

Correspondence

N Reissland
Department of Psychology
William Guild Building
University of Aberdeen
Old Aberdeen
Aberdeen AB24 2UB
UK

Turn-taking in early vocal interaction: a comparison of premature and term infants' vocal interaction with their mothers

N Reissland and T Stephenson*

University of Aberdeen, Aberdeen and *Queen's Medical Centre, Nottingham, UK

Accepted for publication 17 July 1998

Summary

Aims The present study was designed to test the hypothesis that mothers of premature infants compared with mothers of term infants differ in the structure which they impose on the vocal exchanges with their infants.

Methods Thirteen mothers and their premature and term babies, were observed at discharge and 2 months later in three situations: free play, changing nappy, and feeding. Maternal child-directed speech was coded as well as the timing of their utterances in respect to the infants' vocalizations. The mean relative frequency of infant vocalizations following maternal child-directed speech was computed.

Results It was found that mothers of premature babies in comparison with mothers of term babies, followed significantly more often their infants' vocalizations with an utterance directed at the child. In contrast, term infants compared with preterm infants followed significantly more often their mother's utterances with a vocalization.

Conclusion Mothers of premature and of term babies differ in their timing of child-directed speech. This might have implications for the language development of premature and term infants.

Keywords: maternal verbal interaction, premature infants, term infants, turn-taking

Child: Care, Health
and Development

VOLUME 25
NUMBER 6

1999

PAGES 447-456

Introduction

Any conversation implies that the interlocutors take turns regularly. One view among researchers of child-directed speech is that most mothers at least in

North America and Europe make up for the young child's interactive insufficiencies during the first year. Mothers in a majority of cultures (for exceptions see Schiefflin 1983; Lieven 1994) structure the interactions with their children by providing questions and answers. Mothers also motivate their infants to take an increasingly active part in the exchange by continually stimulating the child through questioning and by reinforcing the child's vocalizations (Bateson 1975; Bloom 1988).

The timing of a mother's child-directed speech is thought to be a salient feature of the infant's environment and an important component of maternal linguistic responsiveness (Roth 1987). Mothers who respond contingently, commenting on the child's focus of attention or activity, have children who use language for a greater variety of referential and symbolic purposes (Rescorla 1984; Tomasello & Mannle 1985).

Bloom *et al.* (1987) established that temporal parameters of adults' responses, specifically turn-taking, affected both the timing and quality of infant vocalizations. These findings would support the contention of Kaye (1982) that parents construct frameworks into which children are integrated through parental effort rather than the infants' effort.

A large number of studies have focused on the question of the effect of prematurity on language development. A number of researchers found that early difficulties in production of language can forecast later language difficulties (Paul 1991; Paul & Alforde 1993; Thal 1994). Although premature infants are delayed on a number of receptive and productive language measures (Greenberg & Crnic 1988; Aram *et al.* 1991; Menyuk *et al.* 1995), maternal perceptions of their infants' abilities are also important factors influencing the infants' language development (e.g. Sameroff & Chandler 1975; Brown & Bakeman 1980).

For example, Brown and Bakeman (1980) and Sameroff and Chandler (1975) suggested that because some mothers of premature infants perceive their babies as being handicapped, their interactions are different from those of mothers of term infants. Crnic *et al.* (1983) found that mothers of premature infants were more active and offered more stimulation than mothers of full-term infants, but that the infants themselves were less responsive as well as less competent than their full-term age peers. This lack of responsiveness might have been the result of over-stimulation.

If mothers of premature infants interact differently with their babies then this might affect their ability to establish turn-taking routines. Given the importance of turn-taking in the development of infant-parent interaction in general (e.g. Trevarthen 1979; Kaye 1982) and language development in particular (e.g.

Bruner 1975; Bohannon & Marquis 1977; Rescorla 1984), it is important to establish whether mothers of preterm and of term infants differ in their turn-taking structure.

In summary, in the present study, turn-taking during verbal and vocal interaction between mothers and children either born prematurely or at term was examined. The hypothesis that mothers of premature infants compared with mothers of term infants differ in the turn-taking structure which they impose on the vocal exchanges with their infants, is tested.

Methods

Participants

Thirteen mothers and their babies were observed, five babies born prematurely (two boys) and eight babies born at term (four boys). The term babies ranged in gestational age from 38 to 42 weeks, with a mean of 40.1 weeks. They were observed in the maternity ward at that age. They were observed a second time a mean of 7.8 weeks after discharge (range 6.2–11 weeks). The preterm babies ranged in gestational age from 26 to 32 weeks with a mean age of 30.2 weeks. They were observed at discharge when they had reached a mean of 39 weeks (range 37–40) and were observed a second time a mean of 6.3 weeks after discharge (range 6.2–7 weeks) (see Table 1).

