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EFFECTIVENESS OF MARY AINSWORTH'S MATERNAL SENSITIVITY SCALE WITH
FOUR-WEEK-OLD INFANTS

By

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Abstract

The attachment relationship between a mother and her infant provides a foundation for future development (Bowlby, 1951; Sroufe, 2005). A high level of maternal sensitivity has been deemed one of the most important antecedents to a secure attachment (van IJzendoorn & Bakermans-Kranenburg, 2004). Although Mary Ainsworth originally developed a measure of maternal sensitivity other researchers developed measures to determine a mother's level of sensitivity (Mesman & Emmen, 2013). The Strange Situation Procedure (SSP) was developed to determine the classification of the attachment relationship (Ainsworth, Bell, & Stayton, 1974). Currently these measures focus predominantly on dyads that include an infant at approximately age 12 months. Since the benefit of earlier intervention in problematic parental-infant relationships is evident (Juffer, et al., 2008), discovering ways to accurately measure parental sensitivity at earlier infant ages would be beneficial. This study is unique in that it includes infants who are 4-weeks old. The overall intent of this study is to ascertain the relationship between maternal sensitivity at 4-weeks and attachment classification at 16-months and whether the Ainsworth Maternal Sensitivity Scale (AMSS) (Ainsworth et al., 1974) is a reliable measure for assessing maternal sensitivity at the infant's age of 4-weeks and 16-months. Sixty-eight mothers were videotaped during interaction with their infant at age 4-weeks. Mothers returned with their 16-month-old infant to participate in the SSP to determine attachment security (see Ainsworth & Bell 1970). Maternal sensitivity during the SSP was also coded using the AMSS and previously reported results determined that higher levels of maternal sensitivity at that time were related to secure attachment (Muir, Koester & Yorgason, 2012). Maternal sensitivity was coded during the 4-week infant-mother interaction using the AMSS. Results showed that maternal sensitivity at 4-weeks was not correlated with the maternal sensitivity at 16-months. Maternal sensitivity at 4-weeks was not related to overall attachment classifications at 16-months but specifically deciphered subtypes of secure and disorganized attachment. Development of infant age-specific measures that predict attachment is worth future consideration.

Table of Contents

Abstract.....	ii
Table of Contents.....	iii
Introduction.....	1
History of the Attachment and Sensitivity Constructs.....	1
The Contemporary State of Affairs.....	14
The Current Study.....	22
Hypotheses.....	24
Methods.....	24
Results.....	28
Discussion.....	30
Future Directions/Conclusion.....	32
References.....	36
Table 1.....	42
Figure 1.....	43
Figure 2.....	44
Appendix A.....	45
Appendix B.....	48
Appendix C.....	49

Effectiveness of Mary Ainsworth's Maternal Sensitivity Scale with Four-week-old Infants

John Bowlby's attachment theory was a revolutionary contribution to the field of psychology (Karen, 1994). Through collaboration with Mary Ainsworth, the secure base phenomenon and the maternal sensitivity construct were added to his developing theory (Ainsworth & Bowlby, 1991). These important research contributions are deeply entwined with his attachment theory (Grossmann, Bretherton, Waters, & Grossmann, 2013). When researching attachment theory and maternal sensitivity, it is important to understand the genesis of these interconnected concepts.

History of the Attachment and Sensitivity Constructs

Mary Ainsworth created the maternal sensitivity construct over 60 years ago (Grossmann et al., 2013). Her own unique personality, education, and research opportunities helped to shape this influential construct. Ainsworth first realized she wanted to be a psychologist at the age of 15 when she read *Character and the Conduct of Life* (1927) by William McDougall. The book suggests that an individual should look inwardly at personal character to evaluate their feelings instead of just external influences. This was an entirely new idea to the young Ainsworth. Later, when Ainsworth attended the University of Toronto, she studied psychology voraciously. She believed the science of psychology offered opportunities to vastly improve life experiences. As a graduate student, she was a teaching assistant for Dr. Edward A. Bott who greatly influenced her ideas about the scientific method. These ideas later allowed her to move beyond the common experimental and quantitative methods and focus on discovering variables based on collected data (Ainsworth, 1983).

William E. Blatz was another major influence in her studies and research. His security theory sparked her secure base idea that was expanded on years later in her own research

(Bretherton, 1992). For Ainsworth's dissertation, Blatz invited her to create a measurement for researching young adult relationships with peers and parents. This work revealed patterns when compared to autobiographical information. Finding patterns based on scales became a dominant theme in Ainsworth's research style. After obtaining her doctorate degree, Ainsworth began lecturing at the university and continued working with Blatz to further develop theory of security research (Ainsworth, 1983).

During World War II in 1942, Ainsworth enlisted in the Canadian Women's Army Corps where she was able to use her clinical psychology training to give psychological tests, interview, recommend placement, and counsel. This environment allowed her to appreciate the clinical side of psychology in a multidisciplinary atmosphere. When she returned to the University of Toronto she expanded her knowledge of personality and personality assessment by teaching emotion and motivation, theories of personality, and personality appraisal. She also volunteered at the veteran's hospital and attended workshops focused on the popular techniques of the time—such as the Rorschach and Thematic Apperception Test. Simultaneously, she worked with Blatz to develop scales to evaluate security in diverse life stages (Ainsworth, 1983).

After her marriage in 1950, Ainsworth moved with her husband to London. She responded to a job notice for a research assistant at the Tavistock Clinic where John Bowlby was investigating the effect of separation from the mother on early personality development using a new ethological approach to attachment theory. Her work with Blatz and her knowledge of personality development and assessment were assets to Bowlby's research team (Bretherton, 1992).

Bowlby was in the process of developing a controversial theory about the origins of infant attachment. Bowlby refuted the well-accepted behaviorist and psychoanalytic theories

regarding maternal-infant attachment. His deviations were based on influences from Konrad Lorenz's imprinting studies, Harry Harlow's maternal deprivation studies, and Bowlby's own observations of the detrimental effects of maternal separation (Bowlby, 1969). He also had childhood experience with loss and separation. Loss of his own primary attachment figure and caregiver (a nanny) at age four made him sensitive to the behaviors that he saw as a clinician in children experiencing loss or separation. Another influential childhood factor is that his parents did not offer emotional warmth in their aloof parenting style (Karen, 1994). Bowlby's reaction to these personal life experiences was not reflected in the dominant attachment theories he encountered as a clinical psychologist. He believed there was much more to the attachment relationship than just reinforcement or need satisfaction. He found that the ethological approach to attachment "...provides a wide range of new concepts to try out in our theorizing... [For example,] formation of intimate social bonds...conflict behavior...[and] pathological fixations" (Bowlby, 1969, p.7). He stressed the importance of learning from studying the behavior of other species:

In the fields of infant-feeding, of reproduction, and of excretion we share anatomical and physiological features with lower species, and it would be odd were we to share none of the behavioral features that go with them. Furthermore, it is in early childhood, especially the preverbal period, that we might expect to find these features in least-modified form. May it not be that some at least of the neurotic tendencies and personality deviations that stem from the early years are to be understood as due to disturbance in the development of these bio-psychological processes? (Bowlby, 1969, p.7)

When Bowlby discovered the work of Konrad Lorenz, he was intrigued. Lorenz discovered that an infant bird attaches to a specific other during a sensitive period. The attachment is stable and affects the behavior of the dyad. Bowlby applied these findings to his observation of human mother-infant interaction (Bowlby, 1969). He observed that infant behaviors such as clinging, crying, and following are directed towards the attachment figure in order to elicit specific reactions. Bowlby was also influenced by the work of Robert Hinde. Hinde observed infant-mother interaction of rhesus monkeys in captivity. His findings supported Bowlby's theory that certain infant behaviors have the specific purpose of establishing a reciprocal attachment to a primary caregiver. Hinde was encouraged by Bowlby's work to look at rhesus monkey infant-mother interaction as well as the effects of separating the dyad.

Hinde introduced Bowlby to the work of Harry Harlow. Harlow investigated infant rhesus monkeys' preference for a wire mother that fed the infant versus a wire mother covered with soft cloth. He discovered that the infant monkey preferred the cloth-covered "mother" and when a fear response was induced, the infant would seek the cloth-covered "mother" instead of the wire "mother" that offered food (Bowlby, 1969). These findings supported Bowlby's "conviction that it is proximity to and close bodily contact with a mother figure that cements the infant's attachment rather than the provision of food" (Ainsworth & Bowlby, 1991, p. 336). Bowlby also witnessed infants seeking their attachment figure during fearful situations. He called this seeking "a haven of safety" which mirrored Ainsworth's secure base idea.

Enlightened by the study of other species, Bowlby suggested that attachment behaviors were not evidence of dependency—as psychoanalytic theory suggested—but rather "a major component of human behavioral equipment...and as having protection as its biological function, not only in childhood but throughout life" (Ainsworth & Bowlby, 1991, p. 336). Bowlby

continued research aimed at supporting his theory that early experiences and the emotional environment shape a child's personality with lasting consequences into adulthood (Karen, 1994). He also stressed that behavior is best studied through direct observation of children rather than maladapted adults speaking retrospectively (Bowlby, 1969). Through his clinical experience he was able to show that when treating maladaptive children, it is also vital to treat the parents in order to facilitate desired outcomes; thus revealing the reciprocal nature of the attachment relationship (Bretherton, 1992). He set out to describe different trajectories of child personality development based on healthy, unhealthy, and severed maternal-infant attachment (Bowlby, 1958).

