

A systematic investigation of affect attunement and its link to a global measure of
maternal sensitivity

by

Andrea C Parker, B.S.

A Thesis

In

HUMAN DEVELOPMENT AND FAMILY STUDIES

Submitted to the Graduate Faculty
of Texas Tech University in
Partial Fulfillment of
the Requirements for
the Degree of

MASTER OF SCIENCES

Approved

Kazuko Y Behrens
Chair of Committee

Michael McCarty

Sybil Hart

Peggy Gordon Miller
Dean of the Graduate School

August, 2012

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ACKNOWLEDGEMENTS

First, I would like to thank my advisor and mentor, Dr. Kazuko Behrens, who guided me throughout my graduate work to complete my thesis and master's degree. Her dedication to her students and breadth of knowledge of the field has inspired me in my work on my thesis and beyond. If it was not for her patience and expertise, this thesis would not have come to fruition.

I also would like to thank Dr. Michael McCarty, his wisdom and frankness with care helped me see things more clearly. My gratitude also goes to Dr. Sybil Hart. Her careful edits and knowledge of infancy was essential to this thesis.

This thesis is dedicated to two brilliant researchers, who are no longer with us, that helped me along in life and my career. First, to my father, who has shown me first-hand how to be a scientist and researcher while being the greatest father who gave me support and always believed that I could do whatever I set my mind to. Second, to my mentor and friend Dr. Sarah Kulkofsky who encouraged me to go to graduate school and pursue my research interests, and was always willing to give advice along the way.

Last but not least, I thank my mother and the rest of my family. I have been blessed with a large family that has always supported my goals and I would not be where I am today if it was not for their love and encouragement. Also, my gratitude goes to all of my friends, especially Thomas, Katie, Paulina and Caroline for keeping me sane throughout this process.

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ABSTRACT

Through the process of affect attunement, mothers will engage in behaviors that appear to be matching their infant's inner state. A mother internalizes her child's inner feelings and relays these feelings back to him or her through verbal and nonverbal signals, often unconsciously, and in a different modality than that expressed by the child. To date, very few systematic investigations of affect attunement have been reported. The present study sought to systematically examine affect attunement behavior and examine its relationship with a global measure of maternal sensitivity. The Maternal Behavior Q-Sort was utilized to code maternal sensitivity which uses a set of 90 cards that describe maternal behaviors. The sort is compared to the sort of a "prototypical sensitive mother" and yields a composite score for each mother.

A subsample of mother-child dyads ($N = 59$) were observed for this study. The dyads all participated in the standard Strange Situation Procedure (SSP) as part of a larger, longitudinal social development project. All mothers were previously observed to yield a MBQS score and approximately a year later, affect attunements of the same mothers were coded during episodes 2, 5, and 8 in the SSP. Findings revealed a strong correlation between total frequency of attunement and MBQS score, $r = .407$, $p < .01$. When examining each SSP episode separately, MBQS score was also significantly correlated with the frequency of Episode 2 ($r = .337$, $p < .01$), Episode 5, ($r = .282$, $p < .05$), and Episode 8 ($r = .300$, $P < .05$). To the best of our knowledge, this is the first study to empirically report the association between maternal affect attunement and sensitivity.

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CHAPTER I

INTRODUCTION

Maternal Sensitivity

Maternal sensitivity has long been considered fundamental to a child's development, especially in the attachment field. An infant has an innate need for an attachment figure, and will form this bond whether or not the caregiver is sensitive to the infant's needs (Ainsworth, Blehar, Waters, & Wall, 1978; Bowlby, 1958). According to Bowlby (1958), a child develops an attachment regardless of the type of care, but sensitivity is likely to affect the quality of attachment. Infants will over time form a relationship with their caregiver that is the result of all of their previous interactions (Stern, 1977). In Uganda, Ainsworth and colleagues examined infants to see the effects of weaning and separation. Infants exhibit attachment behaviors such as crying, smiling, following, and clinging to gain proximity to their attachment figure when they are in distress or sense a threat (Ainsworth et al., 1978). Ainsworth took the knowledge learned from Uganda and began a new longitudinal study in Baltimore. There, infants and their mothers were observed for over a year to examine their relationship in all facets of daily life. Researchers spent months familiarizing themselves with the families studied and attachment was assessed with a newly developed scale measure and garnered an overall relationship between attachment security and sensitivity of $r = .78$. (Ainsworth, Bell, & Stayton, 1974).

