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**Maternal Touch and Maternal Child-directed Speech: Effects of Depressed Mood in the Postnatal
Period**

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Maternal Touch and Maternal Child-directed Speech: Effects of Depressed Mood in the Postnatal Period

Abstract

Background: Postnatal depression affects the emotional state of mothers and the quality of mother-infant interaction. **Method:** Touch behaviour and content of child-directed speech were analysed for 72 mothers and their infants during pleasurable play. Eighteen infants of mothers with depressed mood, and 18 controls were seen when they were 6 months old; and eighteen infants of mothers with depressed mood, and 18 controls were seen when they were 10 months old. **Results:** Depressed mothers in comparison with non-depressed mothers lifted their infants more, restraining their behaviours. Infants of depressed mothers in contrast to infants of non-depressed mothers spent greater periods of time in touching self rather than mother or toy, compensating for the lack of positive touch from their mothers. Mothers with depressed mood of 6-month-old infants included fewer affective and informative features in their speech than their controls. Non-depressed mothers of younger babies, showed a higher use of affective features when compared with non-depressed mothers of older infants. In contrast, depressed mothers of 6-and 10-month-old babies showed similar frequencies of affect-salient speech during the interactions in spite of their infants' changing developmental demands. **Limitations:** Mothers in this study were only mildly depressed, as assessed by the Edinburgh Postnatal Depression Scale (EPDS). Nevertheless, the findings indicate that mothers with depressive symptoms differ from non-depressed mothers in relation to touch and content of speech when interacting with their infants. **Conclusions:** These results suggest that postnatal depression may influence touch behaviour as well as the affective and informative content of maternal speech. The effect is that mothers with depressed mood in comparison with non-depressed mothers touch their infants more negatively and their speech is less well adjusted concerning the amount of emotional versus information related content thereby preventing depressed mothers from responding effectively to their infants' developmental needs.

Key words: depressed mood, touch, maternal child-directed speech, infant emotional response

Introduction

Infants' ability to respond effectively to the environment develops in the context of an interactive relationship with their mothers (Brazelton, Koslowski & Main, 1974). Mother-infant interactions imply a process of synchronous and bi-directional influence, where skills are transmitted, which promote learning experiences (Kaye, 1982). The quality of these interactions varies depending on mothers' emotional state.

Postnatal depression has been associated with reduced quality of mother-child interaction and increased risk of behavioural disturbance, and impaired cognitive, social and emotional development in their offspring (e.g., Sinclair & Murray, 1998; Murray, 1991; Hay & Kumar, 1995; NICHD Early Child Care Research Network, 1999; Pickens & Field, 1993; Kumar, Hipwell & Lawson, 1994). However, some researchers argue that maternal touch can compensate for the lack of verbal and facial emotional communication by depressed mothers with their infants (Pelaez-Nogueras, Field, Hossain, & Pickens, 1996).

Although the systematic study of maternal and infant touch has been widely neglected (Malphurs, Raag, Field, Pickens, & Pelaez-Nogueras, 1996; Pelaez-Nogueras *et al.*, 1996; Hertenstein & Campos, 2001; Hertenstein, 2002), recent research on tactile stimulation demonstrates that maternal touch is an important means of communication during early social exchanges. Touch elicits positive affect, reduces negative affect, and modifies overall responsiveness in infants as early as 3 months of age (Stack & Muir, 1990, 1992; Pelaez-Nogueras *et al.*, 1996; Stack & Arnold, 1998). According to Hertenstein (2002), through touch, mothers and infants can exchange perceptions, thoughts and feelings, which promote emotional and non-emotional or informative communication.

