggesting that it may be beneficial for infants with symptoms of GERD. However, research concerning implementation of MT treatment for infants with GERD has not yet occurred. The current state of knowledge concerning massage therapy and the possible success it may have upon infant GERD recovery will be reviewed through various emotional and physical illness research.

Massage therapy is provided through manipulation of the skin. The human skin is a thin outside container for the human inside, delivering complex communication between the internal and external world of the individual. Formal research evaluating the effects of touch and massage of the skin within the human experience has been largely pursued through the Touch Institute (Field, 2003) and neurobiological science, increasing understanding of the human response through the skin.

The skin of the body is holistic and comprehensive. The individual responds through afferent and efferent central nervous system (CNS) pathways of the cutaneous sensory nervous system (CSNS; Ansel, Kaynard et al., 1996; Ansel, Armstrong et al., 1997). The skin grows during fetal development to become the largest external organ, yet it is not a late development within the fetus. Rather, the skin begins formation early in fetal development, alongside the central nervous system development and then continues to be in communication with other major internal systems following birth through the nervous system. Communication occurs between the skin and immune system (Misery, 1997; Schaubert & Gallo, 2008), neuroendocrine system (Shome et al., 2011; Skaper, 2001; Sugarman, 2002), gastrointestinal system (Kalliomaki et al., 2001), and respiratory
system (Ansel, Armstrong et al., 1997; Bradding et al., 1992). Thus, it is possible for the young infant chronically distressed with GERD to experience internal system relief from massage of the external skin through this bi-directional internal-external highway of CNS communication.

Massage therapy also has the potential to improve the emotional state of the GERD infant, as there are correlations between disorders of the skin and emotions, relationships, and stress (Chui, Chon, & Kimball, 2003; Fried, 2002; Misery, 1997; Zouboulis & Bohm, 2004). Hofacker and Papousek (1998) consider infant regulatory disorders are associated with mother-infant dyadic interactions, reiterating the importance of including infant sensory integration to augment relational psychotherapy treatment.

**MT Treats Chronic Distress**

The infant with GERD experiences a chronic disruption in health. Massage therapy has been used in the treatment of many chronic illnesses, yet, there are few young infant studies utilizing infant massage therapy (MT), so other age groups will augment this review. Term infants of HIV-positive mothers studied by Scafidi and Field (1996) demonstrated that those infants receiving MT had greater weight gain and improved Brazelton infant development scores, while the control group without MT remained at baseline or decreased Brazelton scores. The infant with GERD may have difficulty maintaining weight and normal development when distressed and may benefit from MT for these symptoms.

On a micro-level immune system outcome, Shor-Posner et al. (2006) found that children with HIV increased their number of natural killer cells following twice-weekly massage over 12-weeks versus the control group who received a friendly visit.
Interestingly, the immune system responses were age dependent. Children 4 years of age or younger with HIV had a profile of higher CD4, B cells and increased natural killer cells with massage therapy, as compared to children aged five and older who did not increase their NK cells. However, the older child showed significant increases in their immune antigens CD4 and CD25. This study clarifies that not all ages or populations respond equally to MT, and it does support the need for the proposed study for specific empirical development for infants 6 to 10 weeks of age with GERD.

Jump, Fargo, and Akers (2006) evaluated infant responses to massage therapy in those aged 2 to 33 months in an orphanage in Ecuador. The authors evaluated the outcome of illnesses among those infants massaged daily for 15 minutes for an average of 53 days versus those not massaged. Illness was found to be impacted positively by massage therapy as there were 50% less reported incidences of diarrhea. It was also estimated that the prevention rate of diarrhea was calculated to be 16% and that other illnesses were reduced by 5% due to massage therapy. Although the study had problems with design (observers not being blinded, data collection not uniform, and those infants less than 6 months of age having different daily care), monitoring illness symptoms provided one measureable way to determine the young infant’s response to massage therapy and massage was found to be successful in improving health. As the GERD infant experiences gastrointestinal symptoms and possibly respiratory symptoms, this study supports the concept that MT has been an appropriate choice for intervention.

Chronic pain has also been mitigated with massage therapy and the potential infant GERD pain may be mitigated. Field et al. (2002) studied the effects of massage therapy versus relaxation therapy upon adults experiencing chronic fibromyalgia. The
Interventions were conducted with each participant 10 times over 5 weeks, resulting in the massage therapy group experiencing improved sleep, decreased pain, and decreased Substance P (SP). SP is involved in the pain pathway (Sugarman, 2002), has immunological significance in the gastrointestinal tract, and heals through inflammatory processes (Ansel, Kaynard, et al., 1996). The manipulation of the skin stimulates regeneration of the nerve growth factor, a regulator of SP (Ansel, Kaynard, et al., 1996; Schauber & Gallo, 2008; Skaper, 2001), and perhaps is an avenue of decreasing pain and inflammation.

Hernandez-Reif, et al. (2002) found that adults with Parkinson’s disease had improved sleep and activities of daily living as a result of massage therapy. This was evidenced by decreased stress responses of urinary norepinephrine and epinephrine levels. Those with chronic back pain (Hernandez-Reif, Field, Krasnegor, & Theakston, 2001) increased their sleep, serotonin, and dopamine levels with massage therapy. Concurrently, their pain, depression, and anxiety decreased. In another study, depression, anxiety, hostility, and cortisol were decreased with massage therapy (Hernandez-Reif et al., 2000).

Massage therapy may offer relief from distress in the infant with GERD that is also experiencing dyadic disruption. Mother may experience depression and the infant may then be at risk for increased cortisol levels, decreased dopamine, and decreased serotonin levels (Field, Hernandez-Reif, & Diego, 2011). Additionally, infants born to mothers with depression are found to have an associated asymmetry of right frontal brain waves on EEG. This asymmetry was decreased with a 10-minute massage therapy in one-month-old infants (Jones, Field, & Davalos, 1998).
Additionally, anxiety is one emotion predominantly relieved through massage therapy and it may be an obscured symptom experienced by the infant who is then unable to be soothed. Nurses experienced decreased anxiety through 5 weeks of weekly massage therapy. And, although it was not statistically significant, those not massaged experienced an increase in anxiety (Bost & Wallis, 2005). Young children with atopic dermatitis improved their skin disorder, yet also decreased their anxiety scores after daily massages by a parent. Additionally, the massage decreased the parent’s anxiety (Schachner, Field, Hernandez-Reif, Duarte, & Krasnegor, 1998).

Research does not always clarify if the positive effects of massage therapy are helpful for the short-term or whether the improvement is long-term. One study did document a continuum of positive results as adolescents with attention-deficit/hyperactivity disorder improved their present mood state as well as their long-term classroom behavior with twice per week massage therapy (Khilnani, Field, Hernandez-Reif, & Schanberg, 2003). It is unknown if immediate relief of GERD symptoms are possible for the infant or whether the massage must be implemented over weeks of time, and it is unknown how the holistic dyad will respond to an infant intervention.

**Smaller steps toward recovery.** Although the study being proposed is evaluating MT that has been used over a six-week period, the observation is still cross-sectional for that moment in time. Thus, it is important to consider how the short-term and long-term impact of the experience of massage therapy might impact the infant. Short-term or single-time massage experiences have not been documented in the term infant population, yet the concept is supported through research in other populations.
It has been found that chronically negative illnesses may begin immediate recovery through one massage therapy session, providing momentary relief and beginning the process of regaining health. This was demonstrated in those who attended a clinic for chronic pain and anxiety; there was a significant relief with a single 15 minute massage versus 15 minutes of talking about pain with a nurse (Seers, Chricton, Martin, Coulson, & Carroll, 2008). The study also included a carefully documented research design that demonstrated how one time massage therapy helped reduce medication use for several hours, giving immediate relief.