Sensitive care-giving has been linked to optimal development. Insensitive care-giving in infancy has been linked to behavior problems for children later in life, such as

less sympathy to peers or less tolerance to frustration (Simpson & Belsky, 2008). Whereas, sensitive care-giving has been linked to a child's more positive and less negative interactions with friends (McElwain & Volling, 2004). Sensitivity is believed to mediate attachment and later development. Early secure attachments more greatly predict future psychosocial achievements if the sensitivity experienced in infancy and early childhood continues over time (Thompson, 2008). Early sensitive care taken together with security of attachment interact to predict developmental outcomes (Thompson, 2008). When sensitivity and attachment were examined in a longitudinal study, it was found that infants who were classified as secure later received more sensitive care, and infants who were classified as insecure later received less sensitive care (Belsky & Fearon, 2002). When these children were later evaluated for developmental outcomes, it was found that the infants who were securely attached and later were shown sensitive care performed best and children who were insecurely attached and later received insensitive care performed worst. It was interesting that when there was not a concordance between security and sensitivity, children who were insecurely attached but later received sensitive care performed better than those who were securely attached but later received insensitive care. This highlights the importance of maternal sensitivity (Belsky & Fearon, 2002). With multiple sensitivity measures, there is not a consensus on one, and most measures do not have a high concordance with attachment classification. In two well know meta-analyses, effect sizes of $r = .24$ (De Wolff & van IJzendoorn, 1997) and $r = .27$ were found (Atkinson et al., 2000), both lower effect sizes.

Affect Attunement

Multiple facets of sensitivity have been examined over the years. For example, Daniel Stern advanced the concept of “affect attunement” in the mid 1980’s (Stern, Hofer, Haft, & Dore, 1985). According to Stern, mothers are often motivated to understand and resonate with their infants’ feelings and desires and engage in behaviors that he termed as “affect attunement” (Stern et al., 1985). Stern distinguishes such maternal behaviors from mere “copying” or “mimicking” because affect attunement behaviors often differ in modality and are done unconsciously while matching the intensity (Stern et al., 1985). In other words, mothers may try to provide vocal support for their babies when exhibiting certain behaviors or some kind of physical representation with gestures when their babies vocalize with the same intensity. In most cases, the mother does this unconsciously, and in a different form than that expressed by the child (e.g., a mother making drum sounds to her child banging) (Stern et al., 1985). These interactions can be extremely subtle for both mother and child but are still meaningful interactions (Reddy, Hay, Murray, & Trevarthen, 1997). That is because through such subtle interactions, the child could perhaps sense the on-going confirmation of being cared for and understood. While mothers, fathers, and even strangers exhibit affect attunements to children, mothers are likely to demonstrate such behaviors at the highest levels because they spend the most intimate time with their infants and thus are more motivated to match the infants’ inner experiences (Chada, 1995).

It is the intermodality of affect attunement that elaborates these shared feeling states the mother is experiencing with her infant (Jonsson, Clinton, Fahrman, Mazzaglia,

Novak, & Sorhus, 2001). A mother internalizes her infant's inner feelings and relays these feelings back to the infant using verbal and/or nonverbal signals. Stern et al. (1985) claim that the best way to describe affect attunement phenomena is through examples, some are presented below:

Example 1. A 10-month-old girl finally gets a piece in a jigsaw puzzle. She looks toward mother, throws her head up in the air, with an arm flap raising herself partly off the ground in a flurry of exuberance. The mother says “YES, that a girl.” The “YES!” is intoned with much emphasis. It has an explosive rise that echoes the girl's fling of gesture and posture. One could easily argue that the “YES, that a girl” functions as a routine response in the form of a positive reinforcer. And it certainly does do so. But, why does not the mother just say, “yes, that a girl”? Why does she need to add the intensely intoned “YES...” that vocally matches the child's gestures? The “YES,” we suggest, is an attunement embedded within a routine response (p. 250-251).

Example 2. An 8 ½-month-old boy reaches for a toy, just beyond reach. Silently, he stretches toward it, leading and extending arms and fingers fully. Still short of the toy, he tenses his body to squeeze out the needed extra inch of reach. At the moment, his mother says, “uuuuuh...uuuuuh!” with a crescendo of vocal effort, the expiration of air pushing against her tense vocal chords. The mother's accelerating vocal-respiratory effort matched the infant's accelerating physical effort (p. 250).