Different qualities of touch relate not only to the context of touching, but also to characteristics of the mother (Hertenstein, 2002). Depressed mothers might interact with their infants in an intrusive, controlling and over-stimulating manner, or in a withdrawn, passive and under stimulating way (Malphurs, Raag, Field, Pickens, & Pelaez-Nogueras, 1996; Field, Healy, Goldstein & Guthertz, 1990; Cohn, Matias, Tronick, Connell, & Lyons-Ruth, 1986). Postnatally depressed mothers in comparison with non-depressed mothers touch their infants in a more negative manner (rough pulling, tickling, poking), and with different frequency (Lyons-Ruth, Zoll, Connell, & Grunebaum, 1986; Malphurs *et al.*, 1996; Fergus, Smith & Pickens, 1998). Since touch between

mother and child is bi-directional, similar to verbal communication, it implies that both partners are active performers (Kaye, 1982; Hertenstein, 2002). Hence not only depressed mothers but also their infants vary their touch behaviour. Specifically, infants of depressed mothers in comparison with infants of non-depressed mothers, spend more time touching their own skin (Hentel, Beebe & Jaffe, 2000). In summary, touch within mother-infant relationship is a bi-directional, communicative, dynamic process, which is subject to contextual factors, individual differences, as well as developmental changes (Hertenstein, 2002).

Maternal child-directed speech promotes closeness between a mother and her baby, and encourages early language learning in the infant (Kaye, 1982; Bloom, Margulis, Tinker & Fujita, 1996). One function of maternal speech is to convey the intent of social interaction focused on describing and discovering the environment (Bornstein *et al.*, 1992). However, both form and function of maternal child directed speech are affected by the emotional state of the mother (Murray, Kempton, Woolgar & Hooper, 1993; Zlochower & Cohn, 1996; Kaplan, Bachorowski & Zarlengo-Strouse, 1999). The speech of non-depressed mothers is characterised by short utterances, repetition, high rates of imperatives and interrogatives, few directives and controlling statements or corrections, and is focused on the children's experience (Murray & Trevarthen, 1986; Snow, 1977). In contrast, speech of depressed mothers is focused on the mother's own experience, contains a high percentage of negative affect, spare use of explanations, suggestions and questions, as well relatively few acknowledgements of infant agency (Cox, Puckering, Pound & Mills, 1987; Murray, *et al.*, 1993). Several studies have shown that children of depressed mothers in comparison with children of non-depressed mothers have more difficulties in expressive language, perform poorly on measures of cognitive-linguistic functioning and are less co-operative at 36 months (e.g. Cox *et al.*, 1987; NICHD Early Child Care Research Network, 1999). As a result, it has been suggested that child-directed language may mediate the association between depression and infant cognitive development in the first 18 months (Murray *et al.*, 1993).

It has also been reported that the type of child-directed speech is affected by age and developmental level of infants (e.g., Sherrod, Friedman, Crawley, Drake & Devieux, 1977; Phillips, 1973). Normally, mothers shift from talk about their infants' internal states and feelings to talk about their activities and external environment over the child's first year of life (Snow, 1977; Penman *et al.*, 1983, Bornstein *et al.*, 1992). The content of maternal

speech in terms of whether it is affect-salient or information-salient has been used to evaluate the child-directed speech of non-depressed mothers (e.g., Penman, Cross, Milgrom-Friedman & Meares, 1983; Sherrod, Crawly, Petersen & Bennett, 1978; Broerse & Elias, 1994; Bornstein, Tal, Rahn, Galperin, Lamour, Ogino, Pecheux, Toda, Azuma & Tamis-LeMonda, 1992). However, it is unclear what effect depressed mood has on the functional content of speech in the postnatal period.

Tronick & Gianino (1986) explain the dynamics of early mother-infant interactions in general, and the effect of postnatal depression in particular, in terms of the “Mutual Regulation Model” (MRM). According to this model, infants in their first year of life regulate their internal emotional states and their relationship with the external environment through a “regulation” process. When facing internal and external disturbing states, infants use “self-directed” regulatory behaviours (forms of self-comfort such as sucking, rocking, touching), and “other-directed” regulatory behaviours (emotional displays such as smiles, crying) to modify the sources disrupting their emotional state. Self-regulatory behaviours are controlled by infants, and reduce their engagement with the environment, which are translated into withdrawal and avoidance of social exchanges. In contrast, other-regulated behaviours include an evaluation of maternal behaviour perceived by the infants, and maintenance of their engagement with the environment. According to the MRM, when mothers respond accurately to their infants’ other-regulated behaviours, infants are able to maintain both self-regulation and regulation of the interactions with the environment.

