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INTERSUBJECTIVITY DURING BOTTLE FEEDING : HOW MOTHERS TALK TO THEIR PREMATURE INFANTS

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Abstract

The characteristics of maternal language and mother-infant interaction were examined with respect to how they may be attributed to, or influence, successful feeding performance for 17 mother-infant pairs during bottle feeding. Language analyses included syntactic, semantic, and complexity components of mothers' verbalizations directed to the infants as well as to others located within the perimeter of the feeding situation. The findings revealed that mothers in unsuccessful feeding episodes demonstrated a greater number of "mother focused" than "infant focused" utterances. Those maternal utterances directed toward the infants during unsuccessful feeding attempts also had a higher frequency of negative and command statements. During successful feeding episodes, mothers spoke more frequently and positively to their babies. Positive statements made by mothers in both groups were associated with ascribing infant agency (i.e., active participation). Mothers who displayed positive interaction characteristics had infants who demonstrated positive feeding outcomes (e.g., consumed more formula). Thus, some associations were found between maternal language characteristics and premature infant feeding performance.

Key Words : maternal language, premature infants, bottle feeding, intersubjectivity

INTRODUCTION

Caregiver-infant interaction can effect the oral feeding behavior of newborns (Ashland, 1995 ; Ashland & Wilcox, 1994 ; Meyer et al., 1994 ; Minde, Perrotta, & Helman, 1988 ; Minde, Perrotta, Marton, Manning, & Hines, 1980), including maternal and infant contingent responsivity. Partner responsivity can include the degree of interest shown towards the other member of the dyad such as visual attending (Fish,

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Stifter, & Belsky, 1993) or reactivity to changes in stimulation provided by one of the partners (Eckerman, Oehler, Medvin, & Hannan, 1994). Signals such as visual attending and reactivity can indicate our motives to others and reflect our desire to communicate. The responding attention provided by the communicative partner, in turn, can affect one's form of communicative signals (Trevvarthen, 1993; Trevvarthen, & Marwick, 1986).

According to Trevvarthen (1993), we are born with an ability to perceive interpersonal motives of others. Motive acts as a catalyst for both causing and regulating movement and modulates our ability to seek and interpret movements of communicative partners. For example, in relation to feeding, the degree of caregiver responsivity to infant signals can influence the infant's state of alertness and efficiency of a sucking pattern effecting the success of feeding. A successful feeding includes not only completing the feeding within an acceptable time frame but also providing a positive interaction resulting in a pleasurable feeding experience for both infant and mother (Ashland, 1995).

Caregivers and their newborn infants each instinctively seek and initiate communication with each other. This concept of mutual contribution to the communication process is supported by theoretical stances such as transactional theory (Sameroff & Chandler, 1975; Sameroff & Fiese, 1990), ecological theory (Bronfenbrenner, 1979), and intersubjectivity (Trevvarthen, 1979; Murray & Trevvarthen, 1985, 1986). Murray and Trevvarthen (1985, 1986) describe the young infant as finely sensitive to the "form, timing, and direction of adult communication" and as a substantial contributor during interaction exchanges (1986, p.15). For example, when the interaction was not pleasurable for either partner, Trevvarthen and Murray reported that mothers and their infants showed distress when either partner did not receive contingent responses from the other during a double blind video interaction. Thus, not only are contingent responses important but each partner also seeks mutually pleasurable exchanges. Pleasure during an interaction exchange can be displayed in a variety of ways including facial expression, tone of voice, verbal content, or manner of touch and movement. Each partner will respond according to the degree of pleasure perceived in any given interaction. For infants, initial communication exchanges often occur during caregiving routines such as feeding episodes. Feeding schedules for newborns are generally every two to three hours, providing multiple opportunities for caregiver-infant interaction during feeding episodes, typically pleasurable.

However, since oral feeding is difficult for many premature infants (Minde, Perrotta, & Marton, 1985), there is potential for disrupting caregiver-infant interaction during feeding episodes (Ashland & Wilcox, 1994; Meyer et al., 1994; Minde, White, Brown, & Fitzhardinge, 1983; Minde *et al.*, 1985). Premature infants may present with increased gaze aversion, decreased responsiveness, compromised physical endurance, slower orienting to faces, and increased irritability and fussiness compared to healthy full term infants (Field, 1977; Sigman & Beckwith, 1980). In addition, feeding behaviors of premature infants may include decreased strength of suck, uncoordinated tongue movements, fluctuating sucking patterns, and difficulties coordinating respiration with swallowing (Case-Smith, Cooper, & Scala, 1989; Cowett, Lipsitt, Vohr, & Oh,