Bowlby's theory impressed Ainsworth but she was not yet convinced of its validity. However, Bowlby and the work of his team at the Tavistock Clinic did have a profound effect on the rest of her research career. Most influential on her future data collection techniques was the work of James Robertson. Ainsworth was inspired by his observational technique. Before his work began with Bowlby, Robertson was trained by Anna Freud at the Hampstead residential nursery to thoroughly and accurately record children's behavior. Ainsworth was assigned to analyze Robertson's data. The work revealed personality or behavior patterns that correlated with antecedent patterns. She vowed to use this observation method as soon as possible in her own research (Ainsworth, 1983).

A research opportunity presented itself when Ainsworth's husband accepted a post as a research psychologist at the East African Institute of Social Research in Kampala, Uganda in 1954. Mary Ainsworth secured funding to research mother-infant interaction in nearby villages. She observed 28 mother-infant dyads in their homes for seven weeks up to 38 weeks. The age range at the beginning of the study was two days to 80 weeks. At the end of the study the age

range was 15 weeks to two years. With the help of Omukyala Katie Kibuka—an interpreter and research assistant—Ainsworth collected data on infant development, the development of the infant-mother relationship, the development of the attachment relationship and behaviors, and variations in infant care practices. The official observation visits were two hours every two weeks. However, Ainsworth also spent hours driving village families to medical clinics and also spent time with families socially when friendships developed (Ainsworth, 1967). Ainsworth concluded early in the study that Bowlby’s ethological theory of attachment was supported and that behaviorist and psychoanalytic theories were not sufficient. She also found support for the secure base phenomenon. She observed that if a mother is a secure base for a child then they will explore the environment more readily and confidently (Grossmann et al., 2013). Through analyses of her detailed notes, Ainsworth discovered three variables that were correlated with secure attachment: maternal attitude toward breastfeeding, amount of maternal infant care, and the mother’s excellence as an informant. She believed these three variables might be part of a broader construct. In her discussion of this, she mentioned the term “sensitivity of the mother in responding” for the first time in a published document (Ainsworth, 1967, p. 400). This idea was developed into the maternal sensitivity construct during Ainsworth’s next major research project in Baltimore, Maryland at Johns Hopkins University.

In the Baltimore study, Ainsworth combined extensive observational research in the home with the Strange Situation Procedure (SSP) in the laboratory. This combination allowed for a more complete understanding of the mother-infant relationship (Ainsworth, 1983). The 26 dyads experienced four-hour, in-home visits every three weeks; a sub-group of 11 had additional weekly visits during the first four weeks of life (Bretherton, 2013). Ainsworth considered the two-hour Uganda visits as a kind of social visit. To remedy this in the Baltimore study, she opted for

four-hour-long visits to increase the likelihood of the mother and infant behaving in a more natural way. The research team also varied the time of day during the observation schedule. This allowed them to observe the participants in all facets of their day. They had only been allowed to visit the Uganda families at the same time each day (Ainsworth, 1967). The four-hour visits began at the infant age of three weeks and followed the maternal-infant relationship development through 54 weeks. Approximately 72 hours of observational data were collected on each dyad during 18 visits. As with the Uganda study, the extensive data collected allowed for Ainsworth to rule out variability in behaviors and look at stable patterns in the relationships (Ainsworth, 1983).

At the end of the data collection segment of the Baltimore study, 12-month-old infants and their mothers came to the laboratory to participate in the SSP. Ainsworth's original purpose for using the SSP was to see how the infant reacted to a stranger in a novel environment with and without the presence of the mother. Nevertheless, Ainsworth could not ignore the variations in infant behaviors exhibited during maternal separations and reunions. Through careful study of the SSP data, individual differences merged into distinct categories of attachment style. She was able to show that the SSP reliably measures infant attachment in a brief time period (Ainsworth & Bell, 1970). Ainsworth also realized that Blatz's security theory and Bowlby's developing ethological attachment theory were complementary theories. These concepts from her research past merged to solidify her secure base phenomenon observed in the Uganda study and supported by the Baltimore data: the infant uses the mother as a secure base to explore their world and the infant's relationship with the mother influences the amount of time an infant spends exploring (Ainsworth, 1983). A classification system was developed by Ainsworth and her colleagues in order to determine an infant's attachment security. The system used secure base exploration

behaviors and separation and reunion behaviors of the infant to make the determination. This system was first presented at one of Bowlby's Tavistock Mother-Infant Interaction Study Groups (Bretherton, 2013) and officially published in 1971 (see Ainsworth, Bell, & Stayton, 1971). The SSP classification system remains the most prominent instrument to assess an infant's attachment style with their caregivers.

The current function of the SSP is to create a situation where the infant's stress level increases progressively over a 21 minute period due to temporary separations from and reunions with the mother. The introduction of a stranger and separations from the mother activate attachment behaviors in the infant. The infant's reactions to a stranger and the infant's reaction to the mother's behaviors are watched and coded. This takes place over a series of discrete episodes. Observers are undetected behind a one-way mirror. The experimenter brings the mother and her baby into a playroom and then leaves. The mother then sits while the baby plays. The observers code whether the baby uses the mother as a secure base to explore or if the baby is unwilling to leave the mother. A stranger enters and sits in a chair. After one minute, the stranger engages the mother in conversation. Next, the stranger tries to interact with the baby. The baby's stranger anxiety level is noted during this episode. The mother then leaves the room. The stranger comforts the baby if they are upset. The baby's reactions to the stranger are coded. When the mother returns she addresses the baby and offers comfort if needed. The stranger leaves. Reunion behaviors of the baby with the mother are recorded. The baby resumes play. After three minutes the mother leaves the baby alone. Reactions of the baby to this separation are coded. The stranger returns and tries to console the baby. The observers note whether the baby is able to be comforted by the stranger. In the last episode, the mother returns.

She greets the baby and offers comfort. She then tries to re-engage the baby in play. Reunion behaviors at this higher stress level are recorded.

The SSP also allows for a researcher to elucidate parental behavior patterns and infant behavior patterns while the attachment system is activated. This has led to greater understanding of behaviors that are specific to each attachment classification group. For example, Tracy and Ainsworth (1981) remind researchers that when an infant is stressed—and therefore has an activated attachment system—“close bodily contact” is necessary to calm the infant. Their research study showed a difference in the *type* of “affectionate act” during stressful SSP segments between the attachment classification groups: “Mothers of babies classified as showing pattern A [insecure-avoidant] in terms of their strange situation behavior were found to emphasize kissing proportionally more than the other mothers and hugging/cuddling proportionally less...such mothers are averse to close bodily contact” (Tracy & Ainsworth, 1981, p. 1341).

As part of the Baltimore study, Ainsworth decided to compare the fourth quarter home-visit narratives (age 9-12 month infant age) with the information obtained from the SSP. From this scrutinizing technique she found themes and patterns of maternal behavior that matched up with secure and insecure attachment styles of the infant. This allowed her to refine her maternal sensitivity construct. Ainsworth first stressed the interaction component of the relationship:

A mother’s characteristic responses to her baby’s distress are a significant aspect of her mothering practices...the ways in which a mother responds to her baby’s distress have much to do with the strength and security of her baby’s attachment to her...A baby’s crying—when he cries, why he cries, and how much he cries—is by no means

independent of the way the mother responds to it...the baby's behavior and his mother's response are interlocked. (Ainsworth, 1967, p. 101)

Moreover, Ainsworth pointed out that sensitivity required the mother to respond to positive cues from the infant, not just negative cues such as crying. The sensitive mothers responded promptly, accurately, and appropriately to these distress or social cues. They followed the infant's mood and timing instead of their own. Infants and sensitive mothers enjoyed reciprocal satisfaction during interactions. These reciprocal patterns of behavior shaped the infant's internal working model and influenced personality development (Bretherton, 2013).

The Sensitivity-Insensitivity scale was developed based on the patterns Ainsworth discovered and the scale was used to predict attachment behaviors: insecure or secure. Insecurely attached infants had two distinctly different patterns of interaction and Ainsworth labeled these insecure-avoidant and insecure-ambivalent. She developed three more maternal behavior scales in order to further classify these insecure infants: Cooperation-Interference, Acceptance-Rejection, and Accessibility-Ignoring. These four Maternal Care Scales use a nine-point Likert scale. Five points on the scale include precise descriptions and examples of the maternal behaviors. For example, the high end of the Likert scale (ratings of six to nine) describes "sensitive maternal behavior that is flexibly adapted to a specific infant's signals and communications...cooperation with the baby's ongoing behavior...acceptance or a positive balance of feelings regarding the baby and being a mother, and...accessibility or attention to the baby's signals" (Bretherton, 2013, p. 466). The low scale-points (ratings of four to one) "describe mothers who appear preoccupied with themselves and engage in more or less arbitrary behavior...Scale mid-points (ratings of 5) capture maternal inconsistencies (inconsistently sensitive, mildly interfering, ambivalently accepting, and inconsistently accessible)" (Bretherton,

2013, p. 466). The scales emphasized emotions (delight, positive versus negative, et cetera), cooperation and control, defensive operations, and maternal and infant learning. Ainsworth's research team applied the scales to the fourth quarter narratives to determine that highly sensitive mothers were also higher on cooperation, acceptance, and accessibility. Highly sensitive mothers in the fourth quarter were also more likely to have infants who were classified as securely attached in the SSP.