Self-directed and other-directed behaviours are expressed emotionally in the face, speech, voice, gesture, and posture. During the first year of life, these various channels are not well coordinated and infants, in order to face all disruptions, require an additional regulatory capacity, which has to be provided by their mothers. Mothers have to read and respond to their infants’ behaviours accurately in order for this system to work well. However, if mothers are depressed, they are not able to respond contingently to their infants’ behaviours. This results in negative emotional states, which infants have to resolve by the use self-regulatory behaviours. This process then produces poorly coordinated interactions. In contrast, well regulated states translate into synchronous and accurate behavioural exchanges between mothers and their infants (Tronick & Gianino, 1986). Additionally, Fogel (1988) suggested that not only the frequency of dyadic events, but also the content of the behavioural

events are important variables of face-to-face interactions. Therefore, frequency of touch and quality of touch (direct, indirect, self-touch, lifting), as well as content of maternal child-directed speech (affect- and informational-salient) are considered for analysis in the present study.

In the present study, differences in behavioural patterns of touch and the functional content of maternal speech (affect- and informational-salient style) were examined in relation to maternal mood and infants' age during a pleasure-eliciting situation. Postnatal depression may arise at a few days, weeks, or months after childbirth, lasting for many months if untreated, thereby influencing maternal interactions with the infants during the first year (Cooper, Campbell, Day, Kennerly & Bond, 1988; Cox, Murray & Chapman, 1993). Furthermore, the content of maternal child directed speech is affected by the age and developmental stage of infants (e.g. Phillips, 1973; Snow 1977; Penman *et al.*, 1983; Bornstein *et al.*, 1992). In order to observe possible cross sectional differences in mothers with and without depressed mood and their infants, touch and content of speech were analysed in mothers with babies falling into two age groups, namely 6-and 10-months.

Given previous findings on postnatal depression, touch and maternal child-directed speech (e.g. Cohn *et al.*, 1986; Field *et al.*, 1990; Murray *et al.*, 1993; Malphurs *et al.*, 1996; Hentel *et al.*, 2000), the following hypotheses were tested: First, mothers of 6-and 10-month-old infants, with depressed mood, in comparison with non-depressed mothers, differ in the quality and frequency of their touch of their infants. Based on findings in the literature of the lack of responsiveness and withdrawn behaviours (e.g. Stein, Gath, Bucher, Bond, Day & Cooper, 1991; Murray, Fiori-Cowley & Hooper, 1996) it was expected that depressed mothers in comparison with non-depressed mothers would touch their infants less frequently. Second it was expected that non-depressed mothers of 6-month-old babies would use more frequently affect-salient speech than non-depressed mothers of 10-month-old infants, whereas depressed mothers of both age groups were expected to use less affect-salient speech than controls. It was expected that non-depressed mothers would use more frequently information-salient speech than depressed mothers. Third, infants of depressed mothers differ from their controls by showing more self-touching behaviours and less other-directed touch.

Method

Participants

Seventy-two mother-infant dyads, recruited from The Birth Register of Aberdeen Maternity Hospital, participated in the study. There were 18 infants (11 boys and 7 girls) of mothers with depressed mood and 18 controls observed when they were 6 months old; and a further 18 infants (11 boys and 7 girls) of mothers with depressed mood and 18 controls observed when they were 10 months old. All infants were healthy, of normal birth weight, and had no history of medical complications. In this sample, 52% of the mothers were primiparous, with a mean of 29.5 years old (R=18-41 years old). All mothers were Caucasian, living in the Grampian area of Scotland in the United Kingdom. They had a mean of 13 years of education,(range10 -19 years).

