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## Maternal Stimulation Upon Mother-Infant Face-to-Face Interaction

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### INTRODUCTION

Mother-infant relation is very unique. Research on mother-infant interaction has dated back in the 1970s. Stern (1971) stated that there are some characteristics of mothers when they interact with their "infants. The early interaction between them later in the child's life predicts how well is the child's interaction with other people. Since success in life is very much determined by the accuracy of responding social stimuli (Goleman, 1995) therefore understanding of how infant interacts with its first caregiver is important. This paper seeks to understand that very first interactions, especially between the child and the mother. Mother-infant interaction is also thought as having developmental effects on the infant. Early interpersonal relations are believed to relate to later social development (Bakeman and Brown, 1980; Sigman and Parmelee, 1979), to later cognitive development (Cohen and Beckwith, 1979; Ramey, Farran, and Campbell, 1979), language behaviors (Field, 1979; Hsu, Fogel, and

Cooper, 2000; Hsu & Fogel, 2001), later attachment patterns (Baumgart-Rieker, Garwood, Powers, and Wang, 2001; Völker, Keller, Lohaus, Cappenberg, and Chasiotis, 1999; Steele, 2004). Beside the importance of mother and infant early interaction, scholars had also interested in how fathers stimulate their infant (Feldman, 2003).

Since early mother-infant interaction forms the foundation for the child's future psychological growth, the analysis of this early interaction between mother and infant would further illuminate early social development of the infant.

### BEHAVIORS OF MOTHER AND INFANT DURING INTERACTION

The behaviors elicited by both mother and infant during the early interaction are very unique.

Stern (1974) conveyed that many social behaviors of mother occurs only in the presence of the infant, and similarly, many of the infant behaviors occur fully only when it interacts with its caregiver. Stern also indicated that in the face-to-

face interactions infants begin to learn and define the rules of social interaction. In these early affective interchanges with mothers they learn: (1) the meaning of their own expressive behavior; (2) the characteristics of people who are important to them; (3) cognitive and affective information which allows them to fit into their culture, to identify with their caregivers and to themselves.

Studies that have been done on early mother-infant interaction were micro-organization of human behavior utilizing a frame-to-frame analysis of sound film (Brazelton, Koslowski, Main, 1974; Stern, 1974; Condon, 1977; Fogel, 1977; Trevarthen, 1979, Tronick, Als, and Adamson, 1979). Mother and infant in this kind of procedure involve in a face-to-face communication.

Tronick, Als, Adamson, Wise, and Brazelton (1978) illustrated the pattern of normal face-to-face interaction between mother and infant. The interaction can be conceptualized as a sequence of phases, each representing different states of the partner/s mutual attentional and affective involvement. The dyadic phases between the mother and infant are: (1) Initiation, may occur when the mother brightens and baby-talks to a sober baby, or a baby vocalizes and smiles to a caretaker who has paused too long; (2) Mutual Orientation, may take place with neutral or bright faces, with the caretaker talking or the infant making single utterances; (3) Greetings,

occur with smiles and "ooh" faces; (4) Play-dialogues, occurs with mother talking in burst-pause pattern and the baby making grunts or continuous vocalizations; and (5) Disengagement occurs when the caretaker goes from neutral face to sober face, or keeps the neutral face but starts to talk to the infant in adult conversational terms, or starts looking away from the baby. From these 5 phases, Tronick, Als, and Adamson (1979) broke the phases into 10 behaviors for the infant, and 6 behaviors for the mother (see Appendix A).