Ainsworth also developed scales to link interactions in the first quarter (infant age was zero to three months at this quarter of the Baltimore study) to fourth quarter sensitivity ratings and SSP classifications at 12 months. One of these scales assessed behaviors during feedings. Ainsworth decided feeding behaviors were important to observe because feeding encompasses a large portion of the newborn's waking moments. If the infant was an "active participant" in the feeding process, this fostered feelings of "efficacy" which is important in the relationship development (Bretherton, 2013, p. 469). Highly sensitive mothers followed the infant's cues and pace when feeding. Mothers who were inconsistently sensitive waited to feed their infant well beyond initial bids for food and were impatient or perfunctory. Highly insensitive mothers used "unpredictable timing and long delays, force-feeding, and disregard for infant rhythms (i.e., speeding up feeding by enlarging the hole in the nipple of the feeding bottle causing choking)" (Bretherton, 2013, p. 469).

Ainsworth's findings and descriptions of successful mother-infant interactions were contrary to the dominant idea that responding to an infant's cries too often and holding an infant too much would spoil the child. When Ainsworth reported the findings, many research teams set out to replicate or refute her work (Bretherton, 2013). Grossmann, Grossmann, Spangler, Suess, and Unzner (1985) replicated Ainsworth's Baltimore study including maternal sensitivity

assessments at two, six, and 10 months. They found support for Ainsworth's construct and her recommendations for more sensitive parenting:

The relationships between maternal interactive behaviors and ratings of maternal sensitivity at 10 months confirm Ainsworth's findings: mothers rated as sensitive responded more promptly and ignored their infants' crying less often than mothers rated as insensitive. Sensitive mothers needed fewer interventions to soothe the child and picked up their crying infants more often. All mothers with a sensitivity rating of 6 and above responded with close bodily contact to the infant's intensive crying. Sensitive mothers interfered less often with the activities of their infants when they picked them up, and they behaved more affectionately when the infant was in their arms. They were also less occupied with routines while holding their infants... Thus we can now claim that we are referring to the same behavior patterns as Ainsworth... when we speak of maternal sensitivity to infant signals and communications. (Grossmann et al., 1985, pp. 245-247)

Years of research all over the world supports Ainsworth's influential finding that maternal sensitivity is indeed an important and predictive antecedent to secure attachment (Bakermans-Kranenburg, van IJzendoorn, & Juffer, 2003; De Wolff & van IJzendoorn, 1997). Continuing research has also led to an understanding of the importance of a secure attachment and the detrimental consequences of an insecure attachment in the first relationship between infant and caregiver (Cassidy et al., 2005).

Through extensive research Ainsworth's attachment classification system has also been supported and expanded. Ainsworth originally classified infants into three groups—secure, avoidant, and resistant. However, through subsequent research it became apparent that a fourth category was needed in order to classify inconsistent behaviors (see Hesse & Main, 2000). In the

1990's the disorganized category was introduced and is currently accepted as the fourth attachment classification group. This group is unique because "it is disorganized individuals who are at the greatest risk for [developing] psychopathology" (Hesse & Main, 2000, p. 1097). Infants classified as disorganized are therefore in the greatest need of intervention in order to alter possible negative outcomes.

Ainsworth and Bowlby collaborated throughout the remainder of their lives to incorporate research findings into the new attachment theory and increase the validity and usefulness of it (Ainsworth & Bowlby, 1991). Ultimately, the main contribution from the work of Bowlby and Ainsworth is that the development of the first relationship establishes internal working models that affect every relationship formed thereafter. Psychological security in a child is best achieved through a secure attachment to a sensitive and supportive mother and father (Grossmann, Grossmann, Kindler, & Zimmerman, 2008). Through their work, and later validating research, developmental psychologists now understand that a securely attached infant has experienced a sensitive caregiver—one who responds accurately and promptly—and therefore develops a working model in which they have a positive view of the self and others. An insecurely attached infant has experienced an insensitive caregiver—one who ignores, delays responses, or responds intrusively and inappropriately—and therefore develops a working model in which they have a negative view of the self and others (Bowlby, 1988).

The consequences of these working models are revealed in research about attachment. A securely attached infant uses their caregiver as a secure base to explore and learn in the world. They are better at resolving dilemmas and present more creativity than insecurely attached infants. These infants exhibit more positive emotions than negative. As a child they become the leader in social play. They are more empathetic, more inquisitive, and more independent. As

teenagers they maintain adaptive social skills and fulfilling peer and parent relationships. As adults, the secure attachment and positive working model allows for trusting relationships and the increased likelihood of sensitive parenting (Bretherton, 2005; Sroufe, 2005).

An insecurely attached infant is clingy, hard to soothe, has problems self-soothing, presents a depressed or flat affect, and may express resentment and anger. As a child they are socially withdrawn, hesitant, and less curious. As teenagers they have few fulfilling peer relationships. They are more likely to have unhealthy peer and parent relationships. They are more likely to reveal psychopathological symptoms and engage in deviant behavior. Personality disorders, dating violence, drug and alcohol use, and antisocial behaviors are all more prevalent in adolescents who developed an insecure attachment to their primary caregiver as infants (Bretherton, 2005; Sroufe, 2005). Adults are more likely to evidence insecure attachment with relationship problems such as marital discord, emotional dependence, fear of abandonment, and intimate partner violence (Follingstad, Bradley, Helff, & Laughlin, 2002). The incidence of drug and alcohol abuse, personality disorders and antisocial behaviors is higher in these adults as well (Lechliter, 2009).

The Contemporary State of Affairs

The majority of children in the United States develop a secure attachment to their primary caregiver. However, 25-35% of children develop an insecure attachment (Belsky, 2005). The percentage of insecurely attached infants increases for high-risk families. Research studies cite parental insensitivity (Ainsworth, Blehar, Waters & Wall, 1978; De Wolff & van IJzendoorn, 1997; Kennedy, 2008; Stayton & Ainsworth, 1973) or negative parenting styles (Hudson, Dodd, & Bovopoulos, 2011) as the main reasons why infants do not develop a secure attachment. Most

new parents automatically adopt the parenting style and sensitivity level that they experienced as infants (Stern, 2002).

Attachment classification is important to intervention research. Parental behavior patterns initiate different attachment behaviors in infants. For example, Cassidy et al. (2005) found that for a secure attachment to occur “certain negative behaviors must not be present: frightening behavior, extremely cold and hostile behavior, or consistent interference with the infant’s attempts to self-soothe. Any mother who exhibited these behaviors had an infant who was insecurely attached to her” (p. 41). If such behaviors are detected in a caregiver then interventions that target caregiver changes in behavior patterns and cognitions can offer education and support in order to change mal-adaptive caregiver behaviors and cognitions. The Circle of Security (COS) is one such intervention program. This program explains attachment theory to caregivers in such a way that they develop an understanding of the need to be a secure base and sensitive caregiver for their infant (Ziv, 2005). The COS utilizes the SSP in order to classify infant attachment styles (secure, avoidant, resistant, or disorganized) and the caregiver’s behavior is also classified during the SSP. Other individual assessments are performed in order to develop a specific intervention plan for the caregiver. Video recordings of caregiver-infant (child) interaction are used in order to allow the therapist to “sensitively [place] emphasis upon both strengths and limitations in her or his caregiving approach” (Cooper, Hoffman, Powell & Marvin, 2005, p. 129).

Researchers implicate this first relationship as predictive of adult attachment relationships because future relationships are built on the patterns established between the infant and their primary caregiver (Shaver & Hazan, 1987). The maternal sensitivity construct has remained an important and highly researched topic as evidenced in the ever increasing number of citations of

Ainsworth's publications. For example, in 1985 there were approximately 1,000 citations; in 2010 there were over 10,000 citations (Grossmann et al., 2013).

The maternal sensitivity measures developed by Ainsworth have been modified by various research teams to encompass multiple data collecting techniques, observation strategies, paternal sensitivity, non-parental caregivers, diverse cultures, and a wide range of child ages. The construct remains valid in all of these variations. Although the construct is widely studied, a unified measure still eludes the research community. Deciphering the methods and results is cumbersome and requires knowledge of the construct's origins and purpose. Mesman and Emmen (2013) conducted a review of the various methods currently in use that originate from Ainsworth's scale—which is also still currently in use. After setting some qualifying standards in order to discover the methods most similar to Ainsworth's original work—a global rating scale was required rather than behavior counts, event-based coding, or micro-level coding—they found 50 parental sensitivity observation instruments. In order to reduce these 50 even further, they excluded instruments that had not been used more than 10 times. Eight remained: the CARE-Index, Coding Interactive Behavior (CIB) scale, Emotional Availability scales (EA), Erickson scales, Global Ratings of Mother-Infant Interaction, NICHD-SECCYD sensitivity scales, and Parent-Child Early Relational Assessment (PCERA) sensitivity scales. A discussion of these instruments based on the findings of Mesman and Emmen (2013) follows (see appendix C for a summary table of the following information).