In other examples, young children, aged 29 months, also gained immediate effects of massage therapy that aided them to tolerate their burn dressing changes (Hernandez-Reif, Field, Largie, Hart et al., 2001). Short-term massage therapy also improved psychophysiological outcomes in stressed adults, as evidenced by autonomic recovery of decreased norepinephrine and heart rate (Delaney, Leong, Watkins, & Brodie, 2002). Also, Kim, Cho, Woo, and Kim (2001) discovered a significant decrease in anxiety and autonomic response in patients receiving a 5 minute hand massage prior to cataract surgery versus those without.

Chiou and Nurko (2010) suggested that children with functional abdominal pain and irritable bowel syndrome may dampen their central gastrointestinal pain perception by reduced excitation of visceral afferent fibers. Yet interestingly, Post-White et al. (2009) found that children who had cancer with reported significant nausea and pain did not want massage therapy. Therefore, the uniqueness of the population again surfaces as an important factor and further research on infant GERD is needed.
Confounding preverbal and parental factors. The preverbal nature of the infant again confounds understanding of their experience and may be misunderstood when parents interpret their infant’s response to MT, such as was the case for massage therapy treatment for cancer distress (Haun, 2009; Haun, Graham-Pole, & Shortley, 2009). Children old enough to self-report had decreased anxiety and increased quality of life with MT. However, parents rating their children who were too young to respond stated MT was distressful. Another example of confounding parental perspectives was found in a study by Post-White et al. (2009). Massage therapy was implemented for both the parent and child on a weekly basis for 4 weeks as they faced the child’s cancer. The crossover design included dyadic quiet time as the control for massage therapy. The massage therapy demonstrated a decrease in anxiety and heart rate for parents and children old enough to self-report. However, the parents of younger children, 1 to 3 years of age, reported that their children were not receptive to the massage therapy. It is possible that parental perceptions become clouded if they are overly anxious or it is possible that parents may be more perceptive of their preverbal child’s expressions. The mother-infant GERD dyad is in a similar vulnerable situation with confounding factors of distress and compromised preverbal communication; research is needed.

Implementation variances. Variances in the implementation of IMT were discovered in the literature review; variances were found in the technique and frequency of applied infant massage therapy (Underdown, Barlow, & Stewart-Brown, 2010). Massage therapy that utilizes moderate pressure or deep tissue massage is considered more therapeutic than light pressure (Field et al., 2004; Field, Diego, Hernandez-Reif, 2010), and in one study was associated with an infant’s increased weight and length.
Additionally, infants given moderate pressure massage improved on the Brazelton developmental test by decreased excitability with stimulation, increased ability to orient to stimulation, and decreased depression scores. However, the infants who received light pressure massage therapy had increased excitability and movements during sleep (Field et al., 2004). Although it may not usually be measured, light pressure massage was found to induce micro-changes within the immune system of adults (Zeitlin, Keller, Shiflett, Schleifer, & Bartlett, 2000). The current study implemented moderate pressured infant massage.

**Summary**

Massage therapy has been shown to significantly improve symptoms of chronic illness, as well as improve symptoms of immediate distresses. Clearly, massage therapy holds promise for decreasing the angst of the infant with GERD by decreasing stress, anxiety, pain, or gastrointestinal discomfort. Mothers and infants are holistic in their life experience, thus the calming or comforting of an infant distressed from GERD symptoms was expected to improve the climate of the mother-infant dyadic life experience.

**Improving the Climate of the Mother-Infant GERD Dyad**

Gaps in knowledge exist concerning treatment of young mother-infant dyads that experience turbulences from negative infant GERD symptoms. Infant GERD has been known to lead to difficulties during feedings (Rudolph et al., 2001; Sherman et al., 2009; Vandenplas et al., 2005), yet these infant GERD symptoms are not experienced in isolation. Research supports the mother-infant holistic dyadic experience (Fraser et al., 2010; Guedenay, 1997; Ham & Tronick, 2009; Middlemiss et al., 2011) and maintaining or improving their inchoate emotional connection is significant for future health (Hane et
al., 2010). The intention of this study has been to mitigate relational disruptions of the mother-infant GERD dyads through infant massage therapy (MT). MT has been shown to decrease distress, pain, and anxiety both in the moment and over time with other populations and the outcomes were observed through Emotional Availability (EA; Biringen, 2008). Additionally, maternal anxiety and maternal depression have been shown to impact the mother-infant relationship and were evaluated in the association with dyadic EA.
CHAPTER III

METHODOLOGY

This study is a secondary analysis of data obtained during a randomized clinical trial concerning infants with gastroesophageal reflux disease (Neu, 2012, NINR #09-1055). The previously collected data was obtained for the purpose of evaluating infant massage therapy (MT) as an intervention to improve gastroesophageal reflux disease (GERD) symptoms during feedings as compared to a control group receiving sham-touch non-massage therapy (NMT). The current study diverged from the parent study by focusing upon MT effects upon the emotional mother-infant feeding relationship as evaluated through Emotional Availability (EA; Biringen, 2008). The previously obtained data controlled for the covariable effects of maternal anxiety (State Trait Anxiety Inventory, STAI; Speilberger et al., 1983) and maternal depression (Edinburgh Post-Natal Depression Scale, EPDS; Cox, Holden, & Sagovsky, 1987; Cox, Murray, & Jones., 1996). Thus, the current study also controlled for these covariates and considered their predictive impact upon the relational outcomes of dyadic EA.

Specific Aims and Hypotheses

The very young mother-infant dyad, 6 to 10 weeks old, is in need of interventions to improve the potential relational disruption experienced from infant GERD symptoms. The mother-infant dyad is holistic and at risk for negative cycles of interactions that impact their intimate feeding experience. A 6-week infant MT intervention was conducted in the parent study. The pre and post intervention feedings were videotaped and these videotaped observations were used to assess maternal-infant EA. The specific aims and related hypotheses for this study are as follows:
Aim 1. Evaluate the efficacy of MT on Emotional Availability during feeding experiences in young mother-infant dyads in which the infant has symptoms of GERD.

H1: Post-treatment dyadic Emotional Availability (EA) will be higher in dyads receiving MT as compared to those receiving NMT.

Aim 2. Evaluate the predictive value of maternal anxiety upon the level of dyadic Emotional Availability.

H2: Maternal anxiety will be higher in those dyads experiencing lower levels of Emotional Availability.

Aim 3. Evaluate the predictive value of maternal depression upon the level of dyadic Emotional Availability.

H3: Maternal depression scores will be higher in those dyads experiencing lower levels of Emotional Availability.

Aim 4. Evaluate the correlation of infant GERD with Emotional Availability.

H4: Infant GERD will have an association with EA scores.

Population and Recruitment

Following Colorado Multiple Institutional Review Board (COMIRB) approval, mother-infant dyads were recruited from eleven area pediatric offices in a large-sized metropolitan community in the western United States. Inclusion criteria for participation in the study included the following: a) infants born between 38 and 42 weeks of gestational age; b) infants 6 to 10 weeks of age at enrollment; c) infants with an I-GERQ-R (Kleinman et al., 2006) score of at least 16; d) diagnosis of GERD by infant’s pediatric provider; and e) English speaking mothers of at least 18 years of age. Exclusion criteria included the following: a) surgery, chronic illness other than GERD, congenital anomaly,
developmental delay noted by the infant’s pediatric provider; b) lack of regurgitation (to rule out colic versus GERD); c) bilious vomiting or bloody stool; d) symptoms of cow’s milk allergy (e.g., diarrhea, constipation, maculopapular rash); e) projectile vomiting or diagnosis of pyloric stenosis; f) wheezing; g) family history of atopic disease; h) steroidal medications; and i) more than 3 days hospitalization at birth or post-birth hospitalization for conditions other than GERD.