Procedure

The mothers and their babies were observed twice in three situations: free play, changing nappy, and feeding.

The term babies were first seen with their mothers on the maternity unit or, in the case of one baby, soon afterwards at home. The preterm babies were first seen in the neonatal unit at the day of discharge or, in the case of one baby, soon afterwards in the home. Both groups were observed a second time in their homes.

All babies were video- and audiotaped with their mothers while their mothers fed them, changed their nappies and played with them. The videotaping typically lasted 30–50 min

Behaviour codes

Maternal utterances directed at the infant in three situations, namely changing nappy, playing and feeding, in hospital and 6 weeks later at home were coded.

Table 1

	Gestational age at birth*	Age at which first observations were made [†]	Age at which second observations were made [‡]
<i>Preterm babies</i>	32	39	45.2
	30	40	47
	32	37	43
	31	40	46
	26	39	45.2
Mean	30.2	39	45.3
<i>Term babies</i>	40	40	47
	41	41	47
	40	40	47
	40	40	46.2
	40	40	46.5
	42	42	49.8
	40	40	51
Mean	40.1	40.1	47.9

*Expressed as post-menstrual age in weeks. [†]Expressed as post-menstrual age in weeks, i.e. gestational age + postnatal age. [‡]Expressed as post-menstrual age in weeks, i.e. gestational age + postnatal age.

Furthermore, infant vocalizations, namely quasi-resonant sounds and gooing sounds as defined by Oller (1980) were coded. The data were coded in the *Observer* (1995) program (Noldus) as 'states', giving the start and endpoint of the observation. Non-vegetative sounds (such as coughing, sneezing or burping, see Oller 1980) or crying were not coded as infant vocalizations. Consecutive utterances and infant vocalizations were identified. Utterances qualified as consecutive when they followed each other within 15 s. This accords with Bloom *et al.* (1996) who, with regard to 1-year olds and their mothers, defined a 'shared topic' when it happened within 15 s from target.

The order with which the mother or child followed the initiation of the vocalization by the child or mother, was coded. The mean relative frequency of these sounds following maternal utterances directed at the infants and the mean relative frequency of maternal utterances following infant vocalizations, was computed. The mean time between infant initiation of a vocalization and maternal response was for premature infants = 3.58 s (range = 2.09–4.67 s) and for term infants = 1.77 s (range = 0.5–3.37 s). The mean time between maternal initiation of an utterance and infant 'response' was for premature infants = 2.58 s (range = 1.91–4.0 s) and for term infants = 3.37 s (range = 1.61–6.24 s).

Inter-rater reliability was established by asking two coders to code 11% of the sample which had been coded by another coder (child vocalizations and

maternal utterances directed at the child). The inter-rater reliability was mean 89% agreement (range 82–100%).

Results

The data were subjected to the Fisher exact probability test. This is a non-parametric one-tailed test for exact probabilities (Siegel 1956). The division for the Fisher exact tests between preterm and term mothers and infants was the upper boundary of the term infants' or term-mothers' responses. In other words, eight term infants or mothers appeared in one cell of the test and were compared with the number of premature infants or mothers who appeared in the other cell. This allowed an analysis of how many preterm infants fell within the set boundary of the term infants.

Separate analyses were conducted to address the following questions.

Do term infants in comparison with premature infants differ in the amount they vocalize?

A Fisher exact test showed that there was no significant difference between premature and term infants in the mean frequency with which they emitted vocalizations in hospital and at home (see Table 2). Hence term and preterm infants vocalized with a similar frequency.

Do term infants compared with premature infants differ in the frequency with which they vocally 'respond' to maternal utterances in hospital and at home?

A Fisher Exact test showed that there was no significant difference between premature and term infants in the mean frequency with which they followed their mothers' utterances with vocalizations in hospital (see Table 3).