1978; Medoff-Cooper, 1991; Medoff-Cooper, Verklan, & Carlson, 1993; Medoff-Cooper, Weininger, & Zukowsky, 1989; Palmer, 1993). These aspects of premature infants' interactive and feeding behaviors have resulted in caregivers' use of less than optimal feeding techniques (e.g., frequent bottle manipulation, Ashland 1994, 1995) and inhibited caregivers' abilities to interpret infant behaviors during feeding attempts. For example, mothers of premature infants have been reported to demonstrate inappropriate initiation of interactions, to verbalize and smile less, and show fewer attempts at interacting with their infants (Minde *et al.*, 1985; Minde, Perrotta, & Hellman, 1988; Thoman, Turner, Hebert-Leiderman, & Barnett, 1970).

Important information can be gained from examining the contributions made by both adults and infants to the maintenance of a successful or positive interaction during oral feeding attempts. The degree to which caregivers are responsive to infant signals may influence both infants' state of alertness and efficiency of their sucking behavior, potentially impacting the success of a feeding episode (Fish *et al.*, 1993; Minde, Perrotta, Marton, & Manning, 1980). One aspect of maternal behavior, maternal language use, is one avenue for exploring maternal responsivity. The positive and negative aspects of maternal language and the degree to which their responses are contingent to infant behaviors may influence infant bottle feeding performance. In support of this notion, Meyer *et al.* (1994) found that mothers of premature infants who received intervention for providing developmental care for their infants responded less negatively and were more sensitive to infant behavior than the control group who did not receive the special training. The infants of the intervention group displayed marked decrease in difficult feeding behaviors than did those infants in the control group.

To date, maternal language has been minimally examined with respect to the potential influence on the oral feeding outcomes of at-risk infants. The examination of maternal language characteristics during feeding episodes may provide additional information for identifying the nature of positive and negative interactions that contribute to feeding performance outcomes. Murray (1993, 1996) found that maternal depression resulted in a higher incidence of negative interactions which, in turn, was found to be predictive of poorer infant cognitive outcomes. The language characteristics of depressed mothers was found to be similar to the language of mothers in unsuccessful feeding episodes (Ashland, 1995).

The purpose of this study was to further examine the effects of maternal language characteristics and mother-infant interaction on successful bottle feeding abilities of premature infants. Specifically, to study potential relationships between maternal length of utterance and infant feeding performance, differences in maternal syntax characteristics and positive and negative feeding performance, and maternal interaction, affect, and referencing influences on feeding outcomes. Developmentally, the social experiences that occur during feeding time between caregivers and infants may be critical for social integration and communication development (Paul, Dittrichova, & Papousek, 1996).

METHODS

Participants

The participants were 17 mother-infant pairs selected from an archival data base of 32 mother-infant pairs videotaped during the transition from gavage to initial bottle feeding sessions in Neonatal Intensive Care Unit (NICU) settings (Ashland & Wilcox, 1993). The infants were recruited from a level II and a level III NICU in Phoenix, Arizona, USA. All infants were gavage fed when they entered the study and had no prior oral feeding experience. The gestational age range of the infants was 26-35 weeks with a mean of 29 weeks. The birth weight range was 900-2268 grams, $M=1495$ grams. The average infant medical severity rating was moderate (Neonatal Medical Index, Korner *et al.*, 1994). A moderate severity rating included assisted ventilation for 3-14 days; and/or birth weight less than 1000 grams, Grade I or II IVH, apnea or bradycardia requiring medication, patent ductus requiring medication, or hyperbilirubinemia requiring a transfusion. The ethnic backgrounds of the participants included 12 Caucasian, three Hispanic, one Native American, and one African American. The age range of the mothers was 17-32 years, mean age was 22 years. Other participants in this study included a staff speech-language pathologist, a staff occupational therapist, and two developmental nurse specialists. Infants with oropharyngeal anatomical anomalies that interfered with the feeding process (e.g., cleft palate, choanal atresia) were excluded from participation.