Area pediatric offices posted an information sheet explaining the purpose of the study and the pediatricians were encouraged to give the mothers of infants diagnosed with GERD a COMIRB approved authorization form for participation. Additional recruitment for participants in the study was enacted through the university intranet email system. The recruitment of mother-infant dyads intended to target a sample representative of the general population as measured in 2000 (74.5% White, 17% Hispanic, 4.4% Black, and 4.1% Other). Mother-infant dyads interested in participating and who fit the criteria were contacted by the Research Coordinator. A meeting was scheduled to review the study, to sign consent, and to understand the randomization of the study participants into two different groups of infant MT or NMT. Randomization was accomplished with SPSS software. CONSORT guidelines were used for the study plan and a total of 36 mother-infant dyads were randomly placed into two groups following recruitment and signature of informed consent. Participants, pediatric care providers, and data collectors remained blinded to group assignments until completion of the intervention and data collection in the last week of the intervention, week 6. Mothers and infants kept their routine pediatric appointments and were to seek additional appointments if the infant GERD symptoms worsened or there were other health changes.
Protocol Procedures

The original study involved a 6-week, twice-a-week intervention of either MT or NMT with infants prior to their feedings. The protocol for either intervention included implementation by a massage therapist in the evening in a quiet room of the home at least 90 minutes post-prandial to prevent potential additional acid reflux. The intervention was terminated if the infant cried inconsolably for 3-4 minutes, had several bouts of reflux, or became dusky or apneic. Mothers did not observe the intervention procedures. Both groups were to conclude treatment within a total of 30 minutes. The feeding sessions that occurred between mother and infant at baseline and in the final sixth week were videotaped and stored in a locked cabinet in the research office. The de-identified video recordings were scored for emotional availability in this secondary analysis.

Infant protocols. The prior study implemented both MT and NMT interventions according to the protocols that follow. The certified massage therapist was trained to constrain communication with the infant so the results obtained would be subsequent to the touch intervention and not confounded with the relational quality of the therapist. Eye-contact and smiles from the therapists were acceptable in response to the infant’s vocalizations, yet there was to be no initiated communication by the provider. Mothers were not given information about what procedures were implemented with their infant prior to feeding, but the therapist could respond to mother’s questions with, “The baby is coming along. How do you think he/she is doing [or]…How has your baby been this week?”

Infant massage therapy (MT). The procedures followed the 1996 Field protocol of infant massage therapy. The therapist was allowed to use baby lotion on the hands to
improve the smoothness of skin massage on all areas except the infant’s face. Massage therapy was initiated with fingertips or thumbs stroking from the center of the forehead to the outer. The eyebrows were stroked from the inner to the outer edges and strokes were sent down the sides of the infant’s nose, across the upper and lower lips into the cheeks, massaging the jaws, behind the ears, and under the chin. The infants were held against the therapist’s chest while MT was gently provided by stroking the sides of the infant’s abdomen. The baby’s hips were then rocked while the knees were supported to release tension, and the legs were bent and pumped towards the chest as in bicycling motions. Hips were rotated and stroked from buttocks down legs to toes, with massage and rotation of the ankles and feet. The arms, wrists, and hands were stroked and squeezed/twisted and each finger was squeezed. Hands were placed on the infant’s back, gliding from the neck down the back. Then each leg was massaged from the buttocks to the foot. The back was massaged with fingertips moving in small circles while avoiding the spine. The back was ‘combed’ with hand open and fingers spread from neck to the buttocks. The infant was then brought to the mother for feeding following conclusion of the IMT.

**Non-massage therapy (NMT).** Sham-touch NMT providers did not use side-to-side movement of the hands and instead used only moderate consistent touch with one hand placed over the other. The infant was held on the shoulder for the full 30 minutes and if the infant was fussy, the therapist was able to stand up and walk. The infant was additionally allowed to use a pacifier. The infant was then brought to the mother for feeding upon conclusion of the NMT.
Measurements

Emotional Availability (EA; Biringen, 2008) of the mother-infant GERD dyads was assessed while controlling for the baseline covariates of maternal anxiety and depression. Additionally, these covariates were evaluated for their predictive value of EA outcomes.

Primary Variable: Emotional Availability

The Emotional Availability (EA; Biringen, 2008) scales supply information about the quality of the observed verbal and nonverbal dyadic exchanges within the emotional relationship. This study utilized EA Scales to evaluate the interpersonal communication and quality of emotional connection between the mother-infant GERD dyad during the feeding experience. EA has been considered the ‘emotional glue’ found within the language of relationship and the EA Scales provide a way to score the verbal and nonverbal communication within each specific dyad. EA scores were determined through blinded evaluations of the recorded feeding experience of each dyad in both groups.

EA consists of six scales to score observations of the verbal and nonverbal emotional communication between partners within a dyad. However, each partner has a specific, not identical, scale that is able to asymmetrically evaluate the differing perspectives of interactions between a caregiver (mother) and a care-receiver (infant). The six foundational scales include the following:

Maternal Scales

1. Sensitivity: responsiveness contingent to infant communication
2. Structuring: scaffolding to support infant’s safe growth to autonomy
3. Non-intrusiveness: infant’s exploration supported without interference
4. Non-hostility: pleasant, respectful communication towards the infant

Child Scales

1. Responsiveness: age appropriate exploration and response to mother

2. Involvement: ability and willingness to engage mother

The six EA scales help clarify the complexity of responsive dyadic interactions and the six domains are considered discrete. Each of the six domains are scored on a Likert scale 1 to 7 to determine the specifics of the domain being evaluated. A level 7 in any of the six domains is considered to be the highest level of emotional connection and level 1 is considered the lowest of EA interactions. A moderate score demonstrates some level of relational disruption. EA scores are able to be examined in specific subscales of domains, evaluation of each partner, summed for a total EA score with all subscales, and evaluate specific dyads or patterns in populations. However, the unique contribution of the EA Scales is that this is not a score of two individuals, but rather a score of dyadic language obtained through emotional responses. EA scoring also includes an intuitive global score evaluation that reflects the general tenor of the dyadic relationship, providing a check and balance of the more finite observational scores that are determined through the subscales.

The validity of EA Scales as an assessment of systemic dyadic interactions (Easterbrooks & Biringen, 2005) is based upon recognition that although EA has a foundational development from attachment research, it moves beyond attachment development. Attachment research was based upon the infant’s fear of separation and the need for protection for survival, whereas EA includes other aspects of the maternal relationship that reflect her ability to accurately read the cues of the infant (Emde, 2012).
to ensure safety, growth, and enjoyment. EA is not only an evaluation of the action of connection from a mother towards her infant, but also an evaluation of how the infant receives the communication, reflecting the mother’s ability to read the infant’s tolerance or needs (Easterbrooks & Biringen, 2005). Thus, the infant is considered the gauge of the quality of the relationship, and although the infant also initiates communication, the higher responsibility of maternal attunement towards the infant largely determines the success of the relationship over time.

According to EA, emotional connections are more significant to the relationship than behavior. Maternal emotional connections are not successful unless they are congruent with her infant’s cues and positively received. The assessment of an infant’s emotional responses are not distinguishable without placement within the context of their mother’s interactions. For example, a mother may appear as sensitive during an observation, yet if the infant does not respond it suggests there is not a pattern of usual emotional connection or there is an inconsistency of ‘apparent sensitivity’ rather than true sensitivity increasing emotional connections (Biringen, 2005; Easterbrooks & Biringen, 2005).