The 10-item Edinburgh Postnatal Depression Scale (EPDS) (Cox, Holden & Sagovsky, 1987) was used to assess the current state of maternal depressed mood. Initially, Cox *et al.* (1987) reported for the scale a sensitivity of 86%, a specificity of 78%, and a positive predictive value of 73%. Later, Murray & Carothers (1990), found a lower sensitivity of 67,7%. In another study (Harris, Huckle, Thomas, Johns & Fung, 1989), the EPDS proved to be more sensitive (95% versus 68%) and specific (93% versus 88%) than the Beck Depression Inventory (Beck, Ward, Mendelson, Mock & Erbaugh, 1961). Total scores on the EPDS range from 0 to 30. A cut-off 9/10 was considered to identify depressed mood (Cox, Murray & Chapman, 1993; Cox & Holden, 1994). For this reason, mothers who scored 9 and above were classified as suffering from depressed mood, and mothers who scored 0-8 were classified as non-depressed mothers. The EPDS ratings of depressed mothers with 6-month-old babies were mean =10.77; and of depressed mothers with 10-month-old babies were mean = 14.22 (range 9-23). The EPDS ratings of controls with 6-month-old babies were mean = 3.66; and of controls with 10-month-old babies were mean = 4.94 (range 0-8).

Procedure

Observational sessions, lasting 5 minutes took place in the homes of participants, at optimal times when babies were awake and alert, usually after having been fed (Bornstein & Tamis-LeMonda, 1990). In this sample, 50% of the babies were observed in the morning and 50% in the afternoon. Only the observer, the mother and baby were present during the interaction. Infants were placed in a “baby seat” and their mothers sat in front of them

approximately 18 inches away. Two cameras with directional microphones were used; each one was set approximately one metre from the mother and the child, in order to record their faces and upper torso during face-to-face interaction. Mothers were invited to play with their infants as usual using a soft toy (a zebra beany baby) in order to elicit pleasure. This pleasure-eliciting situation was chosen because it represents an opportunity in which mothers with and without depressed mood interact and play with their infants within the context of an emotional communication (Reissland, et al. 2002).

Coding

Touch

Frequency of touch was coded during the entire interaction for the number of times that any physical contact (on clothes or skin) occurred between either mother and infant, towards each other or towards the toy, (e.g., Stack & Muir, 1992; Stack & Arnold, 1998). Mean frequency of touch was defined as the total number of touch behaviours, divided by the total time in minutes of the interaction. The types or quality of touch coded for both mothers and infants, were either direct (using the hands and touching part of the body), or indirect (using the toy). Maternal lifting (using hands and arms to hold the toy or baby up) and infants' self-touching behaviour were also coded.

Infants' vocalisations

Infants' vocalisations were coded in terms of relative frequency (incidents per minute) of occurrence, and were defined as any utterance or sound accompanied by positive, or neutral affect, without considering physiological sounds such as burps, cries, sneezes or hiccups (Stack & Arnold, 1998; Reissland & Stephenson, 1999). Infants' behavioural states were coded in terms of vocally active, and vocally inactive (neutral) (Malphurs *et al.*, 1996).

Maternal Speech

Frequency of maternal speech to their babies was coded and analysed based on the function of each utterance classified as: (a) affect-salient (feeling-oriented)- expressive, generally non-propositional, idiomatic or meaningless statements with an affective function, expressed as laughing, greeting, encouragement, recitation, onomatopoeia, discouragement, mimicking and endearment; and (b) information-salient (object-oriented)-direct

statements, interpretations, questions and reports about the infant, mother, or environment. These categories are mutually exclusive (see Table 1). The coding unit was defined as an utterance with a single functional category, and the unit changed when there was a change in coded utterance type or when an utterance terminated and a silence of at least 2 s followed. Therefore, a minimum unit size could be a single word or the sound of a letter, for example, hi, a, aha, e or goo (Penman *et al.*, 1983; Bornstein *et al.*, 1992).

Reliability

Maternal and infant's touch and vocalisations were coded frame-by-frame using the Observer System (1995). An independent observer, blind to mothers' group status coded 15.27% of the sample (11 mother-infant pairs). The mean percentage of agreement ranged from 92.1% to 98.84% (kappa coefficient = 0.93) for infants' measures, and from 81.45% to 97.83% (kappa coefficient = 0.83) for maternal touch. The percentage of agreement for functional content of maternal speech ranged from 77.19% to 98.41% (kappa coefficient = 0.78).