The CARE-Index codes three to five-minute free-play or face-to-face interactions with infants, toddlers, and preschoolers. It is the only scale discussed that was specifically developed with direction from Ainsworth and Bowlby. It has been expanded to include fathers, teachers, and clinicians. The index has been used in varying populations in the United States and Europe,

as well as Chile. Coders must be certified in order to access and use the index. The scale evaluates the sensitivity, control, and unresponsiveness of the adult by noting specific behaviors—facial expression, vocal expression, position and body contact, expressions of affection, pacing of turns, control, and choice of activity. This instrument has been linked to attachment classifications in the SSP. It has also been demonstrated that this instrument has the ability to detect changes in sensitivity after an intervention program implementation (as cited by Mesman & Emmen, 2013).

To obtain a sensitivity score, the Coding Interactive Behavior (CIB) instrument combines 22 scales that rate interactions between the child and the adult. The scales assess: acknowledgement of the child signals, positive affect, gaze, appropriate vocal quality, consistency of style, resourcefulness, and supportive presence. The scales have been adapted for fathers, newborns, toddlers, feeding interactions, preschoolers, and adolescents. The dyad is coded most often during face-to-face interactions. No studies were found linking this instrument to attachment. The instrument has been shown to detect changes in sensitivity after an intervention program implementation. The instrument has been used to assess sensitivity in Ramallah and the West Bank (as cited by Mesman & Emmen, 2013).

There are four editions of the Emotional Availability Scales (EA). The third is the most common for assessing sensitivity. The fourth edition can be applied to any caregiver interacting with a child up to age 14. The third edition is available, but the fourth edition is only available to trained professionals. The scales emphasize positive, appropriate, and creative interactions. Genuineness, authenticity, congruent interest, pleasure, and amusement are also assessed. The instrument has been linked to attachment in Western countries as well as India. It has also been

demonstrated that this instrument has the ability to detect changes in sensitivity after an intervention program implementation (as cited by Mesman & Emmen, 2013).

The Erickson Scales are typically used to rate interactions of toddlers and preschool-age children while doing a teaching task with their caregiver. The scale has been used to assess maternal and paternal interactions. Supportive presence, intrusiveness, hostility, clarity of instruction, sensitivity and timing of instruction, and confidence are rated. The instrument has been linked to attachment classifications in the United States and Japan. This instrument has the ability to detect changes in sensitivity after an intervention program implementation and is available to researchers without official training (as cited by Mesman & Emmen, 2013).

The Global Ratings of Mother-Infant Interactions scale was developed to rate maternal behaviors but has since been used to rate paternal behaviors as well. The scale is used in early infancy (two to five months infant age) through 12 months. Behaviors during face-to-face or free-play interactions are coded: warmth, acceptance, responsiveness, non-demandingness, signal perception, empathy, positive affect, appropriate responsiveness, and taking the child's perspective. This instrument has not been linked to attachment security in the United States but it has been linked to attachment security in South Africa. Improvements in sensitivity—after an intervention for mothers with infants of very-low-birth-weight—were detected by this instrument. The instrument is available without official training (as cited by Mesman & Emmen, 2013).

The Maternal Behavior Q-sort (MBQS) is the only scale mentioned that obtains sensitivity scores highly correlated with the Ainsworth Sensitivity scale. The Q-sort is used during home-visits with varying tasks. The scale has been used with fathers and mothers interacting with their infant, toddler, or preschool-age child. A separate Q-sort is available for

the preschool age assessment. The Q-sorts do not require official training for use. The instrument assesses signal perception, prompt responding, child-centered responding, ability to satisfy the child, positive affect, affection, and touch. The instrument has been linked to attachment classifications in Western samples and in Colombia. It has the ability to detect improvements in “parenting quality” post intervention (as cited by Mesman & Emmen, 2013, p. 494).

The National Institute of Child Health and Human Development study of Early Child Care and Youth Development (NICHD-SECCYD) has developed an instrument to assess parental sensitivity up to the infant age of 24 months during free play. (Beyond this age the study employs the Erickson scales.) The instrument focuses on sensitivity to distress and nondistress. Appropriate responsiveness and effectiveness of response are evaluated. These scales have been linked to attachment classifications and are able to capture improvements in maternal sensitivity towards preterm infants after an intervention (as cited by Mesman & Emmen, 2013).

The Parent-Child Early Relational Assessment (PCERA) instrument rates parent-child interactions in a variety of tasks—feeding, structured task, free play, and separation/reunion episodes. The child age is typically under 12 months. Signal perception, appropriate and contingent responsiveness, and empathetic awareness behaviors are rated. Use in non-Western countries was not found. The instrument has been linked to attachment security (in premature infants). No studies were discovered specifically evaluating PCERA ability to detect changes in parental sensitivity after intervention implementation (as cited by Mesman & Emmen, 2013).

A variety of research questions have been evaluated with the instruments discussed above as well as other measures of sensitivity. For example, the relationship between maternal

depression, maternal sensitivity, and child attachment among Asian and Hispanic mothers yielded cultural insights by modifying a sensitivity frequency scale (Huang, Lewin, Mitchell, & Zhang, 2012). Joosen, Mesman, Bakermans-Kranenburg, and van IJzendoorn (2012) modified Ainsworth's initial sensitivity scale to include an intrusiveness measure. They used the scale to predict harsh discipline in toddlerhood. Kim et al. (2011) discovered that certain areas of the brain are more active in highly sensitive mothers versus insensitive mothers when they hear their own infant's cry. The mother's sensitivity was measured using the CIB at three months (Kim et al., 2011). Leerkes (2010) used a three-point Likert scale based on Ainsworth's sensitivity definition to evaluate response to infant distress and nondistress cues and cognitive processes as sensitivity predictors.

As support for this construct grows, the need for a systematic measurement instrument increases. The development of a unified measure for assessing parental sensitivity should allow for more clarity and adherence to Ainsworth's original construct descriptions (Mesman & Emmen, 2013). For example, the concept of maternal warmth and affect is not part of Ainsworth's original definition of maternal sensitivity. However, all of the scales mentioned above—except the NICHD-SECCYD sensitivity scales—evaluate warmth and affect in the sensitivity measure. Ainsworth found that warmth and affect did not predict secure attachment in her Uganda study (Ainsworth, 1967). She decided warmth and affect should be measured separately from the sensitivity construct that focused more on reciprocal affect and enjoyment. All but two of the Uganda mothers showed warmth and positive affect (possibly because a mother may force herself to show these behaviors without actually feeling positive feelings because of social norm pressures). Therefore, Ainsworth included warmth and affect in her Acceptance-Rejection scale which assesses the “balance between the mother's positive and

negative feelings about her baby” (Mesman & Emmen, 2013, p. 487). Agreeing on a unified measure may help diminish such differences in measurements. However, a more unified or systematic measurement may limit the variety of hypotheses that researchers wish to study. The variability in instrument measurement allows for a much broader look at the sensitivity construct.

For instance, when Ainsworth developed the construct, fathers were generally not the primary caretaker and therefore deemed less important to the child’s development. Sixty years later, this idea has changed. The paternal-child relationship is finally being recognized as vital to healthy child development as well—whether or not the father is the primary caretaker. Research has revealed that a child’s psychological security and subsequent healthy life relationships are best achieved through a secure attachment to a sensitive and supportive mother and father (Grossmann et al., 2008). Many sensitivity measures are being used to assess parental sensitivity (including all of the measures discussed above as well as the scale Ainsworth developed discussed below). Some are modified to accommodate differences in maternal and paternal interacting styles and others are not modified. This is just one example of the expansion of the maternal sensitivity construct that needs further evaluation.

Infant/child age is another example that needs careful evaluation. Most measures are used for infancy through toddler years (see Appendix C). Just one of the above mentioned assessments has been used on newborns (CIB). However, this measure is used up through adolescence and it has never been linked to attachment classification (Mesman & Emmen, 2013). Some instruments adjust for different ages and some apply an unmodified measure to different ages. The validity of measuring the sensitivity construct has extended from infancy to encompass adolescence. Discussion of how these findings should be interpreted should ensue.

Another issue with age is that research is trending towards validating sensitivity measures for older child ages while largely ignoring newborn or prenatal sensitivity assessment. Ainsworth developed the scale through observations of 9-12 month-old infants. She had other ideas for very young infants such as coding interaction while feeding the infant (Bretherton, 2013). Assessing sensitivity at earlier infant ages and implementing intervention when needed is a worthy endeavor to prevent relationship difficulties. Inclusion of Ainsworth's newborn assessments such as infant feeding could decipher patterns that are indiscernible with the current scale. So far, the construct has been used to detect and define problems after the relationship has developed maladaptive patterns. Assessing sensitivity at younger infant ages could shift the focus towards preventing problems before the relationship develops these maladaptive patterns.