These affect attunement behaviors are important particularly in the development of self for the infant. Mothers respond to their infant's behavior thus leading the infant to feel and have a secure sense of the world and their place in it (Stern et al., 1985). Stern et al. argue that infants may not acknowledge such maternal attuning behaviors but that infants would notice when misattunement occurs. It is predicted that infants' frequent experiences of misattunement or non-attunement may lead to less optimal developmental outcome. Stern and colleagues define behaviors of misattunement as "the allusion of sharing, but not the actual sense of sharing" (Stern et al., 1985). A misattunement occurs when the mother misjudges her infant's inner state, and sometimes includes interruption of child's play (Stern et al., 1985). An example of misattunement that Stern et al. provides is as follows:

A little boy crawls away from mother to a new toy, and then begins to flail the toy about once he grabs it. His play is very animated through his motions, vocalizations and breathing. The mother pretends to not understand the level of the infant's excitement, and jiggles his bottom from side to side with less enthusiasm and intensity. The baby then stops his play, and turns to look at the mother, noticing that her action did not match his intensity (p. 261-262).

In sum, affect attunement exchanges are generally considered to be a positive sharing experience for mother and child. However, these exchanges can also be negative if mismatches frequently occur between mother and child (Osofsky & Eberhart-Wright, 1998). These behaviors may represent a pertinent part of intersubjective relatedness,

because to complete affect attunement behaviors, the mother needs to respond to the child without merely imitating the child's action (Stern et al., 1985).

Mother-child interactions or social exchanges between mother and child have been most extensively and systematically studied in the field of attachment. Studies that examine associations between affect attunement phenomena and attachment are rare, however, there are findings based on a few studies, often with an extremely small sample size, that have shown inconsistent results (Haft, 1989; Haft & Slade, 1989; Szajnberg, Skrinjaric, & Moore, 1989). It will be an interesting endeavor to examine the link between affect attunement and attachment more closely.

However, phenomena similar to affect attunement have been frequently examined even though researchers did not specifically use the term affect attunement. Dunham and Dunham (1990) investigated mothers and their 3-month-old infants to examine the link between mother-infant vocal interactions and a contingency task which examined infant's visual fixations. They found that the more time mothers and their infants spent in vocal turn taking, the more time infants spent on visual fixations (Dunham & Dunham, 1990). Tronick and Cohn (1989) examined mother-infant coordination, which is the degree to which mother and child are able to coordinate their behavior which is crucial for the infants learning of social skills. Three, six, and nine-month old infants took part in "normal" interaction in a laboratory with their mother. Mother-infant coordination was examined by looking at matching and synchrony. It was found that coordination increased with age and that mothers spent more time coordinated with their sons, which the authors relate to other studies that found gender differences in mother's reactions to

their child's expressions (Tronick & Cohn, 1989). To examine mind-mindedness, that is, a mother's ability to recognize the internal thinking of her child's mind and then use that information when interacting with them, Meins and colleagues (in press) observed mothers and their 8-month old infants during a 20 minute free play episode, dyads were later observed at 15-months in the standard Strange Situation Procedure. They found that, secure dyads had higher scores for maternal mind-related comments, (e.g., the mother commented on what the child would or does like) and had lower scores for non-attuned comments (e.g., the mother commenting on something unrelated that the infant could not possibly be thinking of at that moment).

The Maternal Behavior Q-Sort

When examining sensitivity, there are a number of different versions of sensitivity measures with a wide range of definitions that have been utilized to examine the link between attachment and sensitivity (Atkinson et al., 2000; Atkinson et al., 2005; De Wolff & van IJzendoorn, 1997). Most measures have been contingency based but there is a measure that utilizes a Q-sort approach. Specifically, the Maternal Behavior Q-Sort (MBQS: Pederson & Moran, 1996) is a measure to assess maternal sensitivity, using a set of 90 cards that describe maternal behaviors at home. The sort is compared to the sort of a "prototypical sensitive mother" and yields a composite score for each mother. The MBQS is geared toward evaluating maternal sensitivity in situations where the mother's attention is divided (Pederson & Moran, 1995).

The MBQS has been validated and shown relatively high correlations with attachment security, $r = .60$ (Pederson & Moran, 1996). Compared to most other

sensitivity measures, this is closer to the initial Ainsworth Baltimore longitudinal study, where the relationship between attachment security and sensitivity was $r = .78$ (Ainsworth et al., 1974). In fact, in a well-known meta-analysis of maternal sensitivity and attachment security, De Wolff and van IJzendoorn (1997) found an effect size of $r = .24$, which is considerably lower than that found by Ainsworth and colleagues. Another meta-analysis found a slightly higher but similar effect size ($r = .27$) (Atkinson et al., 2000). Stiles (2004) found that the MBQS and the Ainsworth Maternal Sensitivity Scale have similar interclass correlations for interrater reliability, at .80 and .81 respectively. These results show that the MBQS appears to be a more effective measure to evaluate sensitivity.