The 17 infant participants were selected based on degree of medical risk and bottle feeding performance. Specifically, infants who presented with moderate medical risk and whose feeding performance could be described as clearly successful or unsuccessful based on quantifiable behaviors (e.g., amount of formula intake, time for consumption, frequency of maternal bottle manipulation). The infants were then grouped by successful or unsuccessful feeding performance using an objective check list by the investigator and two independent observers (developmental nurse specialists). Criteria for successful feeding performance included: three or more positive quantitative indicators (e.g., consumes entire bottle, coordinated suck-swallow, low frequency of maternal bottle manipulation). Criteria for unsuccessful feeding performance included: three or more negative quantitative indicators (e.g., increased time to complete feeding, uncoordinated suck-swallow, lethargy or poor endurance, high frequency of maternal bottle manipulation). The successful group included seven infants, all males, with a mean gestational age of 31 weeks (range: 25-35 weeks), and a mean birth weight of 1494 grams (range: 1110-2070 grams). The unsuccessful feeding group included ten infants, four females and six males, with a mean gestational age of 30 weeks (range: 26-35 weeks), and a mean birth weight of 1550 grams (range: 900-2268 grams).

Procedures

Three videotaped observations from this archival video data base are available for each infant including a neurobehavioral screening examination, a bottle feeding attempt by each infant's nurse, and a subsequent bottle feeding attempt by each infant's mother. All three observations were obtained within a one-week period. The neurobehavioral screening was conducted 24-48 hours before the first bottle feeding attempt.

Then, 2-3 days after the first bottle feeding attempt, the nurse was videotaped feeding the baby, and 24-48 hours later the mother was taped bottle feeding the baby. All the infants were initially gavage fed and had no oral feeding experience prior to the initial videotaped observation. For the purpose of this investigation, only the mother-infant bottle feeding observations were examined.

Descriptive microanalyses were conducted of mother and infant behaviors during each entire observed bottle feeding episode. Detailed transcriptions were made of the sequence of infant and maternal behaviors using a time reference code from the video in minutes and seconds. Adult behaviors included seven types: (a) interactive (e.g., smiling, singing), (b) visual regard - toward or away from the infant, (c) touch, (d) verbalizations - directed to and away from the infant, (e) modification of the environment (e.g., alter lighting or noise), (f) movement (e.g., rocking), and (g) bottle manipulation (e.g., twist, jiggle). Infant behaviors that were noted included: (a) visual regard - focus toward or away from caregiver, (b) touch, (c) vocalizations (e.g., grunting, crying, sighing), (d) states of alertness (e.g., drowsy, low level alert), (e) movement (e.g., flexing, head turning), (f) distress (e.g., choke, finger splay, rapid respiration), and (g) feeding behaviors (e.g., sucking, spitting up). Maternal language behaviors were then coded utilizing a rating scale adapted from the *Global Ratings for Mother-Infant Interactions at Two and Four Months* (Fiori-Cowley, & Murray, 1995) and analyzed with respect to potential relationships to infant feeding outcomes. The coding of maternal language behaviors was conducted by a graduate research assistant who was "blind" to the grouping factors of successful or unsuccessful infant feeding performance.

Reliability

The graduate research assistant in this project participated in approximately 20 hours of training with the adapted language coding system until .80 inter-and intra-judge reliability was consistently demonstrated over three consecutive coded segments of five minutes each. Point by point comparisons were made with the original coding and percentages of agreement were obtained. If a minimum of 80% of agreement was not obtained on a particular measure that segment was recoded by consensus and another five-minute segment was randomly selected for independent review. This process was repeated until at least 80% agreement was achieved. After completion of the maternal language coding, ten percent of the data, or two five-minute segments, for each infant was randomly selected from the beginning, middle, and end of a maternal feeding session for analysis by a second individual trained in the coding procedures used in this investigation. The independent analysis included identification of maternal language characteristics: complexity, syntax, interaction focus, affect, and agency. Inter-judge reliability across the maternal language categories ranged from .81 to .99, $M = .85$. Intrajudge reliability ranged from .86 to .98, $M = .92$.

Data Coding and Analysis

Coding of the language characteristics of maternal utterances involved documenting utterance complexity; syntax; and characteristics of interaction, affect, and refer-

encing. Guidelines for this coding were adapted from Fiori-Cowley and Murray (1995). Complexity coding consisted of documenting length of utterance, repetitions of utterances (exact and not exact), and same topic utterances (for two consecutive utterances). Aspects of syntax that were coded included: interrogatives, imperatives, declaratives, and greetings. The coding of interaction characteristics involved indicating the focus of each maternal utterance whether the focus was the infant, the mother, or another person. Specific interaction codes included: (a) *infant* focused - focus of comment is the infant (e.g., "you are hungry"), (b) *infant* focused expansions - expanding on an infant behavior (e.g., child starts sucking; "my look how you are sucking"), (c) *mother* focused - comments about mother or mother's agenda (e.g., "come on", "hurry up", "will you give me a smile"), (d) *other* focused - comment to another person, (e) *other* focused infant - comments to another person about the infant. Coding maternal affect included documenting comments that were positive (e.g., praise, empathy, encouragement), negative (e.g., corrections, criticisms), and neutral. The final coding category was referencing infant agency-presence or absence. Utterances coded for presence of agency required making direct reference to the infant and indicating whether the infant was an active participant capable of action (e.g., "you are trying to move your arms"; "you are sucking so good"). Non-agency codes applied to maternal utterances that referenced the child but that did not ascribe agency or action to the child (e.g., "you are so beautiful"). All utterances were coded for length, syntax, interaction, and affect. However, utterance repetition and agency referencing did not occur in every utterance and thus were only coded as they occurred.