The evaluation of patterns that surface from data analysis may assist discernment of any specific dyad’s need for intervention, yet patterns also may increase understanding of unique specific populations. Bornstein et al. (2006) and Bornstein, Hahn, Suwalski, & Haynes (2011) have validated the cross-contextual, cross-cultural, and short-term reliability of EA scores. EA reliability was also evaluated by using the Still Face (SF) experimental tool assessing dyadic connections and dyadic disruptions between mothers and their infants. In the experimental model by Carter, Little, and Gerrity-Rakous (1998),
mothers of four-month old infants were asked to normally interact with the infant for 3 minutes, then to have a still face without interaction or response for 2 minutes, and then to resume normal interactions for 3 minutes. This experiment is representative of an emotional disruption and denial of connection or neglect, often creating a profound effect upon infants (Tronick et al., 1998). The EA Scales evaluated the mother-infant interactions of the study in the two segments, initial and recovery interactions. The reliability of the EA Scales was found to be above .90. The middle segment of non-responsiveness was not scored by EA as it was not a dyadic interaction.

Additionally, Moszkowski, Stack, and Chiarella (2009) found an intra-class reliability coefficient of .89 to .99 within differing domains of the EA Scales of sensitivity, structuring, non-hostility, and infant responsiveness with infants 5.5 months of age. In another study, the reliability of composite EA maternal scores of 13 dyads in a sample of emotionally dysregulated mothers was found to be .73 (Kim, Teti, & Cole, 2012).

Importantly, the foundational reliability of the EA Scales is also dependent upon the user’s observational skills and ability to accurately interpret dyadic responses and score them accurately. This skill is gained through a centralized inter-lab training available through EA. The study evaluations were conducted by a blinded certified EA coder trained within the EA centralized lab and an inter-rater reliability was maintained with a second seasoned and certified coder on 100% of the videotapes. The EA results were determined through observation of the recorded verbal and nonverbal mother-infant feeding interactions obtained at baseline and the final 6th week following MT or NMT. An observation of EA of at least 20 to 30 minutes is recommended for most valid
findings (Biringen, 2005). Thus, the length of the observations within this study were considered reliable for resulting outcomes; having 100% inter-rater reliability also allowed for confidence in these results.

**Covariate Variables**

**State-trait anxiety inventory.** The STAI-Form Y scale was used to obtain baseline data of maternal anxiety in the parent study; this data was used to determine if there is a predictive anxiety for EA values. The State Trait Anxiety Inventory (STAI; Spielberger, 1983) contains two scales to evaluate an individual’s anxiety as either a State (S-temporary) or Trait (T-pervasive) symptom. The two scales of STAI, S and T, have 20 items each that are based upon a Likert scale of 1 to 4 with split-half answers correlated in weight. The test-retest of the T-Anxiety scale demonstrates a reliability of .73 to .86 in college students and .65 to .75 in high school students. A median coefficient of .33 on the S-Anxiety scale was found, however, unlike the T-Anxiety, it is to be expected that a lower reliability with the S-Anxiety scale naturally occurs within the transitory state experience of anxiety provoking experiences. Yet .92 to .90 were the median alpha coefficients for STAI-Y, S and T respectively. Cronbach’s alpha for maternal T-Anxiety in the study of mothers with premature infants was 0.89 with a temporal stability of 0.65 (p < 0.001) across a 3-month period of correlation (Zelkowitz, Na, Wang, Bardin, & Papageorgiou, 2011).

The STAI has been a widely used and validated anxiety scale within research and the scores of the STAI are normed according to gender, age, and population, with females experiencing higher levels of anxiety. The scores range from 20 to 80 with the severity of the anxiety to be determined within the population evaluated. McMahon, Barnett,
Kowalenko, Tennant, and Don (2001) assessed women 11 to 14 weeks postpartum and determined that scoring above 40 on the STAI was defined as ‘highly anxious’.

Spielberg cited that those with clinical depression are known to also have higher scores of T-Anxiety. The psychometric properties of the STAI-Form-X were improved in the subsequent Form-Y to more clearly differentiate anxiety from depression. Yet, Bieling, Antony, and Swinson (1998) still found the validity of the STAI-T had overlapping underlying variables of depression and general negative affect. Although there are possible confounding factors of depression and negative affect, the information from the STAI is of significance when monitoring for the healthiness of a mother’s interactions with her vulnerable young infant.

*Edinburgh post-natal depression scale.* The Edinburgh Post-Natal Depression Scale (EPDS; Cox et al., 1987; Cox et al., 1996) is a screening tool for postpartum depression. The scale has 10 items placed upon a Likert scale of 0, 1, 2, or 3 that assesses the way a postpartum mother has felt in the past 7 days. All 10 items may be completed within 5 minutes and the screening may be repeated again in 2 weeks. A score of 10 to 12 or greater suggests there is a likelihood of depression. The EPDS is a screening tool that requires further assessments to plan for treatment. The tool has split-half reliability, sensitivity 85%, specificity 77%, and a predictive value of 83%. Yet, Kim et al. (2012) determined that depressive symptoms were not predictive of EA scores. Instead, increased maternal emotional dysregulation was found to be predictive of inverse EA scores. McMahon et al. (2001) found that maternal depression correlated positively with distressed infants, yet maternal anxiety was even more highly correlated. However, research has clearly indicated that the infant is at-risk in their development from maternal
depression (Luby, 2009), that early-life prolonged maternal depression has cognitive sequelae (Azak, 2012), and that the review by Goodman and Brand (2009) demonstrated that maternal depression or postpartum depression is common.

**Infant GERD symptoms: I-GERQ-R.** Infant gastroesophageal reflux symptoms will be assessed by the I-GERQ-R (Orenstein et al., 1996) questionnaire. A score above 16 is considered to represent troublesome symptoms. The internal consistency has been reliable on test-retest at 0.85 and the construct validity shows significant differences between cases with congruence between maternal diaries and physician diagnosis, \( p < .01 \) (Kleinman, Revicki, & Flood, 2006). However, this is not a diagnostic tool, but rather a screening tool that is useful for this population.

**Data Analysis**

Post-treatment scores on the EA Scales were compared during feedings between the MT and NMT groups. The study has a total dyadic \( n \) of 36, randomly divided between two groups, resulting in \( n = 18 \) in each group of MT and NMT. Multivariate analysis of covariance (MANCOVA) was used to evaluate the independent variable (MT versus NMT) upon the dependent variables of EA, as explicated within Hypothesis 1. The additional effects from maternal anxiety (STAI-State and Trait) from Hypothesis 2 and maternal depression (EPDS) from Hypothesis 3 were delineated as covariates and evaluated in their predictive quality of EA scores. The correlation of infant GERD symptoms and EA scores were also examined through Regression analysis. The assumptions of the MANCOVA were met through the following:

1. Randomized sample of two independent groups
2. The observations on all dependent variables will follow a multivariate normal distribution in each group, and the results will address concerns.

3. The dependent variable matrices had homogeneity of covariance as evidenced through Box’s Test.

4. There was an assessment of the linear relationship between the covariates maternal anxiety and depression and the dependent variables of EA scores.