Results

Means and standard deviations of infant and maternal measures are shown in Table 2.

Maternal touch

Mothers of 6- and 10-month-old infants, with depressed mood, in comparison with non-depressed mothers, differed in the quality and frequency of touch directed to their infants. In relation to direct touch, there were no main effects for age or depression, but a significant interaction was observed ($F(1,68) = 12.41; p < .001; \eta_p^2 = .154$). Depressed mothers of 10-month-old infants touched their babies directly more frequently than their controls and depressed mothers of 6-month-olds. Control mothers of 10-month-old infants, did not differ from non-depressed mothers of 6-month-olds. Analysis of variance on indirect touch showed no main effects for age or depression, but a significant interaction was found ($F(1,68) = 4.17; p < .045; \eta_p^2 = .058$), although none of the comparisons using Tukey HSD were significant.

Analysis of variance was performed on frequency of maternal lifting with age of infants and psychological state of the mother as factors. A main effect was found for infants' age (mean for 6 month-olds = 0.18 mean for 10 months olds = 0.77; $F(1,68) = 9.86; p < .002; \eta_p^2 = .127$). A significant interaction was observed between maternal

mood and infants' age on mothers lifting their infants ($F(1,68) = 4.43$; $p < .039$ $\eta_p^2 = .061$). Maternal lifting patterns appear to change according to the age of the infants. Depressed mothers of 10-months-old babies lifted their infants more frequently when compared with their controls and depressed mothers of 6-month-old babies.

Maternal Speech:

The content of speech of mothers with and without depressed mood differed. Statistical analyses were performed on mean frequency of maternal vocalisations using ANOVA, where the factors were age of infants (young, old) and mood state of mothers (depressed, non-depressed). In relation to affect-salient speech, there were no main effects, but a significant interaction was found between age of infants and mood state of the mothers ($F(1,68) = 12.08$; $p < .001$; $\eta_p^2 = .151$). Pairwise comparisons (Tukey HSD) showed that non-depressed mothers of 6-month-old infants included more affective features in their speech, than the depressed mothers of 6-month-olds. Non-depressed mothers of 10-months-old-infants in comparison with depressed mothers of 10-month-old infants did not differ (see Table 2), but the control mothers of 10-months olds use less affective salient speech than non-depressed mothers of 6-month-olds. As predicted (Hypothesis 2), the frequency of maternal-affect salient speech varies significantly among mothers without depressed mood in relation to the age of their infants; in the case of depressed mothers it remains constant.

Analysis of variance for information-salient speech with depressed mood and age groups as factors showed no main effects, but a significant interaction between age of the infants and maternal mood state ($F(1,68) = 3.99$; $p < .050$; $\eta_p^2 = .055$). Contrary to prediction (Hypothesis 2), depressed mothers of 6-month old infants, in comparison with control mothers, included fewer informative features in their speech. However, depressed mothers of 10-month-old infants included as many informational features as their controls when interacting with their babies.

Infant Behaviours

Infants of depressed mothers differed from their controls by showing more direct and indirect self-touching behaviours. Analysis of variance was performed on mean frequency of infants' direct and indirect self-touching behaviour, considering as factors the age of infants (6 and 10 months old) and maternal mood state (depressed

and non-depressed). A significant main effect was found for depression in relation to direct self-touching, mean for children of depressed mothers = 8.6, mean for controls = 4.48 ($F(1,68) = 9.48$; $p < .003$; $\eta_p^2 = .094$). A significant main effect was found for depression in relation to indirect self-touching, mean for children of depressed mothers = 4.76, mean for controls = 1.93 ($F(1,68) = 10.23$; $p < .002$; $\eta_p^2 = .131$). There were no main effects for age and no interaction in both cases. As predicted (Hypothesis 3), infants of mothers with depressed mood touched part of their own body either directly or indirectly, more frequently compared with infants of non-depressed mothers in both age groups. There were no significant differences in relation to infants touching their mothers either directly or indirectly, or in the amount of vocalisations expressed by them when interacting with their mothers in both age groups. Table 2 shows the means and standard deviations for maternal and infants' behaviours in both age groups.