The number of occurrences for items within each language category (e.g., complexity, syntax) were then tallied and percentages were calculated based on the total number of utterances. For example, in the syntax category, percentages were calculated that demonstrated what percentage of the total utterances were interrogatives, imperatives, declaratives, and greetings. A series of independent T tests were used to examine potential differences within each of the maternal language categories. In addition, a Pearson Product Moment Correlation was used to explore possible relationships between the language categories (e.g., agency and maternal affect).

RESULTS

A series of statistical analyses were performed with regard to two grouping factors: successful and unsuccessful infant feeding performance. The dependent measures included complexity of maternal utterance; syntax of maternal utterance; and characteristics of maternal interaction, affect, and referencing.

Complexity

Both groups of mothers in the successful and unsuccessful feeding episodes used similar sentence lengths (MLU range: 3.3 to 3.7). Sample maternal responses included: "there you go", "come on", "get your tongue down", "are you sucking?" This finding corresponded to observations in the literature that caregivers reduce and simplify their sentence structures when interacting with young children. Also, both groups of mothers displayed low use of repeated and same topic utterances with a mean of less

than one percent. The frequency of comments made by mothers to their infants was slightly higher in the successful group (5.6 comments per minute, $R=2.2$ to 9.9) compared to mothers in the unsuccessful group (3.2 comments per minute, $R=0.94$ to 6.7). However, the differences were not significant. The similarities found in maternal language complexity across both feeding groups did not support the hypothesis that language complexity would be related to infant feeding behaviors. For example, that mothers in successful feeding episodes would use longer sentences or speak more frequently to their infant than mothers in unsuccessful feeding episodes.

Syntax

An analysis of maternal syntax patterns revealed similarities as well as differences between mothers in the successful and unsuccessful feeding groups. Comparisons made across the four categories of syntax codes (interrogatives, imperatives, declaratives, and greetings) revealed that statements were used most frequently by both groups of mothers than the other three types of syntax. This was not an unexpected finding in view of infants' primary mode of communication being nonverbal. In addition, of those utterances directed toward the infants, a trend in the data showed that the mothers in the unsuccessful feeding group used more commands than mothers in the successful group (see Table 1).

Table 1 Maternal Syntax and Feeding Performance

Feeding Performance	Commands %	Statements %	Questions %	Greetings %
Successful Group	.14	.64	.15	.13
Unsuccessful Group	.28	.54	.14	.04

Sample command statements, such as "come on" and "hurry up" were frequently used when the infants stopped sucking or were sucking less frequently. Such verbal prompts did not generally result in the initiation of infant sucking behaviors. In comparison, responses by mothers in the successful group were characterized by encouragement and empathetic statements when infant feeding difficulties were displayed (e. g., "are you tired", "you can do it"). Maternal affect paired with command statements was coded as negative.

Interaction Focus

It was hypothesized that mothers in the unsuccessful feeding group would talk less to their babies than mothers in the successful feeding group. However, an analysis of the findings showed that both groups of mothers used statements directed toward their infants; 50% and 34% respectively for the successful and unsuccessful feeding groups. Although both groups of mothers talked equally to their infants, a trend in the data revealed that mothers in the negative feeding outcome group used greater numbers of comments that focused on themselves (41%) compared to the mothers in the positive group (24%), ($T=-2.09$, $p=.059$). That is, the mothers in the unsuccessful feeding group frequently made statements based on their needs even though they were

speaking to their babies. For example, “let’s go”, “you need to hurry up and finish” were statements that were directed toward the baby but reflected the mother’s desire for the baby to finish his or her bottle. In comparison, statements made by mothers in the successful group showed a focus on the infant (e.g., “oh, are you okay?”, “you are hungry”, “what’s the matter?”, “you can do it”). Infrequent statements were made that expanded on a babies behavior (<1%) or that were directed to someone other than the baby (<2%).