The MBQS was initially designed to be used for 2 separate 2-hour home observations, but recently, studies of shorter observations have been conducted. When evaluating the MBQS and the Ainsworth Maternal Sensitivity Scale for sensitivity of teen mothers, Stiles (2004) established that there was no significant difference based on time observed between one- 2 hour observation or either 4 or 6 hours of total observations over multiple visits. More recently, Tarabulsky and colleagues (2009) validated a much shorter 25-item version of the MBQS in which coders observed a short 10 minute clip of mother-child interactions when infants were 10-months old. Behrens, Parker, & Haltigan (2011) recently found a successful use of a 72-item version of the MBQS during the Strange Situation Procedure (SSP) with significant correlations between MBQS score and attachment security.

In addition to their home visit study discussed earlier, Ainsworth and colleagues (1978) developed the seminal laboratory procedure known as the Strange Situation Procedure (SSP). The SSP is a laboratory procedure designed to identify the attachment behavior during instances of increasing stress to the infant. The SSP is a widely used gold standard measure of attachment that consists of eight episodes in which the mother and child interact and includes two separations and two reunions. Episode 1 is a brief introductory episode where the mother enters the room, carrying her infant in her arms. The remaining seven episodes last approximately three minutes each. During episode 2, the infant explores a heap of toys on the floor with the mother present. She takes a seat but responds to the infant as necessary. During episode 3, a stranger enters, and the infant and stranger interact with the mother present. Episode 4 is the first separation when the mother leaves the room and the stranger remains in the room. Episode 5 begins when the mother returns to the room and the first reunion between mother and child occurs. During episode 6, the mother separates from the child again, leaving the infant alone in the room for the second separation. During episode 7, a stranger enters but separation from the mother continues. Episode 8 is the final and second reunion episode when the mother returns.

Thus, in the SSP, episodes 3, 4, 6, and 7 do not include the mother interacting with the child. Nevertheless, the SSP presents a series of contexts, varying in the degree of stressfulness for the child, and thus, the SSP may offer an optimal situation in which maternal affect attunement behaviors and maternal sensitivity can be observed. The SSP was devised to estimate the child's security of attachment toward the caregiver based on

their interactive behaviors displayed during reunion episodes. Discussion of the process of assessment as well as attachment categories derived from this assessment is beyond the scope of this paper, thus is not further discussed.

CHAPTER II

STATEMENT OF PROBLEM

In this study, maternal behaviors during the SSP were observed. Specifically, the present study seeks to systematically observe and evaluate maternal affect attunement behaviors that are exhibited during the episodes when mothers are present and available to interact with their infants and compare these results with maternal sensitivity scores assessed via the Maternal Behavior Q-Sort (MBQS).

The SSP was thought to provide the ideal environment in which maternal affect attunement behaviors can be observed in the form of sensitivity because mothers were given no specific instruction on how to behave toward their infant, thus, mothers' spontaneous behaviors can be examined. At the same time, mothers are expected to follow general laboratory procedures while being videotaped. This causes the mother to have to focus on the competing demands of her child and the procedures. Pederson and Moran (1995) asserted that these competing demands revealed more meaningful differences in sensitivity. It has also been shown that greater maternal sensitivity to infant distress, but not nondistress, was correlated with a higher chance of the infant being rated as secure in the SSP (McElwain & Booth-Laforce, 2006).

To the best of my knowledge, Stern's notion of affect attunement has not gained much attention to be empirically validated. No study to date has systematically investigated this phenomenon. The goal of this study is then to systematically examine affect attunement and to investigate the link between affect attunement and maternal sensitivity. I expect to see that mothers will use primarily cross modal attunements as

were seen in Stern and colleagues (1985) original study. It is expected that there will be a link between affect attunement and maternal sensitivity.

CHAPTER III

METHODOLOGY

Participants

The current study was conducted based on archived data made available by Dr. Kazuko Behrens. A subsample of mother-child dyads ($N = 59$) was observed. They were initially recruited as part of a larger, longitudinal social development project. Infants were 12 months old ($M = 53.63$ weeks, $SD = 3.01$), and 30 (51%) were boys. Mothers' age ranged from 20 to 39 years old ($M = 29.34$, $SD = 4.46$). Mothers were primarily White (85%) with the rest including Hispanic (10%) and others (5%). The sample was middle class (Hollingshead $M = 2.6$, $SD = .8$).