Another description of typical segments of infant behaviors when interacting with the mother was given by Brazelton, Koslowski, and Main (1974). The periods were described as follows: (1) Initiation, the infant begins to look at the mother with dull eyes, a relaxed face, and slowly moving extremities of the body. The exception of this behavior occurs if the mother has turned away from the infant; (2) Orientation, occurs when the infant looks toward her, the eyes and face brighten, the body orients so that it faces the mother, and the extremities extend toward her; (3) State of Attention, occurs when the infant sends and receives cues from the mother. In this state the arms and legs move slowly, the face alerts, the eyes dull and then brighten with smiles, grimaces, and vocalizations; (4) Acceleration, occurs as the looking sequence builds up. The oscillation of attention and inattention, and the jerky, lidded quality of the eyes

drops out; (5) Peak of excitement, in this state the duration of the intense state is shorter and intersperse with efforts to control the degree of excitement. Infant may bring his hand to his mouth to suck, suck on his tongue, or yawn; and (6) Deceleration, occurs when the infant/s bright look dims, the eyes dull down and seem to lid over, his face assumes a duller, more relaxed attitude, his smiles fade and decreasing in number and intensity. The vocalization decreases or ceases, tonguing and yawning may increase, blinking increase in number and duration of each blink, and the infant tends to lean back in the relaxed sitting position; (7) Withdrawal or Turning Away, occurs in various patterns such as a dull expression, reduced activity, face and eyes not oriented to the mother but to other person or object.

In the communication between mother and the infant, the mother attempts to achieve an understanding of the infant's intention during the communication, and for doing so, the mother engages in particular kinds of activities in particular kinds of ways (Tronick, Als, Adamson, 1979). Some of the activities of the mother are as follows: (1) Preparatory activities, the mother reduces the interference of physiological needs such as hunger or lack of sleep, the mother activities contain the interference of reflexes and other disorganizing motor activity, and the mother soothes and calms the infant

if s/he is upset (Brazelton, Koslowski, Main, 1974); (2) State setting activities, the mother sets or resets the infant for face-to-face interaction so that the infant orients to his/her mother; (3) Maintaining a communication framework, the mother creates "continuants" which include almost constantly modulated speech, rhythmic patting and tapping and rhythmic movement of her body; (4) Infant - like modification of adult actions, the mother behaviors are slowed down and exaggerated so that mother's behaviors become similar to those of the infant's, e.g. mother uses "baby talk" voice where pitch, syntax and pronunciation are altered.

Stern (1977) also postulated the mother behaviors during the mother-infant interaction. First, mother initiates or signals a readiness or invitation to interaction, e.g. surprise expression. Second, the mother maintains and modulates an ongoing interaction, e.g. smiling and the expression of concern. Third, the mother terminates the interaction, e.g. frown with the head aversion. Fourth, the mother avoids social interaction which signaled by gaze aversion or expressionless by the mother.

Osofsky and Danzger (1974) suggested that maternal attentiveness and sensitivity toward the infants were related to infant visual, auditory, and tactile behaviors. The mother's auditory stimulation was related to the responsiveness of the infant in the

auditory domain, her visual stimulation was related positively to the infant's auditory and tactile responsiveness, and the mother's tactile stimulation was related to the infant's responsiveness in the visual, auditory, and tactile domains. In sum, there appeared to be a strong relationship between the mother's stimulation in a particular domain and the infant's responsiveness in that domain as well as others.

Furthermore, the break-down of mother's behaviors can be explained from the following studies. Kaye and Fogel (1980) investigated 37 infants at 6, 13, and 26 weeks of age in face-to-face play with their mothers. It was found that mothers used touching, posture changing, and bouncing to try to attract their 6 week-old infants. At all 3 ages, mothers used facial activity, to hold infants attention. Over the period from 6 weeks to 6 months, the mother's absolute rates of discrete changes in facial expression increased. by 50% while they had the infant's attention. Further study conducted by Cohn and Tronick (1987) with 3, 6, and 9 month-old subjects looked at how babies become positive in the interactions found support for the functional importance of both the affective quality and the organization of the mother's behavior. Infants of 3, 6, and 9 months of age were far more likely to become positive after their mother did so. At 3 and 6 months, the probability of the infant becoming positive following the mother was decreasing and the

probability of becoming positive before the mother was even more decreasing. This phenomenon indicates that the mother's positive affective expressions are essential to the quality and organization of the infant's behavior.