Affect

Both groups of mothers spoke positively about their babies, ranging from 21% to 32% of all statements directed toward the infants. However, a trend in the data revealed that mothers in the negative feeding outcomes group used greater numbers of criticisms and negative comments (36%) than mothers in the positive feeding group (18%), ($T = -1.89$, $p = .077$). The following sample of two maternal-infant interactions reflects aspects of positive and negative maternal affect:

Positive Interaction

M: “yes my love it’s time to eat”,
 “this is delicious” (smiles)
 I: no response, eyes closed
 M: “how delicious is the food my
 love
 I: no sucking, opens eyes
 M: “I like it, I like it my love”

Negative Interaction

I: makes fussy noises
 M: “oh” (prolonged) and puts nipple in
 baby’s mouth
 I: poor lip seal on nipple then grimaces
 M: partially removes bottle, “what a face”
 M: puts nipple back in, twists bottle “it’s
 the same stuff you just ate”
 I: continues to grimace

The positive interaction scenario from a successful feeding episode demonstrated a positive maternal language style and also contingent maternal responses to infant behaviors. While the negative interaction scenario from an unsuccessful feeding episode reflected negative maternal comments and non-contingent maternal responses to infant behavior. The latter pattern of maternal interaction interfered with the infant’s feeding performance.

Referencing Agency

Both groups of mothers used infrequent statements that ascribed agency to the infants (8-11%) and non-agency (3-9%). This was not surprising given the general minimal activity demonstrated by newborn premature infants during oral feeding episodes. However, interestingly the agency statements made by both groups were highly correlated with positive statements ($r = .91$, successful group; $r = .81$, unsuccessful group). That is, when the mothers viewed the baby as an active participant in the feeding interaction process, their statements reflected that the baby was making a positive contribution to the feeding outcome (e.g., “you are sucking so good”, “look how well you are eating”, “you are keeping your eyes open more”). It was expected that there might be a relationship between mothers in the unsuccessful feeding group view-

ing the infants as active participants (agency) and their use of commands and expression of negative affect. An illustration of agency paired with negative affect was when a mother in the unsuccessful feeding group responded: "what's the matter, you just ate that a minute ago". However, the correlations between agency and commands ($r = .40$) and between agency and negative affect ($r = .34$) were low for the mothers in the unsuccessful feeding group.

SUMMARY AND DISCUSSION

In summary, mothers in the negative feeding group directed more utterances toward themselves than the mothers in the positive feeding group. This may be an indicator that the focus for these mothers was to meet their needs or that they were having difficulty relating to the infant's abilities or needs. This finding coincided with maternal language styles of depressed mothers interacting with their infants using frequently mother-focused statements (Murray, 1993, 1996). In addition, the typical style of maternal interaction for both groups was for mothers to make comments to their babies versus stating commands and posing questions. This was not an unexpected finding given a newborn infant's level of communication development. However, the trend of using more commands and expressing criticisms by mothers in the unsuccessful group compared to the mothers in the successful feeding group coincided with poorer feeding performance exhibited by infants in the unsuccessful group. Similar findings were reported by Minde *et al.*, 1985 and Meyer *et al.* 1994 when mothers whose infants had difficulty feeding frequently displayed negative affect toward their infants. The mothers' responses in this study to less than optimal infant feeding behavior was to frequently make negative verbal prompts for the babies to suck or finish their bottle, or to manipulate the bottle to elicit a sucking response. Such patterns of maternal behavior were paired with unsuccessful feeding outcomes. Finally, with regard to agency, although mothers in both groups infrequently described their infants as actively contributing to the feeding process, when they did do so it was in a positive light. This may be reflective of Trevarthen's notion of intersubjectivity, that we are motivated to seek pleasurable interactions (Trevarthen, 1993).

In conclusion, infants in the successful group responded positively to maternal style of interaction, including the mothers' style of language expression. These infants consumed formula more efficiently and demonstrated fewer signs of distress compared to infants in the unsuccessful feeding group. Thus, some associations were demonstrated between maternal language characteristics and premature infant feeding performance.

Clinical Applications

Potential clinical applications of these findings may include consideration of maternal language variables. Such maternal language characteristics may provide an indicator of a negative mother-infant interaction as they affect infant feeding outcomes. Also, mothers who express higher numbers of commands and criticisms may have a negative influence on infant feeding outcomes. Conversely, mothers who display positive interaction characteristics may influence positive feeding outcomes. Additionally,

mothers who display negative interaction characteristics may also benefit from assistance that may potentially improve feeding performance and overall development of at-risk infants.

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