The setting and length of observations vary extensively across the measurement instruments as well. The typical observation time is now just 10 minutes and sometimes as little as five. This is vastly different from Ainsworth's extensive and repeated home visits. A 10-minute, one-time interaction may not be enough time to observe "characteristic response" patterns that Ainsworth (1967) discovered (p. 101). Ainsworth warned that "Broader significance can be attributed...to behavior...only if it emerges as consistently related to characteristic behavior in everyday life" (Bretherton, 2013, p. 468).

More longitudinal and cross-sectional studies are needed to follow the parental sensitivity construct from pre-birth through adolescence—and beyond. This will aid in more thorough detection of the problems and strengths of using specific measures across childhood and in certain settings and observation lengths.

The Current Study

The current study addresses some of the research issues mentioned above. The relationship between maternal sensitivity and the infant's attachment to the mother at the same point in time has been explored previously with this data set (Muir, Koester & Yorgason, 2012). Analyses were conducted on a sample of 68 mothers and their 16-month old infant recorded during the SSP. Data from SSPs were chosen due to the incremental increase in stress on the infant. This stress allowed the observer to note the baby's bids for maternal attention and the level of sensitivity in the mother's response. The observer coded the mother's sensitivity without knowledge of the category of infant attachment to the mother. Maternal sensitivity was rated using the Ainsworth Maternal Sensitivity Scale (AMSS) (Ainsworth et al., 1974; Kennedy, 2008). This is the same nine-point Likert scale that Ainsworth developed in her Baltimore study; it is still used as a reliable measure of maternal sensitivity in current research (Mesman & Emmen, 2013). Maternal sensitivity was used as the dependent variable and infant attachment classification (secure, resistant, avoidant, disorganized) and security of attachment (secure, insecure) were used as factors in one-way Analyses of Variance. Ratings of maternal sensitivity by overall security of attachment revealed statistical significance ($p = .01$). This finding is in concordance with previous research that supports the theory that maternal responsiveness and sensitivity appears to be one of the most important factors contributing to attachment security.

The current study investigated the reliability and validity of the AMSS. Test-retest reliability was measured using maternal sensitivity ratings at the infant age of four-weeks and maternal sensitivity ratings at the infant age of 16-months. Validity was measured by analyzing whether four-week maternal sensitivity is related to attachment classification in this sample. As noted above, most research studies have focused on much older infants. This current research is

valuable because it offers the possibility of detecting problems with maternal sensitivity at early stages of attachment. An infant typically forms a clear-cut attachment to their primary caregiver by seven to nine months old. If problems with maternal sensitivity can be detected earlier, then intervention can be implemented to aid in the development of a secure attachment.

Hypotheses

Hypothesis 1: Higher levels of maternal sensitivity coded using the AMSS during a 20 minute face-to-face mother-infant interaction at the infant age of four-weeks will be related to secure infant attachment classification coded in the SSP when the infant is 16-months old.

Hypothesis 2: The mother's sensitivity score coded using the AMSS during a 20 minute face-to-face mother-infant interaction at the infant age four-weeks will correlate with the mother's sensitivity score coded using the AMSS during the SSP at the infant age of 16-months.

Methods

Participants

The sample included 66 mothers and 68 infants due to two sets of twins. The dyads consisted of 36 infant males (53%) and 32 infant females (47%). Mean parental age was 26.52 years (SD = 3.55; range = 19 – 34 years) and mean education was 15.17 years (SD = 1.96; range = 12 – 20 years). Approximately 65% of the mothers were college graduates or beyond. Forty-nine mothers were primiparous and 19 mothers were multiparous. All participants were Caucasian. All of the caregivers were the biological mother.

Procedure

Participants for this study came from a longitudinal study that began in the third trimester of pregnancy and followed the dyads through nine years. Mothers volunteered during

childbirth preparation classes in a mid-size Midwestern city. The pre-birth questionnaire provided demographic information. A subset of mothers agreed to be videotaped at a later date but all mothers were encouraged to participate in the initial survey regardless of their level of involvement in the study. Data used for the current study included information from participants who agreed to be part of the four-week and one year follow-up.

Sixty-six mothers were observed in a videotaped interaction with their infant when the infant was four-weeks old (mean = 31 days or 4.4 weeks; range = 4 – 8 weeks). Two of the mothers gave birth to twins and agreed to be recorded with each of their infants separately—making the dyad total 68. The 20-minute recordings took place in the home during an appointed time when the infant would likely be rested and fed. Mothers were instructed to hold their infant and “interact normally” while sitting in a chair of their choosing. Mothers were asked to avoid feeding their infant in order to avoid coding biases regarding feeding method.

For the current project, these video recordings were assessed for maternal sensitivity using Ainsworth’s Maternal Sensitivity Scale (AMSS) (Ainsworth et al., 1974). The observer received training regarding the maternal sensitivity coding process. To show inter-rater reliability, the observer was required to match (plus or minus one on the Likert scale) on 100 percent of videos used during the training. Random spot checks were also conducted to ensure matching throughout the coding process. The trained observer viewed the video recordings of the 68 dyads consisting of the mother and her four-week-old infant. Based on the mother-infant interaction, the observer assigned a sensitivity score for each mother. The observer was blind to all other dyad information.

At the infant’s age of 16-months (mean = 16 months; range = 12 – 18 months) the dyads came to a university laboratory to be recorded in the Strange Situation Procedure (SSP).

Attachment classification was obtained as part of the longitudinal study. The two coders were research assistants who had obtained acceptable reliability training on a data set from the Institute of Child Development at the University of Minnesota. The classification of D and conflicts in coding were resolved by Dr. Elizabeth Carlson at the University of Minnesota. The resulting classifications of the sample were forty-eight (70%) secure (B); two (3%) insecure-avoidant (A); ten (15%) insecure-resistant (C); and eight (12%) insecure-disorganized (D). This sample is comparable to the majority of North American samples: 65-75% of samples are typically securely attached. However, most samples have more insecure-avoidant than insecure-resistant infants (Belsky, 2005).

Maternal sensitivity scores were also obtained using the SSP recording of dyad interaction. As with the four-week assessment, the observer was required to match (plus or minus one on the Likert scale) on 100 percent of videos used during the training of maternal sensitivity coding to show inter-rater reliability. The mother's sensitivity was coded by specifically examining infant bids for maternal attention (as per Kennedy, 2008) and the mother's response using the AMSS and the observation tool described below. The observer was blind to all other dyad information including attachment classification. The relationship between SSP maternal sensitivity and attachment classification (secure, resistant, avoidant, or disorganized) and the level of the security of the attachment (secure, insecure) have been reported previously for this sample (see Muir, Koester, & Yorgason, 2012).

Measures

Questionnaires: Maternal demographic information was obtained during the third trimester of pregnancy and at four weeks postpartum. The questionnaire included items such as parity, infant sex, maternal education, and maternal age.

AMSS: The Ainsworth Maternal Sensitivity Scale is a nine point Likert Scale used to determine a mother's level of sensitivity during interaction with her infant. The scale ranges from nine (highly sensitive) to one (highly insensitive). The scale offers detailed descriptions of the type of behavior a mother might exhibit (Ainsworth et al., 1974). See Appendix A for the complete scale.

SSP: The Strange Situation Procedure was used to classify infant attachment. The function of the SSP is to create a situation where the infant's stress level is increased. This takes place over a series of timed, consecutive episodes. See Appendix B for a full description of the procedure. The infant's reactions to a stranger and the infant's reaction to the mother are watched and coded by trained observers. The trained observers detect behaviors that are predictive of the different attachment categories (proximity-seeking, contact maintenance, resistance, and avoidance).

Maternal Sensitivity during the SSP: These four questions were employed to guide observers when evaluating the mother's sensitivity to her infant's bidding during the SSP: Is the mother aware of the signal/bid; is the mother accurate in her interpretation; is the mother's response appropriate; is the mother prompt in her response (Kennedy, 2008).

Statistical Data Analysis

The current study compared the four-week maternal sensitivity score with the 16-month attachment classification and maternal sensitivity score. One way Analyses of Variance were conducted to determine whether the four-week and 16-month maternal sensitivity scores were associated with attachment classification and attachment security at 16-months. The dependent variable was maternal sensitivity ratings and the factors were attachment classifications (A = avoidant, B = secure, C = resistant, D = disorganized) and attachment security (secure/insecure).

Post-hoc analyses were also conducted. A correlation was conducted to determine the relationship between maternal sensitivity scores from each time period. Both parametric (Pearson's r) and non-parametric (Cohen's $kappa$) correlations were analyzed as a check for the assumptions. T -tests were conducted on parity, infant sex, and maternal age (median split of high/low) compared with maternal sensitivity at the two time periods.

Results

The demographics available for these dyads (infant sex, parity, maternal age; see Table 1) showed representative distribution across the attachment classifications. Four group (ABCD) and two group (secure/insecure) categories of attachment were evaluated.

Scores of maternal sensitivity at four-weeks of age were observed as follows for the four attachment groups: Secure, $M = 6.7$ (S.D. = 2.2); Avoidant, $M = 7.5$ (S.D. = 2.1); Resistant, $M = 6.5$ (S.D. = 2.8); Disorganized, $M = 4.6$ (S.D. = 1.2). Scores of maternal sensitivity at 16-months of age were observed as follows for the four attachment groups: Secure, $M = 6.3$ (S.D. = 2.5); Avoidant, $M = 5.0$ (S.D. = 2.8); Resistant, $M = 4.9$ (S.D. = 2.3); Disorganized, $M = 4.1$ (S.D. = 2.8). See Table 1 for a summary of the above information.