Procedure

Mothers and their 12 month-old children visited Behrens' lab at Texas Tech University and participated in the standard SSP (Ainsworth et al., 1978). As stated earlier, the SSP consists of eight episodes, lasting three minutes each, except for the first brief introductory episode. The SSP includes two mother-child separations and reunions during which infants' interactive behaviors are observed to estimate attachment security (e.g., Solomon & George, 2008). In this study, episodes 2, 5 and 8 of SSP were chosen for coding affect attunement and maternal sensitivity because, as stated above, these are the episode in which mother and child interact. Episode 2 consists of the infant exploring toys with the mother present. Episode 5 is the first reunion episode. Episode 8 is the second reunion episode. The remaining episodes did not include the mother interacting with the child (i.e., Episode 3 of infant-stranger interaction with mother present; Episode

4 of the first separation where the stranger is present; Episode 6 of infant alone for second separation; Episode 7 of continued separation from the mother with the stranger present).

Measures

Maternal Behavioral Q-Sort. Maternal sensitivity is assessed using the Maternal Behavior Q-Sort, (MBQS) (Pederson & Moran, 1995), a set of 90 cards that describe maternal behaviors at home. Cards are first sorted as either being very like the mother, neutral, or not like the mother. From there, cards are then placed into one of nine piles, with pile 9 representing those cards that most resemble maternal behavior and pile 1 representing those cards that are least like the mother. The sort is compared to the sort of a “prototypical sensitive mother” and yields a composite score for each mother ranging from -1 to 1. The author was the primary MBQS coder, with an understanding of attachment theory and measures but not trained in SSP coding, and who was blind to all information regarding the dyads. Another graduate student coded 26 cases and was also blind to all information and not trained in the SSP. Both coders read available literature on the MBQS and familiarized themselves with the procedure before coding. Five pilot cases were used for training until coders became accustomed to the sorting task and were able to reach agreement on descriptors. In this process, 18 cards were identified that were not applicable to coding in the SSP. These included items 4, 6, 8, 12, 13, 14, 18, 19, 24, 25, 36, 37, 38, 40, 50, 51, 56, 58. They included situations which were not expected to happen in the SSP, including Item 13: “Uses sibling or television to keep baby (B) entertained” or Item 19: “Places B in another room when B is in a bad mood or

cranky.” Once removed, a 72-item version of the MBQS was used for coding. Coders were able to reach an overall agreement of $r = .89$ on 26 cases (36%).

Affect Attunement. A coding scheme was newly developed for the current project to systematically capture the phenomenon of affect attunement. Following careful review of maternal behaviors in several SSP pilot cases, a decision was made as to what maternal behaviors would constitute affect attunement behaviors. Affect attunement behaviors in the current study are defined as behaviors in which the mother responds to her infant in an effort to understand and identify with her infants’ feelings and actions, following Stern et al.’s (1985) description of the phenomena. For the current study, attunements were coded when the infant initiated an action that the mother then responded to by trying to share her infant’s inner state. Each attunement was then coded as either cross modal or same modal and judged at one of three levels, as high (3), medium (2), or low (1) on accuracy for intensity matching. After a number of revisions and refinements, the current coding scheme was devised: IIA = infant initiating action; IAD = infant action direction; MRA = mother’s responding action; MOR = modality of response; AOR = accuracy of response (See Appendix).

Coding. Each interactive behavior was recorded. Prior to coding maternal attunement, the infant’s initiating action (IIA) was first determined as a behavior, vocalization, or both. The infant’s action direction as to the mother or elsewhere (i.e. at a toy or the stranger) was identified next.

Response type. Maternal attunement or the mother’s response action (MRA) was first coded as a behavior, vocalization or both.

Modality. Each attunement was examined whether it was cross modal or same modal. Modality was determined by comparing the IIA with MRA. Attunements were coded as the same mode when the IIA and the MRA were the same type (i.e. both exhibited vocalizations, both exhibited behaviors or both exhibited both vocalizations and behaviors). Attunements were coded as cross modal when the mode of the MRA differed from the IIA (i.e. the infant vocalizes and the mother responds with a vocalization and a behavior, the infant vocalizes and the mother responds with a behavior, or the infant's action is a behavior and the mother responds with a vocalization).

Accuracy. The accuracy of the mothers' attunement was coded by evaluating how well or closely the mother was able to share and match the infant's inner state, focusing on the intensity of the action. High attunement behavior scores (3) were assigned to those mothers who responded to their infant's action with the same intensity, often via cross modality, and thus presumably were able to share and accurately match their infant's inner state. Medium attunement behavior scores (2) were assigned to those mothers who promptly responded to their infant's action but were not well matched to their infant's inner state in terms of intensity. Low attunement behavior scores (1) were given to those mothers who responded but with much delay or did so in a way to control the infant rather than sharing the infant's inner state.

Table 3.1.