5. The covariates were assessed for having a homogenous regression plane.

6. Maternal anxiety and depression are both considered to reliably scored with appropriate tools, STAI-Y and EPDS.

This study is a pilot with a smaller $n$ and there are no other known studies that have implemented MT as evaluated by EA, thus, the power analysis will flexibly use other studies with EA outcomes to determine a suggested effect size of EA. Flykt et al. (2012) determined an eta-squared effect size of .39 in a composite EA score that used the subscales sensitivity, structure, non-hostility, and child responsiveness with 101 dyads receiving intervention versus no intervention. Also, an effect size between EA and maternal emotional dysregulation was determined to be $r = .34$ (Kim et al., 2012). Salmonsson and Sandell (2011) found that maternal sensitivity was the most significant factor to improve with treatment, exhibiting a Cohen’s $d$ of 0.42. Therefore, the power analysis for the study was low at 0.3781 with an alpha set at .05 and a Cohen’s $d$ effect size (ES) set moderately at 0.4 with an $n = 18$ in each group (Lenth, 2006). Although the power was low, this study demonstrated feasibility for a larger study that will verify current outcomes.
Summary

Findings from this study add inferential knowledge in areas of Emotional Availability and the dyadic effects from infant massage therapy (MT) for mothers and infants impacted by the symptoms of infant GERD. Although the sample was small, an additional advantage of the EA Scales is the ability to provide data extending beyond inferential measures through the ability to discern patterns within specific populations.
CHAPTER IV

RESULTS

The analysis of this research study concerning Emotional Availability (EA) for mother-infant gastroesophageal (GERD) dyads following infant Massage Therapy (MT) was developed with a quantitative perspective. The unique foundation of this work has included the perspective that the dyad is an entwined holistic entity, where the health and well-being of either partner, mother or infant, affects the other. Thus, it was anticipated that the successful treatment of one partner would improve the emotional relationship within the infant GERD dyad. The tool evaluating the outcome of the quality of the dyadic emotional connection was the Emotional Availability (EA) Scales (Biringen, 2008), a validated quantitative tool considered for dyadic assessment of the early infant-caregiver. Yet, the validation of EA among very young mother-infant dyads is weak. This study adds critical knowledge of EA assessment with very young mother-infant populations, particularly with infant GERD symptoms.

The analysis for this study was conducted with SPSS computerized software with a pilot study level of \( n = 32 \). There were 36 dyads enrolled in the larger study, but 4 subjects were missing all subscales of Emotional Availability (EA). This equaled 11.1% missing data, less than the 15% high range that might allow data replacement (Mertler & Vannatta, 2005), yet these cases were deleted as they provided no data suggesting participation in this study specifically measuring EA. Variables intended for covariant analysis were maternal anxiety and depression and their effects following treatment implementation, as measured by STAI-State (STS), STAI-Trait (STT; Bieling, Anthony, & Swinson, 1998), and the Edinburgh Postpartum Depression Scale (EPDS; Cox et al.,
The infant symptoms of GERD were evaluated through the I-GERQ-R (Kleinman et al., 2006) and included for correlation analysis.

**Demographic Statistics**

The demographic variables that were evaluated in this study included: maternal educational level according to Hollingshead, maternal age, maternal ethnicity, maternal health during pregnancy, maternal responses to the pregnancy experience, and infant gender. The maternal educational level included a range from 3 to 7; the lowest level of education was partial high school (n=1, 3.1%) and the highest level was graduate professional training (n=7, 21.9%), while 50% had graduated with a college education. The maternal age ranged from 21 to 39 years, with a mean age of 31.19; 11 (34%) mothers were under the age of 30 years old and 5 (15.6%) were above 35 years old. The assessment of maternal health was recoded from written texts to a 3-level variable; 1=no issues, 2=physical issues, and 3=emotional issues. The majority of mothers did not report problems with their maternal health (n=16, 50%), yet 12 mothers (37.5%) reported having physical issues and 4 mothers (12.5%) reported having emotional issues. The dataset also included verbal answers concerning how the mother had viewed her experience of pregnancy and this was recoded to a 3-level variable; 1=positive, 2=positive & negative, 3=negative. It was interesting to note that 13 mothers (40%) had negative comments about their experience, 9 (28%) reported positive and negative comments, and 10 mothers (31%) had fully positive responses towards their pregnancy.

Ethnicity included the categories of White, African American, Hispanic, Asian, and Other. The breakdown of ethnicity represented 59.4% White, 6.3% African American, 15.6 Hispanic, 9.4% Asian, and 9.4% Other. This dataset included the status
of infant gender of which there were 17 boys and 15 girls. Siblings were also evaluated as having a potential impact upon the mother-infant relationship as mother might experience distractions when attempting to care for her new infant. The siblings were coded according to age categories as younger children in the home may increase the distractions versus older children. This variable was coded as siblings < 3 year olds = 2, > 6 year olds = 1. More dyads had siblings less than 3 years old (n=14, 43.8%), 5 dyads had siblings > 6 years old (15.6%), and 3 dyads had more than 2 siblings (9.4%). Ten dyads (31.3%) had no other children in the family, or their infants were the first born. A regression analysis was completed on these variables and it was found the only significant relationships were between ethnicity and the pregnancy-birth experience, r= .421, p = .008. And, there were also inverse negative correlations between ethnicity and maternal education, r= -.377, p = .017. Most importantly, the demographic data did not impact the EA scores when controlled for in a MANCOVA with the factor of group treatment and dependent variables of post-EA MSS, CHILD, NON. There were no factor-covariate interactions and homoscedasticity covariances were equal; Box M, F(6, 5450.709) = 1.727, p = .110 and Levene’s were non-significant. In the analysis, there was no interaction according to group placement and the only statistic approaching significance was the covariate influence of infant gender upon post-CHILD, F(1, 21)=3.859, p = .062, partial Eta² = .144.

**Evaluation of AIM 1**

**Retaining Holistic EA Information**

A MANCOVA analysis was chosen for the 2-level independent variable, MT and NMT, and as a way to provide control for several covariate factors. The covariates
included in the MANCOVA were the baseline scores of EA. In Chapter II, there was
discussion of the need to include all variables of EA in order to maintain a clear
evaluation of holistic dyadic interactions. The outcome analyses of EA scales were
precluded to three variables due to the low number of participants, n=32, and although
this was still less than the 20 scores-per-cell suggested by Mertler and Vannatta (2005), it
was considered as acceptable for a pilot study that would enhance knowledge
development for further studies. In order to retain the highest level of holistic EA
information, the 6 EA scales were collapsed into three variables.

The EA scales of maternal Sensitivity and Structuring were collapsed, the Child
Response and Involvement scales were collapsed, and the Non-Intrusiveness and Non-
Hostility scales were collapsed into 3 EA variables. These merges were consistent with
research by Bornstein et al. (2011) describing a high correlation, r = .88, between
maternal Sensitivity and Structure; and, r = .93, between Child Responsiveness and
Involvement (Easterbrooks, Chaudhuri, & Gestsdottir, 2005). The Non-Intrusiveness and
Non-Hostility scale collapses was reasonable as they had similar narrow ranges of
concentrated scores with few variances except for the 5-15% of the participants with
lower scores. The collapses were made by averaging the EA scores for each data point in
the respective scales to maintain the original EA scaling. Table 4.1 includes the means
and standard deviations obtained prior to and following the collapse of the variables.

**Tests of Statistical Assumptions**

Four outliers were found in the pre-treatment Non-Intrusiveness scale, 4 in the
pre-treatment Non-Hostility scale, 3 in the post-treatment Non-Intrusiveness scale, and 2
in the post-treatment Non-Hostility scale, equaling a total of 13 outliers. These scales
benefitted from the collapse as there became 3 outliers in the pre-treatment group and 2 in the post-treatment group, equaling a total of 5 outliers. Consideration of recoding these final outliers was disbanded as they were valid scores and recoding led to loss of understanding of the population through the data. Also, these scores were germane to the main concepts of this study and a small change in scoring on a Likert-7 scale led to a significant impact upon inferences gathered from the data.