There were no differences on maternal sensitivity scores at four-weeks and at 16-months for maternal age or maternal parity. There was a trend for mothers of males to be rated as less sensitive than mothers of girls at 16-months $t(65) = -1.72, p = .09$. Table 1 summarizes the maternal sensitivity scores for attachment categories, by maternal age groups, parity, and infant sex. None of the correlations between scores at four-weeks and 16-months in any of these subgroups (attachment categories, maternal age, parity, and infant sex) were significant.

Ratings of maternal sensitivity at the two time periods were not significantly related, $k = -.06, p > .05$; $r = .08, p > .05$. The overall mean maternal sensitivity rating at four-weeks was 6.43

($SD = 2.23$). The overall mean maternal sensitivity rating at 16-months was 5.78 ($SD = 2.60$). Although the trend hypothesized between sensitivity at four-weeks and sensitivity at 16-months is not significant, descriptive statistics indicate that sensitivity was higher at four-weeks than at 16-months. This held even when the groups were divided into secure and insecure.

The result of the ANOVA conducted to determine whether maternal sensitivity ratings at four-weeks were associated with infant attachment classification (ABCD) was not significant, $F(3, 64) = 2.20, p = .097, \eta^2 = .09$ (see Table 1 and Figure 1). However, there was a trend toward significance ($p < .10$). Also, the means indicated that there was a difference in sensitivity between the four groups. Therefore, a post-hoc LSD was performed to identify the difference. The analysis showed that there is a significant difference between maternal sensitivity ratings of the groups secure and disorganized ($p < .05$) with higher maternal sensitivity in the secure group and lower maternal sensitivity in the disorganized group.

The result of the ANOVA conducted to determine whether maternal sensitivity ratings at 16-months were associated with infant attachment classification (ABCD) was not significant, $F(3, 63) = 2.21, p = .095, \eta^2 = .10$ (see Table 1 and Figure 2). Again, the trend toward significance ($p < .10$) and the mean differences suggested the conduct of LSD post-hoc analyses that showed that there is a significant difference between maternal sensitivity ratings of the groups secure and disorganized ($p < .05$).

Due to varying group sizes the four attachment classification groups were collapsed into two groups—secure (B = secure; $n = 48$) and insecure (A = avoidant, C = resistant, and D = disorganized; $n = 20$)—in order to create more similar group sizes and simplify the statistical analyses. The result of the ANOVA conducted to determine whether maternal sensitivity ratings at four-weeks were associated with infant attachment security (insecure/secure) was not significant,

$F(1, 66) = 1.923, p > .05, \eta^2 = .03$. The ANOVA conducted to determine whether maternal sensitivity ratings at 16-months were associated with infant attachment security (insecure/secure) at the same age was significant, $F(1, 65) = 6.311, p = .014, \eta^2 = .09$.

Discussion

Hypothesis 1

It was surprising to find that in this study, higher levels of maternal sensitivity coded using the AMSS during a 20 minute face-to-face mother-infant interaction at the infant age of four-weeks did not significantly predict infant attachment classifications coded with the SSP when the infant was 16-months old. As this research study included archival data, it may be that more participants were needed in order to reveal the significance. For this effect size ($\eta^2 = .09$), power analysis suggests at least 124 participants. However, it is worthwhile to note that mothers coded as highly sensitive during the interaction at four-weeks (scoring 6 – 9) were more likely to have an infant classified as securely attached to them at 16-months ($n = 36$ of 48 securely attached infants; 75%).

Hypothesis 2

The mother's sensitivity score coded using the AMSS during a 20 minute face-to-face mother-infant interaction at the infant age of four-weeks did not correlate with the mother's sensitivity score coded using the AMSS during the SSP at the infant age of 16-months. Based on previous research, this finding was also unexpected (however, previous research regarding maternal sensitivity has not typically included infants as young as four-weeks). Research on sensitivity has found sensitivity to be correlated at different time periods. In this study, the means of the scores at the two time periods were fairly similar (6.43 at four-weeks and 5.58 at 16-months) however, the individual participants scored differently at the two time periods. The

results of this study raise the question of whether or not this scale is capturing maternal sensitivity at four-weeks. Infant behaviors used for coding purposes are prevalent at 16-months but are not yet present at four-weeks. It may be that the settings affected the behavior of the mother. At time one the mother was asked to “interact normally” with her infant in her home. This was restricted though by the instructions to remain sitting (in order to stay within range of the camera) and to not feed her infant. This may have been a less stressful situation for the mother and may be why the sensitivity ratings were higher at four-weeks. Also the mothers were holding their four-week-old infant at time one whereas at time two the infant was playing with toys and interacting with the mother. Therefore, mothers may look more sensitive to an observer at time one. At time two mothers were given specific written instructions in the lab with their infant. Some mothers seemed more anxious about the specific instructions. For example, many mothers repeatedly referred to the instruction sheet for her next step instead of interacting normally with her infant. This preoccupation or inability to multi task may have been coded as evidence of insensitivity. In reality, the mother is also in a “strange situation” and therefore may not be able to interact in her normally sensitive manner. It could also be argued that mothers were performing for the camera or anxious about their child doing well or “passing the test.” It is worthwhile to consider that the mothers may have behaved differently due to the environment and a future study could plan to keep the environments the same across time periods (i.e. observe the dyad in the home or in the lab at both time periods).

It is also possible that at four-weeks the new mothers (49 were primiparous) were anxious or not confident yet in their mothering capabilities. This awkwardness may have looked like insensitive behavior at four-weeks. At 16-months these mothers could have adjusted and appeared more sensitive, thus accounting for the lack of correlation between the two time

periods. Also it is important to consider maternal depression (“baby-blues” or post-partum or other types of depression) at four-week infant age that may resolve by the 16-month coding. No other studies were found using the AMSS at four-weeks. However, Mesman and Emmen (2013) mention that the CIB measure has been used at the newborn stage and the Global Ratings of Mother-Infant Interaction measure has been used for two to five month old infants. These two measures may offer insight on how to adjust the AMSS for this younger age. Grossmann et al. (1985) coded maternal sensitivity at two, six, and 10 months in their original study investigating Ainsworth’s new sensitivity construct. The specific procedural details of this study may offer useful insight as well.

The scoring of sensitivity with AMSS may have failed to detect small-scale variations in sensitivity. Due to the 9 points of the AMSS, it is possible that a mother could have scored an eight at time one and a six at time two. Even though her scores do not remain consistent she would still be considered a sensitive mother. Classifying mothers as highly sensitive (6-9) or highly insensitive (4-1) and eliminating category five may be beneficial. Cassidy et al. (2005) modified the maternal sensitivity construct to code the mothers in their research as either “globally sensitive” or “globally insensitive” (p. 39). Their more robust findings support the idea of a less cumbersome scale. These authors also encourage the idea that mothers and infants should be observed more than once in order to determine a mother’s sensitivity behavior pattern (Cassidy et al., 2005). It may be important to look at the sensitivity of these participants at time one and at time two together in order to assign one global rating of the mother’s sensitivity (verses comparing the mother’s sensitivity at each time period). This could offer a more complete picture of the mother’s sensitivity behavior pattern, which may predict attachment styles more accurately.

Future Directions

This study lends support to the theory that maternal sensitivity at the very early stages of motherhood may look different than at later stages and therefore a different coding mechanism should be used. The AMSS scale was developed by Ainsworth using narratives from the home visits that occurred when the infant was 9 – 12 months old. Ainsworth suggested that at earlier infant ages, sensitivity coding might be facilitated by observing infant feeding (see introduction, this document, pp. 13 -14). It seems worthwhile to develop a measure for this type of observation. A good place to start may be with Ainsworth's own ideas about coding at this young infant age. Ainsworth's many hours of in-home observation provide current researchers with valuable information about interaction and behavior patterns that is generally unattainable in the current research environment. Through her many hours of observation, Ainsworth developed six scales that she used to code sensitivity at the infant age of zero to three months: feeding, crying, holding, face to face interaction, affection and expressiveness. She found patterns of behavior that correlated with fourth quarter (9 – 12 months) SSP classifications and sensitivity ratings. Bretherton (2013) offers an excellent reminder and summary of the usefulness of these forgotten scales.

It is also important to consider clarifying and unifying the training for using the AMSS. For example, mothers of avoidant infants tend to kiss their infant more and provide less bodily contact when the infant is distressed (see Tracy & Ainsworth, 1981). This information is not contained in the scale descriptions of the AMSS but it could be pertinent to the coding process. For instance, in this study the four-week insecure avoidant infants had mothers who were rated as highly sensitive (even higher than the secure group). This may be reflective of the need to

operationalize what sensitive maternal behavior looks like at this young age; and coders may regard kissing as sensitive when it might be intrusive to the infant.