Coding for Accuracy of Maternal Response Action

Code	Definition	Example
Low (1)	Mother's response is delayed, routinized, or forced. Does not match infant's inner state for intensity.	<p>I: Clings to M. M: Chuckles and tries to refocus I's attention on toy. I: Whimpers and clings to M M: Says "okay, okay" and tries to reposition.</p>
Medium (2)	Mother's response is genuine but the intensity match is slightly off	<p>I: Cries and clings to M M: Says "We'll okay, you're fine." I: Cries and tries to wrap body around M . M: Says "Do you want to stand up, what do you want to do?"</p>
High (3)	Mother's response is authentic, attentive and accurately matches inner state of the infant.	<p>I: Shakes toy. M: Vocalizes "oh yay" while shaking hands up and down, matching I's intensity.</p>

CHAPTER IV

RESULTS

Preliminary Analyses

Preliminary analyses found no effect for child's sex, maternal education, or maternal age on any of the variables. Therefore these variables were not considered from further analyses.

Descriptive Analyses

Frequency. For $N = 59$ mother-child dyads, MBQS scores ranged from $-.17$ to $.88$ ($M = .71$, $SD = .19$). For these mothers, there were a total of 469 attunement behaviors recorded during 3 SSP episodes of 3 minutes each. The range of total attunement behaviors was from 0 to 28 attunements per dyad ($M = 8.53$, $SD = 6.05$), with four mothers not attuning to their infants at all. It is worth noting that of the four mothers that did not attune at all, three (75%) were Hispanic.

Episode 2 as a whole had a range of total attunements from 0 to 15 ($M = 2.73$, $SD = 2.58$). Episode 2, minute 1 had a range of attunements from 0 to 6 ($M = 1.49$, $SD = 1.35$). Episode 2, minute 2 had a range of attunements from 0 to 4 ($M = 0.73$, $SD = 1.08$). Episode 2, minute 3 had a range of attunements from 0 to 5 ($M = 0.51$, $SD = 0.98$).

Episode 5 as a whole had a range of total attunements from 0 to 12 ($M = 3.00$, $SD = 3.04$). Episode 5, minute 1 had a range of attunements from 0 to 5 ($M = 1.15$, $SD = 1.18$). Episode 5, minute 2 had a range of attunements from 0 to 5 ($M = 1.00$, $SD = 1.40$). Episode 5, minute 3 had a range of attunements from 0 to 4 ($M = 0.85$, $SD = 1.13$).

Episode 8 as a whole had a range of total attunements from 0 to 10 ($M = 2.80$, $SD = 2.68$). Episode 8, minute 1 had a range of attunements from 0 to 6 ($M = 1.20$, $SD = 1.30$). Episode 8, minute 2 had a range of attunements from 0 to 4 ($M = 0.87$, $SD = 1.04$). Episode 8, minute 3 had a range of attunements from 0 to 5 ($M = 0.73$, $SD = 1.22$).

Modality. Out of total affect attunement behaviors recorded for this sample, the majority were coded as cross-modal. That is, 72% of 469 affect attunements (340) were categorized as cross-modal behaviors and 28% (129) were categorized as same modal behaviors (see Figure).

Accuracy. The accuracy score of mother's response behavior was assigned as high (3), medium (2) or low (1). Out of total 469 affect attunement behaviors, 84% (396) were coded as high. Medium attunement behavior scores were assigned to 14% (66) of the total affect attunement behaviors. Low attunement behavior scores were given to the remaining 1.5% (7) of affect attunement behaviors.

Descriptive Excerpts

Cross modal affect attunement. The following examples show the mother exhibiting attunements, all differing in modality from the infant initiating action (IIA).

Example 1. Infant is exploring the play setting and looking at various toys.

Mother says, "What do you see?" (affect attunement 1: gaze vs. verbal) Baby reaches out for a toy, a ring stack, and picks it. Mother says, "Is that rings?"

(affect attunement 2: non-vocal action vs. verbal). Baby then picks up one of the toy rings and smiles, and then puts it in his mouth. Mother says, "Numnum" as the infant bites on the toy (affect attunement 3: non-vocal action vs. verbal). The

infant crawls to the toy telephone and picks up the receiver. Mother says, “Hello, hello, is someone calling?” (affect attunement 4: non-vocal action vs. verbal) matching the intensity and the duration of her son’s exploration with the specific toy.

Example 2. Infant boy sees a rattle. He reaches for the rattle and picks it up, then after examining it, he begins to shake it quickly back and forth. Mother says “Oh yeah! Does it make noise? Does it make noise?” (affect attunement 1: non-vocal action vs. verbal). Infant then sees the bucket, he picks it up, at the same time he is vocalizing “Bah bahbah”. The mother giggles at the same volume as infant’s vocalizations. (affect attunement 2: vocal action and non-vocal action vs. verbal). Baby then smiles at a toy train and reaches to pick it up. Mother says “Oh the train, is that a train?” as her son is reaching towards the toy (affect attunement 3: non-vocal action vs. verbal).