From the studies just cited above, it is obvious that there is a rule governs the mother-infant interaction. According to Tronick, Als, Adamson, Wise, and Brazelton (1978) if the rule is violated, then, the interaction system can not be regulated. Several studies which have been done to see the consequence of the violations will be described. Tronick, Als, Adamson, Wise, and Brazelton (1979) studied the infant's respond differences when they interact with their mothers in normal situation and in still-face situation. In the still-face situation, when the mother fails to respond, the infant sobers and looks worry, and eventually withdraws, orients his face from his mother.

This phenomenon was also true in the study held by Gusella, Muir, and Tronick (1988), who found that 6 month-olds infants decreased smiling and gazing at their mothers and grimaced more during the mother's still-face period.

Parrinello and Ruff (1988) found similar findings. After the baseline measure of spontaneous attention was obtained in their study, the infant was assigned to one of the four conditions (low, medium, highly stimulated, and

control group). It was revealed that during the medium stimulation, the duration of infant attending behavior (attention) increased compared to the control group. Baseline attending behavior was then used to differentiate the low and high attenders. Low attending infants stimulated more by the medium and high stimulation than by the low stimulation; and the already high attending infants were not affected by the stimulation.

Other aspect that can be highlighted from mother-infant face-to-face interaction is the mother overstimulation. Overstimulation from the mother very often disturbs the interaction of the dyad, and it characterized by infant gaze aversion (Brazelton, Koslowski, Main, 1974; Stern, 1974).

Brazelton, Koslowski, and Main (1974) found that infants with the longest attention spans had mothers who were willing to reduce the rate of behavior when the infants were inattentive, allowing the infant the opportunity to gaze back to the mother on his own. Further more these authors suggested that the "sensitive" mothers modulate the amount and distribution of the stimulation according to the infant's visual signals. The mothers tend to reserve their stimulation for their infant's attentive periods and reduce or terminate the activity as the infants turn away from them.

According to Fogel (1982), infants were sensitive to overstimulation: they were more likely to begin and end the smiling and gazing when the adult was relatively nonexpressive.

Brackbill (1971) and Brackbill, Adams, Crowell and Gray (1966) found that continuous stimulation actually depressed arousal level in the infants and young children, at least for short periods of time, and that this effect is not restricted to one sensory modalities. The reduction in arousal level may be produced by continuous auditory stimulation, continuous visual stimulation, continuous proprioceptive-tactile stimulation, or continuous temperature stimulation (Brackbill, 1971,1973).

Fogel's (1977) study on an infant from 5 to 13 weeks of age and the mother gave some hints about how balance can be achieved between involvement with the mother and disengagement from her. Fogel found that the mother's exaggerated displays were not effective in attracting the infant's attention. Mother was more effective when she simply gazed at the infant with her face at rest. Once the baby had met her gaze, and she shifted to a more exaggerated facial expression, she was able to hold the infant's attention and elicit vocalization and wide mouth opening.

The above results support the "optimal stimulation" model proposed by Field (1977): infants tend to look away most when maternal activity is either too

low (as in the still-face situation), or too high (as with an overly stimulated situation).

According to Tronick, Als, Adamson (1979) infant can adapt their behavior when they are interacting with their mothers. In a laboratory experiment when the mother was asked to slow down her already infant-like rate of speech, it was revealed that the infant's smiles and vocalizations were more frequent and sustained. Mother and the infant achieve a higher level of affective involvement and maintain the peak of the interaction longer than the usual. If the mother was asked to remain stillface, it was obvious that the infant tries to greet the mother. The greeting was repeated but if the mother does not greet back, the infant's face slowly sobers and he will look away, but then s/he begins a new pattern of wary looking and checking which keeps open possibility to reinstate the interaction with the mother.