This research is important when considering screening tools and appropriate interventions for the caregiver-infant relationship. Ultimately a screening tool could be developed for doctors and clinicians that could rate a caregiver's sensitivity with their infant. If problems are detected then the clinician could offer support specific to that caregiver's needs. For example, a depressed mother may score low on a sensitivity screening tool. Her provider could then decipher that the cause of the insensitivity might be her depression and help her to find the proper resources to aid in relief from her depression. This could ultimately repair the infant-mother relationship and prevent the negative impacts of maternal depression. Also, if a provider determines that the cause of caregiver insensitivity is maladaptive behavior patterns in the caregiver then they could direct the parent to appropriate interventions that target caregiver behavior change (such as The Circle of Security—see Ziv (2005) for an overview of this intervention program).

It is worthwhile to note that the AMSS identified the most detrimental attachment style. The post hoc analysis showed that there is a significant difference between maternal sensitivity ratings of the groups secure and disorganized. This finding purports that this scale may be worthwhile for assessing the need for intervention with the most at risk dyads.

The maternal sensitivity (and paternal sensitivity) construct has arrived as an important antecedent to attachment relationships and internal working models. As a research community, striving for a consistently valid and reliable parental sensitivity measure is an important endeavor. The AMSS is a worthwhile tool for assessing sensitivity. However, adjustments may need to be made to the scale—using Ainsworth's original ideas as well as new research findings

and tools—in order to make the scale more usable today. For example, it may be found that sensitivity measures should be divided by infant age. This study lends support to the idea that developing a measure for very young infants is important. Detecting problems with the caregiver-infant relationship at the earliest possible stage is crucial if the goal is to work toward more secure attachments and positive internal working models in children.

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Table 1. Maternal Sensitivity by Attachment Classification

Attachment Classification	Maternal Age Age _{Mom} M _{years} (S.D.)	Infant Sex % Male	Parity % Primiparous	Maternal Sensitivity Scores (MSS) (1 to 9, higher scores indicate higher sensitivity)		Assoc. of MSS across infant ages	
				4 Wks. M (S.D.)	16 Mos. M (S.D.)	<i>k</i> =	<i>r</i> =
Secure (n =48)*	26.6 (3.5)	45%	75%	6.7 (2.2)	6.3 (2.5)	-.08	.076
Avoidant (n =2)	25.5 (9.2.)	100%	100%	7.5 (2.1)	5.0 (2.8)	.00	1.0
Resistant (n =10)	26.9 (2.7)	80%	50%	6.5 (2.8)	4.9 (2.3)	-.06	-.23
Disorganized (n=8)	26.0 (3.7)	50%	75%	4.6 (1.2)	4.1 (2.8)	.05	-.33
All (n =68)	26.5 (3.5)	53%	70%	6.4 (2.2)	5.8 (2.6)	-.06	.082

* Note. There was one less case in the secure attachment group assessed for maternal sensitivity at 16 months (n = 47).

Figure 1. Maternal Sensitivity at Four-weeks.

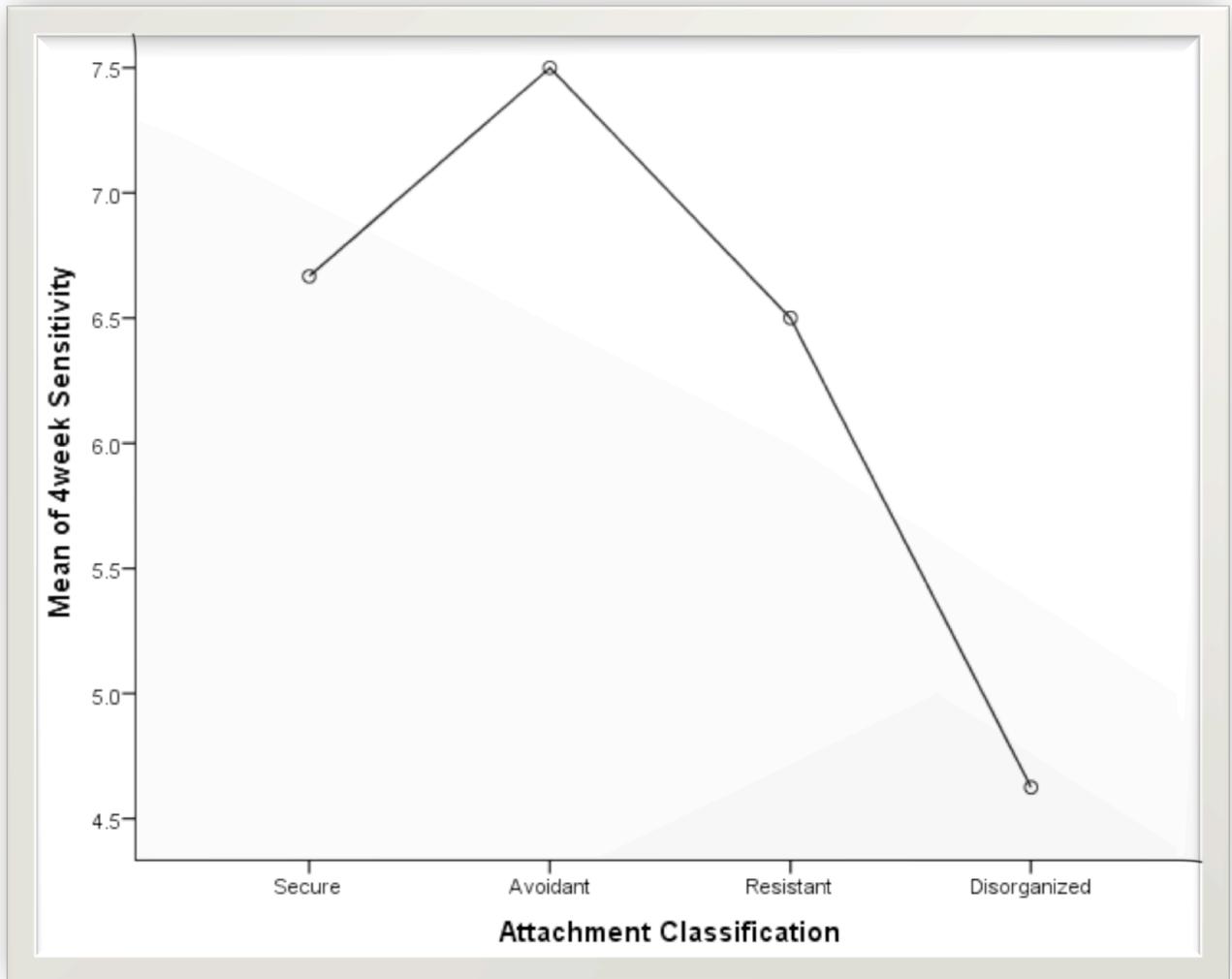
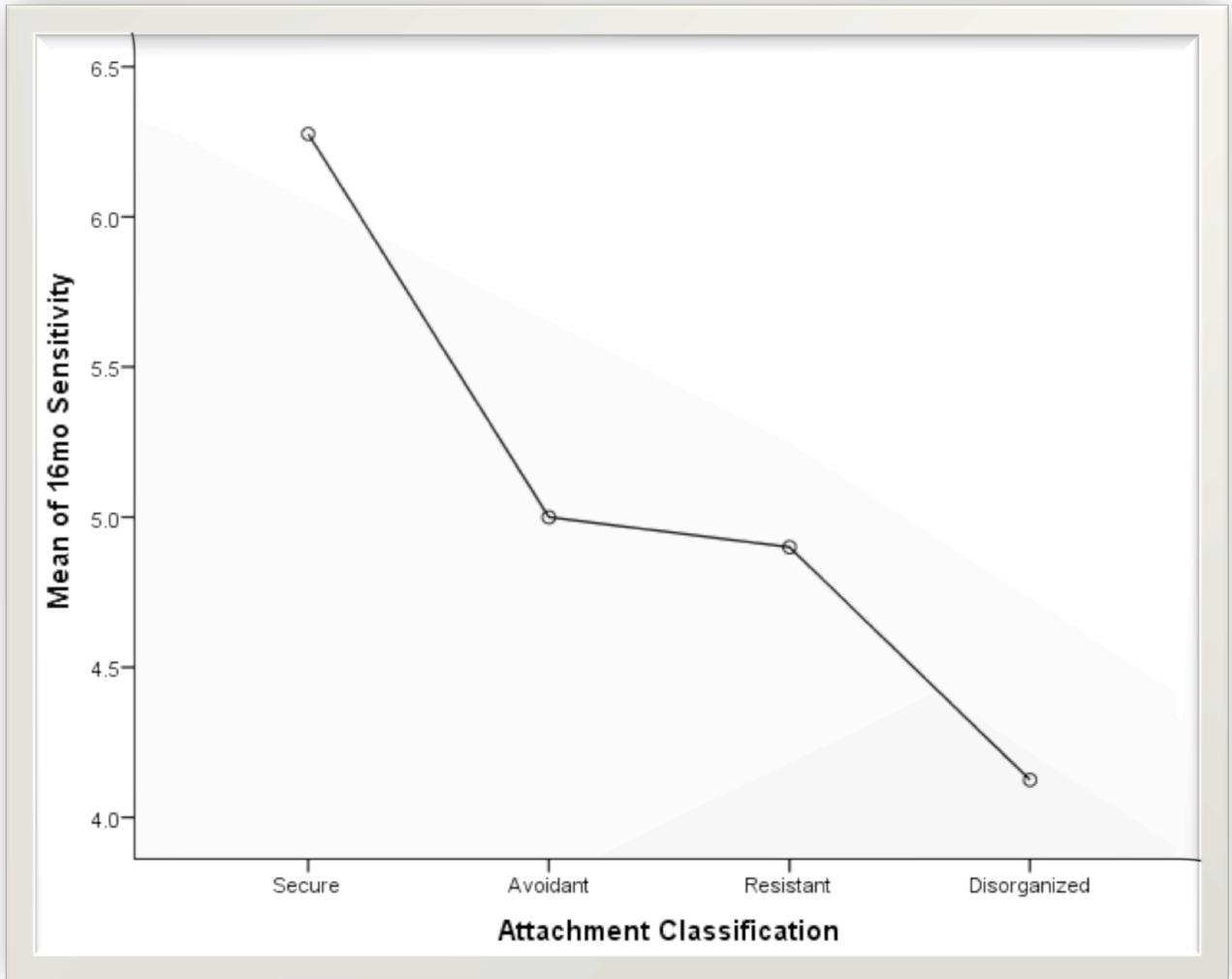


Figure 2. Maternal Sensitivity at 16-months.