Same modal affect attunement. The following examples show the mother exhibiting attunements, all in the same modality as the IIA.

Example 1. A little boy reaches towards the tower of building blocks. He smiles as he gets close and begins to pat his fist on the top. The mother responds to the baby by smiling back at him as he pats the tower of building blocks (affect attunement 1: non-vocal action vs. non-vocal action). The little boy then turns towards his mother, grunts and grabs her. The mother wipes the infant boy’s face, and says “Ohh!” at the same volume and length of time as her son’s grunt (affect attunement 2: vocal and non-vocal vs: vocal and non-vocal). The little boy then

whimpers and whines, then hugs his mother. Mother says “Aww” long and sad as his whimpers, and rubs his back (affect attunement 3: vocal and non-vocal vs. vocal and non-vocal).

Example 2. A little boy hears the sound of a dump truck toy and this excites him. He smiles at the toy and raises his arms and legs up off of the ground. The mother also raises her arms and shakes them enthusiastically, illustrating the same excitement felt by the boy towards the toy dump truck (affect attunement 1: non-vocal action vs. non-vocal action).

Main Analyses

Correlations were conducted between MBQS score and total number of affect attunements overall and also for each episode observed separately. Findings revealed a significant correlation between total frequency of attunement and MBQS score, $r = .407$, $p < .01$. When examining each observed SSP episode separately, MBQS score was also significantly correlated with the frequency of Episode 2 ($r = .337$, $p < .01$), Episode 5, ($r = .282$, $p < .05$), and Episode 8 ($r = .300$, $p < .05$). When the proportion of the modality of cross-modal attunements (i.e., cross-modal/same-modal) shown by each mother was examined for its link to sensitivity scores, a significant association was found ($r = .415$, $p < .01$). That is, the larger the ratio of cross modal attunements over same modal attunements, the higher the MBQS score.

Table 4.1.

Affect Attunement Frequency Table

Episode	Mean	SD	Range
Episode 2. Pre-separation, child exploration with mother present.	2.73	2.58	0 – 15
Episode 5. Post-separation, first reunion.	3.00	3.04	0 – 12
Episode 8. Post-separation, second reunion.	2.80	2.68	0 – 12
Total Frequency.	8.53	6.05	1 – 28

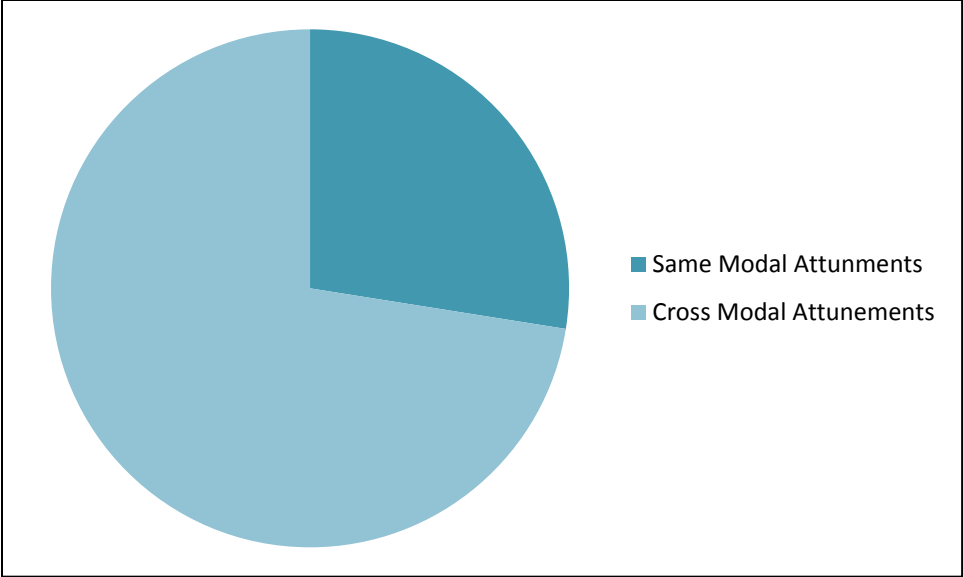


Figure 4.1. Modality of Attunements

CHAPTER V

DISCUSSION

This study sought to systematically examine affect attunement behaviors and their relationship with maternal sensitivity assessed via the Maternal Behavior Q-Sort (MBQS). The SSP was thought to provide an ideal environment to examine maternal affect attunement behaviors because the mothers were given no specific instruction on how to behave toward their infant, therefore, mothers' spontaneous attunement behaviors could be investigated.