Feldman's study (2003) on a hundred couples and their first born with a mean age of 20.51 weeks. Three pattern of behaviors were assessed: orientation, intensity, and temporal pattern of infant positive arousal. It was revealed that same-gender interaction was more optimal, more frequent synchrony and shorter lags to responsiveness. Mother-infant interaction was characterized by positive affect and embedded in a social episode while father-infant interaction involves high arousal, sudden with

multiple peaks. Mother-infant synchrony was also related to social orientation but inversely related to maternal depression and infant negative affect. As for father and infant synchrony, it is related to positive arousal and security to father's attachment.

There are times when the mother and the infant behaviors during the interaction do not match (asynchrony). Tronick, Als, and Adamson (1979) stated that mis-match in this interaction is necessary for the development of the communication. If the mis-match is still in the range of the infant's capabilities, it offers an expanded and more complicated social environment to the infant. But, if mother is overstimulating, the infant will turn away. In this case, a sensitive mother will decelerate and add on components of behavior more slowly the next time.

In her research on the effect of changes of maternal temporal pacing upon maternal sensitivity and infant behavior, Arco (1978) divided maternal temporal style into 4 categories:

- (1) Initial Natural Temporal Style;
- (2) Slow Temporal Style;
- (3) Return to Natural Temporal Style;
- and (4) Fast Temporal Style.

Maternal sensitivity came to its peak during the Initial Natural Temporal Style, and so did the infant attending behavior. Infant positive expressiveness was very high during this phase and infant negative facial expressiveness was lower during this

phase. During the Slow Temporal Style, maternal facial expressiveness was lower than during any other phase. When the temporal style was returned to the Natural Style, maternal sensitivity, infant attending behavior, mutual visual regard and facial alternation were very low. Infant exhibited more positive facial expressiveness during the Fast Temporal Style; infant visual regard of mother and infant negative vocalization were significantly higher in the Fast Temporal Style compared to the other style. This finding suggested that the shift from initially faster paced interaction to an even further acceleration in the fast-phase reflects a condition of overstimulation.

Briefly, the results of these studies indicated that overstimulation or understimulation from the mother violates the interaction and moderate stimulation from the mother during the interaction serves as a better elicitor for the infant's attending behavior and arousal level.

#### **METHODS IN ASSESSING MOTHER-INFANT INTERACTION**

The methods of assessing mother-infant interaction are various. To decide what method will be used to code the data depends on the kinds of behaviors investigated, duration of the observation, and the cost. It has to be considered that each method has its advantages and disadvantages. The most common method is using video camera to capture

infant's facial expression (Ullstadius, 2000); and infant's facial and mother's hand movement (Stack and LePage, 1996). In Ullstadius' study, the infant was seated on mother's lap, facing her in a distance about 20-30 cm. Infant's facial expressions were captured on a camera placed about 2-3 meters away from the child at 30-45° to infant's face. In Stack's and LePage' study, however, the infants were seated on a car seat facing the mother who seat on a stool in a distance at about 70 cm away. A camera was placed behind and to the right of the mother to capture infant's facial expression and another camera was placed at above mother's head facing downward to capture mother's hand movement. The image of infant's expression and mother's hand movement were projected on a split-screen generator so that both behaviors could be observed simultaneously.

In assessing mother-infant interaction, Stern and Gibbon (1979) used terms such as "time-out" and "time-in". "Time-out" is a "long-enough" silence of an engagement shift. According to Stern and Gibbon, this period lasts for 3-second or longer, and anything in between pauses of this duration is considered as "time-in".

For Fogel (1977), infant behaviors can be categorized as "run" and "time-out". A "run" is a sequence of events separated by "short" intervals. A "time-out" is the

interval between the offset of a run and the next onset.