Appendix A

Ainsworth's Maternal Sensitivity Scale (AMSS)

9) **HIGHLY SENSITIVE** This mother is exquisitely attuned to B's signals and responds to them promptly and appropriately. She is able to see things from B's point of view; her perceptions of his signals and communications are not distorted by her own needs and defenses. She 'reads' B's signals and communications skillfully, and knows what the meaning is of even his subtle, minimal, and understated cues. She nearly always gives B what he indicates he wants, although perhaps not invariably so. When she feels that it is best not to comply with his demands – for example, when he is too excited, over-imperious, or wants something he should not have – she is tactful in acknowledging his communication and in offering an acceptable alternative. She has 'well rounded' interactions with B, so that the transaction is smoothly completed and both she and B feel satisfied. Finally, she makes her responses temporally contingent upon B's signals and communications.

7) **SENSITIVE** This mother also interprets B's communications accurately, and responds to them promptly and appropriately – but with less sensitivity than mothers with higher ratings. She may be less attuned to B's more subtle behaviors than the highly sensitive mother. Or, perhaps because she is less skillful in dividing her attention between B and competing demands, she may sometimes 'miss her cues'. B's clear and definite signals are, however, neither missed nor misinterpreted. This mother empathizes with B and sees things from his point of view; her perceptions of his behavior are not distorted. Perhaps because her perception is less sensitive than that of mothers with higher ratings, her responses are not as consistently prompt or as finely appropriate – but although there may be occasional little 'mismatches', M's interventions and interactions are never seriously out of tune with B's tempo, state and communications.

5) INCONSISTENTLY SENSITIVE Although this mother can be quite sensitive on occasion, there are some periods in which she is insensitive to B's communications. M's inconsistent sensitivity may occur for any one of several reasons, but the outcome is that she seems to have lacunae in regard to her sensitive dealings with B – being sensitive at some times or in respect to some aspects of his experience, but not in others. Her awareness of B may be intermittent – often fairly keen, but sometimes impervious. Or her perception of B's behavior may be distorted in regard to one or two aspects although it is accurate in other important aspects. She may be prompt and appropriate in response to his communications at some times and in most respects, but either inappropriate or slow at other times and in other respects. On the whole, however, she is more frequently sensitive than insensitive. What is striking is that a mother who can be as sensitive as she is on so many occasions can be so insensitive on other occasions.

3) INSENSITIVE This mother frequently fails to respond to B's communications appropriately and /or promptly, although she may on some occasions show capacity for sensitivity in her responses to and interactions with B. Her insensitivity seems linked to inability to see things from B's point of view. She may be too frequently preoccupied with other things and therefore inaccessible to his signals and interpret them inaccurately because of her own wishes or defenses, or she may know well enough what B is communicating but be disinclined to give him what he wants because it is inconvenient or she is not in the mood for it, or because she is determined not to 'spoil' him. She may delay an otherwise appropriate response to such an extent that it is no longer contingent upon his signal, and indeed perhaps is no longer appropriate to his state, mood, or activity. Or she may respond with seeming appropriateness to B's communications but break off the transactions before B is satisfied, so that their interactions seem fragmented and incomplete or her responses perfunctory, half-hearted, or impatient.

Despite such clear evidence of insensitivity, however, this mother is not as consistently or pervasively insensitive as mothers with even lower ratings. Therefore, when the baby's own wishes, moods, and activity are not too deviant from the mother's wishes, moods, and household responsibilities or when the baby is truly distressed or otherwise very forceful and compelling in his communication, this mother can modify her own behavior and goals and, at this time, can show some sensitivity in her handling of the child.

1) HIGHLY INSENSITIVE The extremely insensitive mother seems geared almost exclusively to her own wishes, moods, and activity. That is M's interventions and initiations of interaction are prompted or shaped largely by signals within herself; if they mesh with B's signals, this is often no more than coincidence. This is not to say that M never responds to B's signals; for sometimes she does if the signals are intense enough, prolonged enough or often enough repeated. The delay in response is in itself insensitive. Furthermore, since there is usually a disparity between M's own wishes and activity and B's signals, M, who is geared largely to her own signal, routinely ignores or distorts the meaning of B's behavior. Thus, when M responds to B's signals, her response is characteristically inappropriate in kind, or fragmented and incomplete (Ainsworth et al., 1974).

Appendix B

Description of the Strange Situation Procedure (SSP)

Infant attachment is traditionally measured using the Strange Situation Procedure (SSP) developed by Mary Ainsworth (Ainsworth & Bell, 1970). The function of the SSP is to create a situation where the infant's stress level increases progressively over a 21-minute period due to temporary separations from and reunion with the mother. The infant's reactions to a stranger and the infant's reaction to the mother are watched and coded. This takes place over a series of discrete episodes. Observers are undetected behind a one-way mirror. The experimenter brings the mother and her baby into a playroom and then leaves. The mother then sits while the baby plays. The observers code whether the baby uses the mother as a secure base to explore or if the baby is unwilling to leave the mother. A stranger enters and sits in a chair. After one minute, the stranger engages the mother in conversation. Next, the stranger tries to interact with the baby. The baby's stranger anxiety level is noted during this episode. The mother then leaves the room. The stranger comforts the baby if they are upset. The baby's reactions to the stranger are coded. When the mother returns she addresses the baby and offers comfort if needed. The stranger leaves. Reunion behaviors of the baby with the mother are recorded. The baby resumes play. After three minutes the mother leaves the baby alone. Reactions of the baby to this separation are coded. The stranger returns and tries to console the baby. The observers note whether the baby is able to be comforted by the stranger. In the last episode, the mother returns. She greets the baby and offers comfort. She then tries to re-engage the baby in play. Reunion behaviors at this higher stress level are also recorded.

Appendix C

Summary of Mesman and Emmen (2013) Sensitivity Measures Currently in Use

Instrument name	Citation	Freely available?	Infant Age range	Setting	Fathers?	Non-Western Cultures?	Single global rating?	Positive affect?	Linked to Attach.?
Ainsworth Sensitivity Scale	Ainsworth, Bell, Stayton, 1974)	Yes	Infancy (9-12 months in Baltimore Study)	Naturalistic Play Feeding Teachingtask Demandingtask	Yes	Yes	Yes	No (included in a diff mat care scale)	Yes
CARE-Index	Crittenden, 2001 (Ainsworth and Bowlby consulted)	No (official training required)	Infancy-Preschool (up to 70 months)	Play Face-to-Face	Yes	Yes	No	Yes (prominent)	Yes
Coding Interactive Behavior (CIB)	Feldman, 1998	No (official training required)	Newborn-Adolescence (different versions for the age and Feeding)	Play Feeding	Yes	Yes	No	Yes (prominent)	NO
Emotional Availability Scales	Biringen, 2008; Biringen, Robinson, Emde, 1998	No (official training required)	Infancy-Adolescence (“0-14”)	Play Teachingtask Demandingtask	Yes	Yes	Yes-3rd edition; No-4th edition	Yes (prominent)	Yes
Erickson Scales	Erickson, Sroufe, Egeland, 1985	Yes	Toddler-Preschool	Teachingtask	Yes	Yes	No	Yes (minimal)	Yes
Global Ratings of Mother-Infant Interaction	Murray, Fiori-Cowley, Hooper, Cooper, 1996	Yes	Infancy (“2-5 mo and up to age 12 mo”)	Play Face-to-Face	Yes	Yes	Yes	Yes (minimal)	Yes
Maternal Behavior Q-sort (MBQS)	Pederson, Moran, 1995	Yes	Infancy-Preschool	Home visits (varies-naturalistic, interview, play or teaching task)	Yes	Yes	No	Yes (minimal)	Yes
NICHD-SECCYD sensitivity scales	Owen, 1992	Yes	Infancy (for +24 mo Erickson scale is used in this study)	Play	Yes	No	Yes	No	Yes
Parent-Child Early Relational Assessment (PCERA)	Clark, 1985	Yes	Infancy-Toddler	Feeding Play Teachingtask	Yes	No	No	Yes (prominent)	Yes