Measures of Associations between EPDS scores, speech and touch variables

In order to determine the relationships between the EPDS scores, the two styles of maternal speech (affect-and information-salient), and touch behaviours for each group of age, a Pearson correlation analysis was conducted.

Results for the 6-month-old group, indicated that EPDS scores were negatively associated with the use of affective ($r = -.329$; $n=36$; $p < .050$), and informational ($r = -.504$; $n=36$; $p < .002$) elements in maternal speech; and also with the frequency of mothers touching their infants directly ($r = -.409$; $n=36$; $p < .013$). In other words, the more depressed the mothers, the less they included affective and informational features in their speech, and the less they touched their infants directly. Additionally, frequency of affect-salient speech was negatively related to the frequency infants touched indirectly their own bodies ($r = -.397$; $n=36$; $p < .016$), but positively associated with the frequency of their mothers touching them indirectly ($r = .422$; $n=36$; $p < .010$). Mothers who used affect-salient speech more frequently touched their infants more frequently, and their babies less often touched themselves indirectly. Finally, positive associations were found between EPDS scores and the frequencies with which infants touched themselves directly ($r = .570$; $n=36$; $p < .000$).

For the 10-month-old group, there were several positive associations. EPDS scores were positively associated with the frequency that babies touched themselves indirectly ($r = .375$; $n=36$; $p < .024$), and with the use of

affective features in the maternal speech ($r = .430$; $n=36$; $p < .009$). Specifically, the use of discourages, as an element of the affect-salient category, was positively associated with both the amount of time that mothers lifted their babies ($r = .401$; $n=36$; $p < .015$), and also with the time that babies spent indirectly touching their own body ($r = .453$; $n=36$; $p < .006$).

These combined findings suggest that differences in the style of maternal speech observed in each age group, are significantly associated with the degree of depressed mood, affecting not only the quality of maternal touch, but also babies' touch behaviour, as well as general responsiveness during mother-infant interaction.

Discussion

In summary, this study found important differences between depressed and non-depressed mothers, and between their infants, when addressing touch and speech styles in relation to infants' age during a pleasure-eliciting situation.

Previous studies have reported that mothers who are clinically depressed tend to show negative affect (anger, sadness), negative touch (rough pulling, tickling, poking), as well as unresponsive behaviour during face-to-face interactions with their infants (Cohn, Matias, Tronick, Connell & Lyons-Ruth, 1986; Field, 1986; Field, Healy, Goldstein & Guthertz, 1990; Holden, 1994; Malphurs *et al.*, 1996; Jones, Field, Fox, Davalos, Malphurs, Carraway, Schanberg & Kuhn, 1997; NICHD Early Child Care Research Network, 1999). Additionally, higher frequencies of touch have been found among mothers with symptoms of depression, indicating over-stimulating behaviour in their use of touch when interacting with their infants (Malphurs *et al.*, 1996; Fergus *et al.*, 1998).

Results from the present study showed that frequency of touch by depressed mothers was related to their infants' age. Depressed mothers of 10-months old infants, compared with their controls and depressed mothers of 6-months old infants, lifted, and touched their babies directly and indirectly more frequently. Hence mothers with depressive symptoms of older babies, touched their infants perhaps as a means to control, restrain and direct their infants' actions, as well as to attract their attention (Field *et al.*, 1990; Fergus *et al.*, 1998). Weiss *et al.* (2000), have suggested that maternal sensitivity seems to interact with frequency of touch to define its effects. Thus, a

more sensitive mother would use touch to attend to her infant's developmental cues and emotional states, while less sensitive mothers may touch their infants without attending to their demands, leading to more negative consequences on the infant's sense of security and attachment. Mothers with depressed mood may not be responding to the incremental demands from their babies as they grow older, which could explain the relative lack of tactile stimulation directed at younger babies and over-stimulation directed at older babies. Because maternal touch conveys specific messages, its quality appears to be affected by depressed mood. Thus, depressed mothers, may be transmitting through touch negative emotions or states without realizing it (Hertenstein, 2002).