Table 4.1. Means and Standard Deviations of EA Scales Pre-Post Collapse

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<thead>
<tr>
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<tbody>
<tr>
<td></td>
<td>Pre- MT</td>
</tr>
<tr>
<td>SENSITIV-SD</td>
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<td>STRUC-SD</td>
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<tr>
<td>NON-INTRUS-SD</td>
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<td>NON-HOST-SD</td>
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<td>CHILD-RESP-SD</td>
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<td>CHILD-INVOL-SD</td>
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Post-COLLAPSE

<table>
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<tr>
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<th>MSS-SD</th>
<th>NON-SD</th>
<th>CHILD-SD</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>4.9583</td>
<td>5.9167</td>
<td>4.1117</td>
</tr>
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<td></td>
<td>.93640</td>
<td>.83137</td>
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<td>5.0714</td>
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<td>5.1806</td>
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<td>4.4107</td>
</tr>
<tr>
<td></td>
<td>.76406</td>
<td>.42095</td>
<td>.95880</td>
</tr>
</tbody>
</table>

Note: Data were collapsed by averaging raw scores: Sensitivity and Structuring to MSS; Child Responsiveness and Child Involvement to CHILD; Non-Intrusiveness and Non-Hostility to NON.
Due to the smaller number of participants in this study, the issues of normality were also more highly impacted. The NON EA variable was significantly skewed before and after collapse and there was an attempt to transform the data; yet there was a lack of success in reaching non-significance in Shapiro-Wilk. In addition, the transformation of data muddied the conceptual understanding when compared to the other 2 dependent variables using the appropriate scaling. A nonparametric analysis was completed and the variable NON was considered to have a no difference in population and transformations were not retained. Additionally, MANCOVA is robust to normality of the population.

Mahalanobis was calculated for 6df, Chi Square critical value 22.46, \(p = < .001\), and there were no multivariate outliers. A two-way MANCOVA was conducted to determine the effects of IMT versus NMT upon EA within mother-infant GERD dyads while controlling for the baseline scores of EA. A regression analysis was conducted with the EA DVs and covariates, and although they were highly significantly correlated, \(p = .000\) to \(.010\), the collinearity statistics were above \(.1\) and ranged from \(.130\) to \(.362\).

Homoscedasticity of variance-covariance was approved with Box’s Test, \(F(6, 5450.709) = 1.727, p = .110\) and the Levene’s Test of error variance across groups was non-significant, \(F(1, 30), p = .662\). The Regression slope for Homogeneity determined no factor-covariate interactions, (Wilks’ = .895, \(F(3, 25) = .978, p = .419\), Eta\(^2\) = .105).

**Significance Testing**

The MANCOVA identified a significant influence of two of the covariates upon the combined EA DV, but there was not an effect from the treatment groups as had been hypothesized. The two pre-scores that influenced the DV included: Pretreatment-NON (Wilks’ = .545, \(F(3, 25) = 6.955, p = .001\), Eta\(^2\) = .455) and Pretreatment-MSS (Wilks’ = .538,
Although pre-CHILD had no significant effect upon the combined DVs (Wilks=.814, $F(2, 25)=1.904$, $p=.155$, Eta²=.186), there was an effect of the Pre-CHILD upon the Post-CHILD scores, $F(1, 25)=5.837$, $p=.023$, partial Eta²=.178. The influence of each covariate pre-EA score was related only to their respective post-scale; Pre-NON related to Post-NON, $F(1, 25)=10.904$, $p=.003$, partial Eta²=.288; Pre-MSS related to Post-MSS, $F(1, 25)=8.141$, $p=.008$, partial Eta²=.232.

Table 4.2. presents the adjusted and unadjusted means for group interaction upon EA after controlling for the covariates. As expected, the NON scores were concentrated at the higher levels of EA and had higher means, but of interest is the higher mean of NON specifically within the NMT group. Conversely, the CHILD scales had the lowest means which increased within the MT group, as did the MSS scales. Although the null hypothesis was retained due to the MANCOVA results, there surfaced intriguing questions about the variance of the NON group from the other two EA groups.

Table 4.2. Adjusted and Unadjusted Means for Groups and Post-EA Scores

<table>
<thead>
<tr>
<th></th>
<th>Adjusted M</th>
<th></th>
<th>Unadjusted M</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MT</td>
<td>NMT</td>
<td>MT</td>
<td>NMT</td>
</tr>
<tr>
<td>Post-MSS</td>
<td>5.231</td>
<td>5.079</td>
<td>5.1806</td>
<td>5.1429</td>
</tr>
<tr>
<td>Post-CHILD</td>
<td>4.587</td>
<td>4.334</td>
<td>4.5278</td>
<td>4.4107</td>
</tr>
</tbody>
</table>

Differences in EA Scales Pre-Post

To follow up from the main analysis, a Repeated Measures ANOVA was conducted on each of the 3 dependent EA variables to evaluate the effect of time pre-post. The Box Test, the Mauchley’s Test of Sphericity, and the Levene’s Test were non-
The CHILD variable did show significant change over time pre-post, Wilks=.866, $F(1, 30)=4.653$, $p=.039$, partial $\eta^2=.134$, yet no significant effect of treatment group. However, there was an interesting trend where the MT group had lower pre-scores, yet higher post scores. Conversely, the pre-treatment NMT group had higher beginning scores that were not maintained at the level of the MT group, creating inverse directional trends over time based upon the treatment group. The MSS scales had no significant difference between pre-post scores and no statistical relationship with treatment group, Wilks=.933, $F(1, 30)=2.164$, $p=.152$, $\eta^2=.067$. Yet, the scores mimicked the CHILD group differences over time where the MT group had a greater trend of improvement versus the NMT group. The third EA variable, NON had a lack of interaction with time and no influence in group significance, Wilks=.903, $F(1, 30)=3.227$, $p=.083$, $\eta^2=.097$. However, the divergence of this variable as compared to the others was supported through the ANCOVA; there was a trend of higher scores in the NMT group and an increase in scores over time. Figure 4.1, Figure 4.2, and Figure 4.3 demonstrate the plotted trends for the 3 variables over time.

**Sensitivity Analyses**

A second MANCOVA was completed with the NON scales removed, retaining the MSS and CHILD variables, to determine if there was a difference in effect given the non-normalized data of NON. There was a slight increase in the effect of pre-MSS scores upon EA, (Wilks=6.32, $F(2, 27)=7.869$, $p=.002$, $\eta^2=.368$) and an effect approaching significance of the pre-CHILD scores upon EA, (Wilks=.817, $F(2, 27)=3.031$, $p=.065$, $\eta^2=.183$). This suggests the pre-NON effects diminish the pre-CHILD effects upon the
EA dependent variable. However, when these revised covariates were controlled for, the primary MANCOVA analyses showed the same results.

Figure 4.1. CHILD Scores per Group Pre-Post. CHILD scores were statistically significant pre-post, $F(1, 30)=4.653, p=.039$, with an increased trend of improvement in the massage therapy (MT) group.

Figure 4.2. MSS Scores per Group Pre-Post. MSS scores are non-significant pre-post, yet mirror the infant score trending per group.
Figure 4.3. NON Scores per Group Pre-Post. NON scores are non-significant pre-post, yet trend closer to significance, particularly in the non-massage therapy group (NMT) there is a higher trajectory of improvement.