Bakeman and Gottman (1987) suggested several methods to code mother-infant interaction: (1) Coding the events occurred during the interaction; (2) Recording the onset and offset times. This method is the most flexible way. The advantage of this method is the completeness of the record and the options for analysis of the data, and the disadvantage of this method is that recording of this sort requires complicated instrument and maintenance and cost more than just paper and pencil. Example of this method can be seen on Appendix B; (3) Timing Pattern Changes, this coding is used if the behaviors are divided into small number of mutually exclusive and exhaustive sets, *e.g.*: a set of behavior is divided into 5 external stimulation, eyes, face, head, and body. In this case there will be a 5 digit coding, first digit for the external stimulation, second for the eyes, third for the face, fourth for the head, and fifth for the body; (4) Coding interval, researcher divided the period of interaction into a number of relatively brief intervals, usually 10 or 15 seconds. Observers then code the codeable events occurred in each interval; (5) Cross-classifying events, this method is like tallying momentary events that the observer has to *note* whenever a particular kind of event occurs; (6) Time sampling, in this method the observer set a short period of time to observe the behaviors, and it is

repeated for several times with the same duration.

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## APPENDIX A

## Infant and mother behaviors in the mother-infant interaction

Infant	Mother
<p>(1) Vocalization:</p> <ol style="list-style-type: none"> <li>1: none</li> <li>2: isolated sound</li> <li>3: grunt</li> <li>4: coo</li> <li>5: cry</li> <li>6: fuse</li> <li>7: laugh</li> </ol> <p>(2) Direction of gaze</p> <ol style="list-style-type: none"> <li>1: toward mother/s face</li> <li>2: away from mother/s face</li> <li>3: follows mother</li> <li>4: looking at toy or hand mother is using as part of interaction</li> </ol> <p>(3) Head orientation</p> <ol style="list-style-type: none"> <li>1: head toward, nose level</li> <li>2: head toward, nose down</li> <li>3: head toward, nose up</li> <li>4: head part side, nose level</li> <li>5: head part side, nose down</li> <li>6: head part side, nose up</li> <li>7: head complete side nose level</li> <li>8: head complete side, nose down</li> <li>9: head complete side, nose up</li> </ol>	<p>(1) Vocalizing:</p> <ol style="list-style-type: none"> <li>1: abrupt shout</li> <li>2: stern</li> <li>3: rapid tense voice</li> <li>4: whispering</li> <li>5: little or no vocalizing</li> <li>6: rhythmic sounds with little modulation</li> <li>7: burst-pause talking</li> <li>8: single bursts in rapid succession with wide pitch range</li> <li>9: burst of sound that peaks with much change of modulation and pitch</li> </ol> <p>(2) Head position</p> <ol style="list-style-type: none"> <li>1: toward and down</li> <li>2: toward and up</li> <li>3: toward and level</li> <li>4: part side and down</li> <li>5: part side and up</li> <li>6: part side level</li> <li>7: toward and level</li> <li>8: toward and up</li> <li>9: toward and down</li> <li>10: thrusting</li> <li>11: nodding</li> <li>12: nuzzling</li> <li>13: cocked head</li> </ol> <p>(3) Body position</p> <ol style="list-style-type: none"> <li>1: turns body full away</li> <li>2: sits back and still</li> <li>3: slumping</li> <li>4: neutral-slightly forward</li> <li>5: sideways shifts</li> <li>6: slight rocking</li> <li>7: large sideways shifts into line of vision</li> <li>8: medium close forward</li> <li>9: going close, staling close</li> <li>10: large shifts forward and back</li> </ol>

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(4) Head position

- 1: left
- 2: right

(5) Facial expression

- 1: cry face
- 2: grimace
- 3: pout
- 4: wary/sober
- 5: lidding
- 6: yawn
- 7: neutral
- 8: sneeze
- 9: softening
- 10: brightening
- 11: simple smile
- 12: coo face
- 13: broad smile

(6) Amount of movement

- 1: 3/4 limbs, large movement
- 2: 1/2 limbs, medium movement
- 3: 3/4 limbs, medium movement
- 4: 1/2 limbs, medium movement
- 5: 3/4 limbs, small movement
- 6: 1/2 limbs, small movement
- 7: no movement
- 8: mother moving infant