Infants' responsiveness (behavioural, emotional and physiological) develops in the context of an interactive relationship, with touch playing an important role (Stack & Muir, 1990; Stack & LePage, 1996; Stack & Arnold, 1998). Infants of mothers with depressed mood, in contrast to infants of non-depressed mothers, touched their own skin more often, which can be interpreted as a self-comforting behaviour that compensates for the lack of positive touch from their mothers. According to Tronick and Gianino (1986), in the context of postnatal depression, the mother fails to respond appropriately to her infant's regulatory signals. Therefore, the child experiences negative affect, and in his/her attempts to repair the interactions, turns to self-regulatory behaviours, such as self-touching, in order to cope with the negative emotional state generated by the uncoordinated feedback from the mother. Infants are highly perceptive of their personal environment (Murray & Cooper, 1997) and respond to their mothers' mood disturbance with a variety of behaviours, which may be considered as important clues in predicting children's future development.

In relation to content of maternal child-directed speech, mothers with depressed mood of 6-month-old babies included less affective and informative features in their speech compared with control mothers. However, in relation to affect-salient speech, there were effects for infants' age, in that non-depressed mothers of 6-month-old babies included more affective features in their speech compared with depressed mothers of 6-month-olds, and compared with non-depressed mothers of 10-month-old infants. Hence, control mothers of younger infants, used affect-salient speech more frequently than control mothers of older infants. In contrast, depressed mothers in both age groups showed similar frequencies in the use of affect-salient speech. When information-salient speech was

analysed, depressed mothers used less information salient speech at 6-months in comparison with controls, but no differences were found between depressed mothers of 10-month-old infants and their controls.

Previous research indicates that verbal communication of depressed mothers to infants differs from the structure of non-depressed mothers' speech (Cox *et al.*, 1987; NICHD Early Child Care Research Network, 1999). Murray *et al.* (1993) suggested that the focus of the speech might mediate the association between depression and infant cognitive development in the first 18 months. When talking to their infants, mothers introduce them in a structured way to elements of their environments such as meanings, spatial settings, and temporal patterns, which provide the main frames for cognitive development (Kaye, 1982). Therefore, changes in maternal speech style in relation to content and function of the utterances, as well as emotional state of the mother, influence the nature of mother-infant interaction and thereby the process of early language learning in infants. Results of the present study suggest that depressed mood in the postnatal period influences the functional content of maternal speech. Specifically, mothers with depressed mood of 6-month-old babies were less likely verbally to share feelings, contribute to emotional exchanges, and impart or confirm cognitive information referring to their infants' perceptual experiences. In contrast, among depressed mothers of 10-month-old babies the degree of depression was related to engagement in affect-salient speech, where the use of discourages was positively and significantly related to the amount of time that mothers held their babies, and the time that babies spent touching their own body.

According to the literature, over the first year of life, mothers have been found to shift noticeably from talking to their infants about internal states and feelings to activities and the environment. Thus, the functional aspect of maternal speech appears to be affected by characteristics of the babies such as age and developmental level (Snow, 1977; Phillips, 1973; Bornstein *et al.*, 1992; Penman *et al.*, 1983; Sherrod *et al.*, 1977). These changes are assumed to reflect changes in the nature of mother-infant relationship, and are also indicators of maternal adjustments to infant growth in communication (Snow, 1977; Sylvester-Bradley & Trevarthen, 1978; Tronick & Gianino, 1986; Zlochower & Cohn 1996). As expected, the results of this study indicate that non-depressed mothers of 6-month-old-babies used significantly more affect-salient speech, when compared with depressed mothers of 6 month-old infants and non-depressed mothers of 10-month-olds. In contrast, the amount of affect-

salient speech used by depressed mothers in both age groups remained fairly constant. The results of the present study suggest that while well mothers appear to use fewer affective features in their speech in relation to older infants, depressed mothers continue to use emotional speech, ignoring their infants' age and developmental need to include increasing information-salient speech.