Patterns

There were not enough participants in this study to conduct a cluster analysis, therefore the data was visually evaluated. Visual inspection of patterns of EA within the population revealed that 16 infants improved their scores from pre to post-treatment and 9 of those increases coincided with MSS increases, while 7 increased when NON also improved. Five infants improved their EA level despite no maternal improvement or a decrease in maternal scores and those infants were in the MT group. Infants also decreased their scores from pre to post-treatment 10 times and 7 were when mother’s MSS decreased, yet no infant decreases were related to lower NON scores. One infant dropped their EA level in spite of mother improving NON and another infant also dropped their EA level regardless of improved MSS.
Evaluation of AIM 2

The data was screened and one outlier was noted in each of the post-STAI state and trait variables. As this was a single case outlier on a wider-ranged tool, it was recoded to 45 and 47 on the respective scales by adding one to the next highest score. A correlation matrix and scatterplot determined there was no linear relationship between maternal anxiety and the EA variables (see Table 4.3.) as measured by STAI.

Evaluation of AIM 3

A scatterplot and correlation analysis demonstrated no linear relationship of maternal depression with the EA variables, as measured by EPDS. See Table 4.3. for the high lack of correlation. However, interestingly, it did become apparent that the covariates of depression and anxiety had a significant linear relationship together.

Evaluation of AIM 4

A scatterplot and correlation analysis demonstrated the post-treatment infant GERD symptoms had a significant correlation of Pearson-r=.344, \( p =.027 \) with pre-treatment NON. However, there was no correlation with other pre-post treatment EA variables or maternal anxiety or depression. See Table 4.3. for correlation outcomes. The significant interaction that was found may be useful in future research concerning baseline and prior maternal NON levels, yet it is beyond the focus of the current study assessing for covariance with the post-treatment EA variables. As none of the covariates were correlated, they were not included in the MANCOVA.

Exploratory Analysis: Descriptive Findings for EA Scores

The EA Global Score is a scaled observation that evaluates the tenor of the dyadic relationship based upon a score to 100 and it is evaluated in addition to the six EA
Table 4.3. Pearson-r Correlations of Covariates and EA Variables

<table>
<thead>
<tr>
<th></th>
<th>Post-EA Range</th>
<th>Post-EPDS</th>
<th>Post-STAI-S</th>
<th>Post-STAI-T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-EPDS</td>
<td>-.073 to .120</td>
<td></td>
<td>.820**</td>
<td>.808**</td>
</tr>
<tr>
<td>Post-STAI-S</td>
<td>-.099 to .161</td>
<td>.820**</td>
<td></td>
<td>.787**</td>
</tr>
<tr>
<td>Post-STAI-T</td>
<td>-.059 to -.179</td>
<td>.808**</td>
<td>.787**</td>
<td></td>
</tr>
<tr>
<td>Post-I-GERQ</td>
<td>-.046 to -.054</td>
<td>.192</td>
<td>.086</td>
<td>.157</td>
</tr>
</tbody>
</table>

Note: The correlations of covariates to EA variables are given in a range rather than posting the entire matrix, and shown in comparison is the strong relationships to the other covariates with significance marked by **; however, the lack of correlation with Post-I-GERQ-R is noted among all Post variables.

subscales. Pre-post Global Scores for each dyad were also evaluated as they provide a check and balance for understanding and verifying the EA measured subscales. A regression analysis was conducted to determine if the post-treatment collapsed subscales correlated with the post-treatment Global Scores. Further evaluation of the results through a regression analysis found that post-MSS, post-CHILD, and post-NON correlated with 89.5% of the Global Score. A step-wise and backward regression were then conducted to determine if any of the subscales more significantly defined the Global Score. It was clarified that although all were significantly correlated with the Global Score, post-MSS and post-CHILD were responsible for 88.7% of the effect and the post-NON would have been removed in the model due to low effect. The NON variable has continued to be divergent from the other EA variables throughout this analysis.

Mothers with EA scores between 3.5 and 5.25 were categorized as having a less than optimum connection with their infant and were named as “inconsistent” in their EA, as based upon terminology within the EA instrument (Biringen, 2008, pp. 26, 44). Infants with EA scores between 3.5 and 5.25 were considered to be “dysregulated” and those between 2.5 and 3.25 were considered to be “disengaged”, as based upon EA descriptions.
of infant behavior within those ranges (Biringen, 2008, pp. 81-83, 93-95). Sixty-two percent, n =19, of mothers fell into the “inconsistent” group post-intervention and none scored below. Seventy-eight percent, n =24, of infants were in the “dysregulated” group and 6.25%, n =2, in the “disengaged” level of EA at post-treatment time. There were 5 infants above these levels at post-intervention and it was noted that their mothers had either been consistently high or had improved in MSS; there was no pattern of treatment group effects. Figure 4.4 depicts the outcomes of the current study post-treatment, presenting the dominant percentage of the population patterns of emotional disruption.

Figure 4.4. Population Patterns of Mother-Infant GERD EA Scores. The predominant pattern was Inconsistent Maternal EA with Dysregulated Infant. The model presents the asymmetrical caregiving-care-receiving feedback loop between partners and how mother facilitates Belonging and Trust with her infant.
Prevalent behaviors associated with these patterns are presented and are based upon EA assessments. It is of interest to note that non-hostility and non-intrusiveness (NON) were minimally correlated with these outcomes and that the most significant effects were low MSS scores and low infant scores suggesting insecure mother-infant relationships.

**Summary**

The null hypotheses of this research were retained as there was no significant difference of MT versus NMT treatment upon mother-infant Emotional Availability and there was no correlation of maternal anxiety or depression with dyadic EA. There was an influence of pre-NON factors with post-GERD symptoms, but no overall relationship between EA and GERD symptom severity.
CHAPTER V

DISCUSSION

Contrary to prediction, the current study found no statistical advantage of infant massage therapy (MT) compared to non-massage therapy (NMT) upon emotional availability (EA) of the mother-infant dyad experiencing infant gastroesophageal reflux disease (GERD). The current research was part of another study assessing the effects of infant massage therapy (MT) upon the infant 6 to 10 weeks old that was distressed with symptoms of GERD. However, the current research specifically evaluated the effects of infant MT versus a control group receiving non-massage therapy (NMT) upon the dyadic relationship. The results demonstrated no statistical differences between MT and NMT upon the dyadic EA scores. Yet, upon visual inspection of the data, there was a trend towards improvement with massage therapy versus non-massage therapy.

The lack of statistically significant differences between the treatment groups may be related to the small population size and thus lacks the power to demonstrate a difference. Additionally, this study was an analysis of mother-infant interactions that were not specifically designed for measurement of such emotional connection and the infants’ faces were not always clearly viewable. There were four cases deleted from the NMT group due to lack of EA data and this may have affected outcome differences between groups. There was a significant improvement from pre-to-post in the total CHILD scores, which may be related to the fact that all infants had experienced some type of touch that would positively impact them, and improvements within both treatment groups might obscure any between-group differences. However, although there was not a significant difference, the CHILD scores had a larger trend towards improvement within
the MT than the NMT group. There also might have been an impact of maternal scores from a videography-based Hawthorne effect upon the mother’s interactions within both treatment groups. The maternal behaviors within NON may be the most easily controlled by mother for the videography as they are more overtly recognized. Yet interestingly, the NON NMT group had greater improvement of scores; the underlying cause of this is uncertain. Any true differences between MT and NMT groups in terms of EA change are therefore uncertain.