One of the main contributions of the current project was to embark on developing a new coding scheme to investigate affect attunement behaviors in a systematic process. This process has not yet been attempted, possibly in part because recognizing subtle behaviors and consistently and confidently judging them as affect attunement would require training and a significant time commitment. To decide on the most effective way to capture this phenomenon, quantitatively and qualitatively, it took several trials before finalizing the current version used in this project. This coding scheme included recording of both the infants' initiating action and the mothers' response action, and focused on mother's modality and accuracy of response in addition to frequency. Each interaction was examined, at each minute of each episode that was observed. It is worthy of note that of the six total Hispanic mothers in the sample, 50% of them did not show any attunement behaviors, which could be indicative of some cultural factors such as, Hispanic mothers may attune to their babies in a different way. However, with such a small proportion of Hispanic mothers in the current sample, no claim can be made and a

future study that considers cultural factors is warranted. Nevertheless, it was impressive to see how Stern's work from 25 years ago still holds true to this study even in the constrained laboratory setting of the SSP. I found the phenomenon mostly cross-modal as Stern claimed.

In the present study, I discovered that over 70% of all attunements were cross-modal, therefore supporting the first hypothesis. And all but one of the 55 mothers who attuned to their infants exhibited at least one cross-modal attunement. This is slightly lower yet supporting the study done by Stern et al., which found cross modal attunements accounted for 87% of all attunements recorded. Accuracy, in terms of intensity matching, was also documented as high (3), medium (2) or low (1). Out of a total 469 affect attunement behaviors, the majority of behaviors were recorded as high accuracy attunements. Just over 1% was considered low accuracy attunements.

This study utilized the MBQS to examine maternal sensitivity. While originally designed to be used for home visits, a few recent studies have effectively utilized the MBQS during shorter mother-child interactions (Behrens et al, 2011, Tarabulsy et al, 2009). The present study further validated such use in another construct. I found a significant link between affect attunement and maternal sensitivity assessed with the MBQS. The second hypothesis was thus, also supported. The moderate association between affect attunement and the MBQS ($r = .407$) is significant but not too high, which indicates that the concepts are tapping similar, but still differing facets of maternal sensitivity.

The significant association, $r = .415$, $p < .01$, between MBQS score and proportion of cross-modal attunements is also worth discussing. This showed that mothers who used more cross-modal attunements as opposed to same-mode attunements had higher MBQS scores. This could be because these mothers are able to better understand their children, which is evidenced by them evaluating their child's inner state and not just mirroring it, but reflecting it back to their child in a different modality.

Limitations

There were of course, multiple limitations to this study. Analyses were done only with correlations. In the future, perhaps more rigorous statistical methods can be utilized. The sample size, although larger than most studies done on attunement, was still relatively small. For affect attunements, infant behaviors could have been broken down to many more categories, including: vocal, respiratory, gestures, movement of head, body, and limbs, as Stern et al. (1985) presented, which could have produced more illuminating results. Stern et al. also interviewed mothers after their free-play episodes to examine maternal awareness of affect attunement behaviors, which might have also confirmed the unconscious aspect of the maternal behavior. However, in the present study, this could not be carried out because this study relied on archived data. Although the use of the SSP to code affect attunement is advantageous, as stated earlier, the SSP may also restrict or interrupt maternal behaviors in some way due to necessary separations structured in the procedure. It is possible that the same mother could more fully engage in affect attunement behaviors in the context with no specific time limit.

Future Research

Future studies should include a larger sample size and utilize more complex statistical analyses to examine the link between affect attunement and maternal sensitivity. A longitudinal study may enable researchers to determine if there is a causal relationship between maternal sensitivity and affect attunement and allow for the evaluation of the child's developmental outcome predicted from moms who attuned more to their infant.

In conclusion, many of the affect attunement behaviors that Stern and colleagues observed long ago are still relevant in this current study. True to Stern et al.'s (1985) claim that most mothers attune to their child in a cross-modal manner, this research corroborated these findings with similar displays of cross-modal behaviors. This thesis provides a new foundation for future research by presenting a new coding scheme to systematically code attunement behaviors and examine how a mother shares her infant's inner state through this process.

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APPENDIX
SAMPLE PAGE OF AFFECT ATTUNEMENT CODING SCHEME

• Episode ____, Minute ____ Time Start: _____

#	Time Start	Description of infant action	IIA ^a	IAD ^b	Description of mothers responding action	MRA ^c	MoR ^d	AoR ^e	Time End
1									
2									
3									
4									
5									
6									
7									

^a=Infant initiating action; ^b=Infant action direction; ^c=Mother's responding action; ^d=Modality of response; ^e=Accuracy of response