(7) Blink

- 1: yes
  - 2: no
- 

(4) Specific handling of the infant

- 1: abrupt shift of baby's position
- 2: abrupt but no shift 3: jerky movement of limbs
- 4: no contact
- 5: gently containing
- 6: small rhythmic backing
- 7: rhythmic movement of limbs
- 8: intensive movement, fast rhythm

(5) Direction of gaze

- 1: toward infants face
- 2: toward infants body
- 3: away from infant but related to interaction
- 4: away from infant and not related to interaction

(6) Facial expression

- 1: angry
- 2: frown
- 3: serious, sad, sober
- 4: lidded
- 5: neutral flat
- 6: brightening
- 7: animated
- 8: simple smile
- 9: imitative play face
- 10: kisses
- 11: exaggerated play face
- 12: broad full smile
- 13: "ooh" face

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(8) Specific hand movement

- 1: eye-wiping
- 2: hand to mouth
- 3: swipe
- 4: fidgets
- 5: all lower limbs extended forward

(9) Specific foot movement

- 1: kick
- 2: startle

(10) Tongue Placement

- 1: tongue slightly exposed
  - 2: tongue maximally exposed.
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Tronick, Als, Adamson (1979)

# CURRICULUM VITAE PENULIS

## **Ambar Widaningrum**

Menyelesaikan studi S1 pada jurusan Administrasi Negara, UGM, sedangkan studi S2-nya beliau tempuh di Mahidol University, Bangkok, Thailand, dengan minat kajian terhadap kebijakan publik dan kebijakan kesehatan. Saat ini beliau masih aktif menjadi staf pengajar pada jurusan Administrasi Negara, program Magister Administrasi Negara, Administrasi Publik, Studi Politik Lokal dan Otonomi Daerah, Studi Kebijakan, dan Studi Kepariwisata UGM.

## **A. Supratiknya**

Lulus dari Fakultas Psikologi UGM tahun 1980 dan menyelesaikan program doktor dengan minat di bidang psikologi sosial-kepribadian di University of the Philippines, Diliman, tahun 1992. Sejak 1981 menjadi staf pengajar di Universitas Sanata Dharma dan pada tahun 1997 menjadi Dekan Fakultas Psikologi di perguruan tinggi yang sama.

## **Tjipto Susana**

Lahir di Surabaya pada tanggal 31 Januari 1969. Studi S1 dan S2 ditempuh di Fakultas Psikologi, Universitas Gadjah Mada, dengan Psikologi Klinis sebagai bidang minat yang ditekuni. Sejak tahun 1996 menjadi staf pengajar di Fakultas Psikologi, Universitas Sanata Dharma. Saat ini beliau sedang menempuh pendidikan program doktoral di Universitas Gadjah Mada.

## **S.A. Nugraheni**

Wanita kelahiran 29 Mei 1966 ini selain menjadi staf pengajar di Fakultas Kesehatan Masyarakat Universitas Diponegoro, juga sedang menempuh pendidikan program doktoral di Universitas Gadjah Mada. Beliau juga masih aktif menjadi staf pengajar di UNSIL Tasikmalaya dan Koordinator penelitian Puslitkes Lemlit Universitas Diponegoro.

### **Sumanto**

Selain menjadi staf pengajar di Universitas Kristen Immanuel Yogyakarta, beliau juga sedang menempuh pendidikan untuk mencapai derajat S3 di Fakultas Psikologi Universitas Gadjah Mada.

### **Supra Wimbari**

Studi S1 diselesaikannya pada tahun 1985 di Fakultas Psikologi UGM. Kemudian beliau menempuh studi S2 di Oklahoma State University, lulus tahun 1999, sedangkan derajat S3-nya ditempuh di Southern University, tahun 2002. Saat ini beliau masih aktif menjadi staf pengajar di Fakultas Psikologi UGM.