**Maternal Anxiety and Depression**

Additionally, there were no EA correlations with maternal anxiety and maternal depression. Maternal anxiety and depression will be discussed together as research has found they have overlapping components and both are not associated with EA scores or GERD symptoms. In the literature review, lower EA scores have been associated with maternal depression (Carter, Gerrity-Rakous, Chazan-Cohen, Little, & Briggs-Gowan, 2001; McMahon et al., 2001; McCarthy et al., 2000; van Doesum et al., 2007; Vliegen, 2009), yet the level of maternal EA in this study was not optimal and did not correlate with depression or anxiety. Carter et al. (2001) found that maternal depression was able to be buffered in a less at-risk population, and the current study population was at less risk for contextual stressors of education and economics per Hollingshead determinations. In the current study there were dyads that would be considered asynchronous, with a mother having a higher EA level than the infant. Easterbrooks et al. (2005) found their teenage-mother asynchronous dyadic relationship patterns were related to the least depressive symptoms, less contextual stressors, and a higher amount of social support for their infant’s childcare. They also found that those mothers focused
upon future self-development versus infant care; future research will improve clarity on underlying dynamics of the current asynchronous maternal-infant EA scores without maternal depression.

Post-partum depression and anxiety has been associated with infant regulatory concerns, including feeding problems (Coulthard & Harris, 2003; McDermott et al., 2010; McMahon et al., 2001). It may be possible that mothers were reticent to disclose their anxiety or depression as they felt burdened for not being able to comfort their irritable infants. More understanding in this area is needed and a more thorough assessment of anxiety and depression needs to be conducted.

**EA and GERD Symptom Severity**

There was also no relationship of EA with infant GERD symptoms. The correlation of one EA scale with infant GERD was significant across time points: Specifically, pre-NON correlated with post-GERD. This specific correlation under AIM 4 may suggest an opportunity for future research, yet this is beyond the scope of the current study. All GERD scores improved across both groups, and this would be expected from the literature of improvement over time as a maturational effect (Rudolph et al., 2001; Vandenplas et al., 2009). The lack of GERD correlation with all variables is obtuse and although many speculations may be made, further inquiry will bring the most accurate enlightenment.

**Methodological Findings**

This study is one of the first to investigate the very young mother-infant dyad using the EA tool, and adds to EA knowledge of young infants with feeding concerns. The majority of research with infant EA and infant reflux has been conducted with
infants 4 months of age and older, which adds to the significance of the current work with young dyads. Additionally, this is the first study to evaluate young infant GERD dyads with infant massage therapy (MT) as an intervention. In the current study it was found that the EA tool was reliable in evaluations of young dyads across time as dyadic changes were able to be measured and it was reliable in use with this population of dyads in naturalistic settings. The inter-rater reliability was attained through the EA lab with the author, Dr. Biringen, and colleagues. The validity of measuring EA concepts in very young infants appeared to be maintained, although there was difficulty in viewing the infant’s faces as they breast fed and the activities during feedings did not vary enough to gain more insight into interpersonal interactions. There were also inconsistencies between videographers, with some intruding into the mother-infant interaction through conversation while others did not. As this was a secondary analysis, the videographers and mothers were unaware that mother-infant interaction would be a focus of the research. Yet, although these infants were very young for assessments, it was possible to measure responsiveness observed in the infant’s placement of their body towards mother, verbal expressiveness, and physical actions/interactions. Additionally, infant inclusiveness was observed as some infants would reach out and touch mother or engage mother through facial expressions and gaze during the feeding and burping, while others did not. Minimal mother-infant interactions were observed, so it is unclear of whether there were underlying mother-infant dynamics or if the infants had not reached the developmental trajectory of responsiveness at 2 to 3 months of age (Lavelli & Fogel, 2005). Yet, overall, when combining the infant interactions with maternal verbal and
non-verbal interactions, the early mother-infant EA relationship was found to be measurable and consistently scored over time with the EA instrument.

Additional studies will augment interpretation precision of such young infant populations. However, based upon the current study, it is recommended that the observation of mother-infant interactions be planned for by using mirrors or different camera angles to gain clearer observations of infant facial expressions, that the videographers be versed in a standard role within the videotaping process, and that there be more interactions other than feedings to clarify the early EA relationship. Additionally, the longer time that one spends time in observing dyadic interactions, the more young infant responses and initiations may surface (Bornstein et al., 2006).

This study employed the methodology of professionally provided infant massage therapy in order to maintain fidelity to the implementation of the massage and decrease variances that have been previously discovered (Underdown, Barlow, and Stewart-Brown, 2010), particularly as variances in the pressure of the massage has demonstrated differing outcomes in research (Field et al., 2004; Field, Diego, Hernandez-Reif, 2010; Zeitlin, Keller, Shiflett, Schleifer, & Bartlett, 2000). Although implementation variance was controlled, there were not statistically significant outcomes. Yet, the presence of touch through combined MT and NMT was statistically significant. Evaluation of the therapist-implemented treatment may add to the understanding of the responsiveness to touch with the early infant with GERD symptoms. Other considerations: more data points in videography allow a regression to the mean and may influence the perspectives in outcomes, and that infants in this study matured over a six-week period so some level of improvement in responsiveness would be expected. It is unknown, but possible, that a
mother-delivered touch intervention would have helped these infants to read their mother’s intentionality in touch and that a mother-delivered touch might have reduced the relational risk from GERD.

**Limitations**

The current research is a secondary analysis of a pilot study based upon infant GERD and not EA, yet the results assist the future research into relationships within mother-infant GERD dyads. As would be expected, a larger population would improve power and result in more opportunity for statistically significant results. Although the currently studied population provided ethnic diversity fitting of the underlying culture, there was less of a range in the levels of education and minimal numbers of younger single or at-risk mothers. There was no impact of anxiety or depression upon the EA scores, yet this may be a hidden factor that would not surface through a screening tool, but might surface through an interview. The effect of videography is powerful in capturing interactions, yet it also has the opportunity to skew data as mother might have recognized her audience and infant expressions were not clearly observed during the feedings. Additionally, the videographers were not always consistent in their approaches during the mother-infant interactions.

The use of baseline and post studies may not provide enough data points to determine population patterns, and greater time spent in observation of these dyads with multiple naturalistic dyadic interactions would likely improve understanding of the young infant and the dyadic emotional connection. The implementation of touch by a stranger may negatively affect the early infant in the developmental stage of developing trust in
relationship. Additionally, the use of more than one professional provider might have skewed the outcomes as each brings potentially unique tactile interactions.

**Clinical Implications**

The experience of the early GERD population has been obscured through a pathological lens, yet it has resurfaced as having possible dyadic components that may benefit from relational healthcare treatment. Healthcare providers are in key positions to recognize and not dismiss the mother-infant dyad seeking assistance for infant GERD. The concept of asymmetrical Belonging and the foundational importance of the emotionally available mother-infant dyadic relationship has been supported through this research, yet an intervention is needed that impacts both dyadic partners.

Infant MT implemented by the mother may more positively affect change for mother and infant within the dyad and should be an area for future research. Encouragement of touch and emotional engagement is considered beneficial for the mother-infant dyad distressed with GERD symptoms. In future studies, videotaping additional contextualized dyadic interactions beyond the feeding experience may be helpful in creating the holistic picture of the dyad within the infant GERD population. Most significantly, the EA scales have provided a window into the early infant world of GERD and are a viable option for increasing dyadic knowledge development.
REFERENCES


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Ham, J. & Tronick, E. (2009). Relational psychophysiology: Lessons learned from mother-infant physiology research on dyadically expanded states of consciousness. Psychotherapy Research, 19(6), 619-632. DOI: 10.1080/10503300802609672


Vliegen, N. (2006). 'She doesn't want to look at me'--Mother-infant observation as a bridge between clinical practice and research. Infant Observation, 9(3), 261-268. DOI:10.1080/13698030601070623