In sum, the present study confirms that both content of speech as well as touch constitute important components of the mother-infant interaction (Cohn, Campbell, Matias & Hopkins, 1990). Depressive mood in this study was found to influence the affective quality of maternal speech, as well as touch behaviour of both mother and infant. In non-depressed mother-infant exchanges patterns varied appropriately with development (e.g. Kaye & Fogel, 1980; Cohn & Tronick, 1987). In contrast mothers with depressed mood of 6-and 10-month-olds responded inappropriately in both the verbal and non-verbal domain in relation to their infants' development. These results underline the importance of considering patterns of interaction in interventions with depressed mothers. Therefore, future research should consider training mothers in the adequate use of maternal touch and content of speech, to help them respond appropriately to their infant's behavioural cues.

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TABLE 1

Summary of categorisation scheme for maternal vocalisations (adapted from Penman *et al.*, 1983; Bornstein *et al.*, 1992):

Style	Category	Referent	Definitions	Examples
1) Information-salient	Direct	Infant's actions Infant's feelings	Propositional sentences. Acceptable in adult conversations	You play with him You should feel happy now
	Interpret	Infant's actions Infant's feelings	To attend to something or to do something To feel something	You want to play with this You do like that one
	Question	Infant's actions Infant's feelings External environment	In meaningful or intentional terms or as a desire for action In terms of affective states	Which toy do you want? What's made you unhappy? What does that toy do?
	Report	Infant's behaviour Mother's behaviour External environment	In terms of what its intentions may be In terms of affective states Asking infant about other things external to infant	You've got my finger I've got your dummy The light is very bright
2) Affect-salient		Encourages	General non-propositional, idiomatic, incomplete sentences or meaningless outside context Positive affect, reassuring, comforting, encouraging	Clever girl
		Discourages	Negative affect, prohibiting, discouraging	That's naughty
		Onomatopoeia/ no-sense	Utterances unacceptable in adult speech and which rely wholly on context for interpretation	Aboo. Goo goo. Meow
		Greets	Vocatives or attentionals	Hi Luke. Hello there
		Mimics	Models infant's sounds	
		Recites	Recited nursery rhymes	This little piggy went to market
		Laughs Endearments		Sweetie

TABLE 2

Frequencies per minute of Maternal and Infants' Behaviours

Means, which do not share the same superscript in one row, are significantly different by Tukey's HSD test ($p < .05$)

Measure	6 Months Old		10 Months Old	
	Depressed mood	Control	Depressed mood	Control
Mother direct touching baby	0.76 (1.13) ^a	1.89 (1.39) ^{ab}	2.45 (2.30) ^b	0.95 (1.21) ^a
Mother indirect touching baby	9.38 (7.76)	13.00 (7.04)	10.93 (9.10)	7.40 (5.29)
Mother lifting baby	0.16 (0.48) ^a	0.20 (0.41) ^a	1.14 (1.16) ^b	0.39 (0.86) ^a
Maternal affect-salient speech	12.32 (7.05) ^a	17.66 (4.92) ^b	14.58 (6.14) ^{ab}	10.78 (3.54) ^a
Maternal information-salient speech	11.91 (5.55) ^a	18.02 (6.92) ^b	14.29 (6.42) ^{ab}	14.17 (7.40) ^{ab}
Infants' self-direct touch	9.43 (10.03)	2.84 (2.02)	7.81 (6.84)	6.12 (4.94)
Infants' self-indirect touch	4.07 (3.71)	2.62 (2.84)	5.44 (5.66)	1.23 (1.51)
Infants' direct touching mother	1.57 (1.87)	2.91 (2.14)	2.51 (2.35)	2.31 (3.26)
Infants' indirect touching mother	0.04 (0.17)	0.22 (0.82)	0.36 (0.93)	0.75 (2.78)
Infants' vocalizations	3.14 (3.69)	3.65 (4.90)	3.78 (3.00)	3.43 (3.27)