Table 2 Mean relative frequency of infant vocalizations in hospital and at home

	Preterm	Term
<i>In hospital</i>		
Child: Care, Health and Development		
< 1.45	4	8
> 1.45	1	0
<i>At home</i>		
VOLUME 25		
< 1.35	2	0
NUMBER 6		
> 1.35	3	8

1999

P = ns

PAGES 447–456

Table 3 Mean relative frequency of infant vocalizations following maternal child-directed utterances in hospital and at home

	Preterm	Term
<i>In hospital</i>		
< 0.25	5	8*
> 0.25	0	0*
<i>At home</i>		
< 0.07	5	0†
> 0.07	0	8†

* $P = ns$. †Significant one-tailed $P < 0.005$

However there was a significant difference ($P < 0.005$, 1-tailed) between premature and term infants in the mean frequency with which they followed their mothers' utterances with vocalizations at home (see Fig. 1 and Table 3). Hence term infants compared with preterm infants followed more frequently the utterances of their mother with vocalizations.

Do mothers of preterm and term infants respond with different rates to their infant's vocalizations?

A Fisher exact test showed that there was no significant difference between premature and term infants in the mean frequency with which mothers

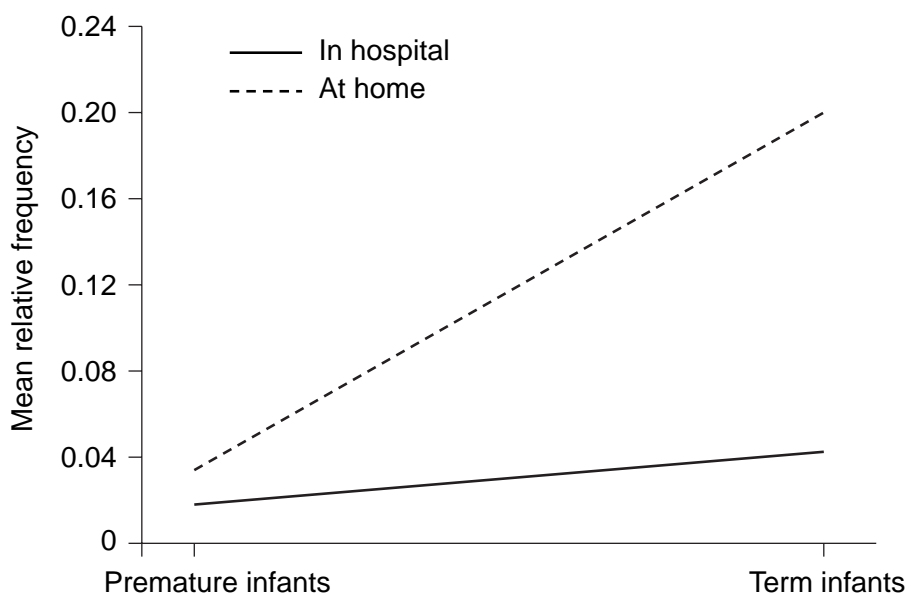


Figure 1 Mean relative frequency of infant vocalizations following maternal child-directed utterances in hospital and at home

responded to their vocalizations in hospital (see Table 4). However, there was a significant difference at home ($P < 0.05$ 1-tailed). Mothers of premature infants followed their infants' vocalizations significantly more often with utterances than mothers of term infants (see Fig. 2).

Discussion

The results of this study indicate that premature and term infants and their mothers differed in their turn-taking. Premature infants compared with term infants 'responded' much less frequently to their mothers' child-directed speech at home. Term and premature infants behaved similarly in hospital, both groups 'responding' only with a mean relative frequency of less than 4% of occasions to their mothers' child-directed speech. However, 6 weeks later at home, the term infants 'responded' to their mothers' child-directed speech with a mean relative frequency of 22%, whereas preterm infants 'responded' still only with a mean relative frequency of 4% of occasions.

In contrast, mothers of premature infants in comparison with mothers of term infants, took every opportunity to respond to their infants' non-cry vocalizations. Hence the difference between mothers of premature and mothers of term infants seemed to be the frequency of their utterances in respect to the infants' vocalizations.

Bloom *et al.* (1987) established that adults' responses to infant vocalizations, specifically turn-taking, affected both the timing and quality of infant vocalizations. In the present study, the mothers of premature infants seemed to impose the structure on the interaction in hospital and 6 weeks later at home. Term infants and their mothers, however, had established the rudiments of turn-taking routines after 6 weeks. This was indicated by the finding that term infant — compared with preterm infant-

Table 4 Mean relative frequency of maternal child-directed utterances following infant vocalization in hospital and at home

	Preterm	Term
<i>In hospital</i>		
Child: Care, Health and Development		
< 0.00	0	0*
> 0.00	5	8*
<i>At home</i>		
VOLUME 25		
< 0.70	2	8†
NUMBER 6		
> 0.70	3	0†

* $P = ns$. †Significant one-tailed $P < 0.05$

1999

PAGES 447-456

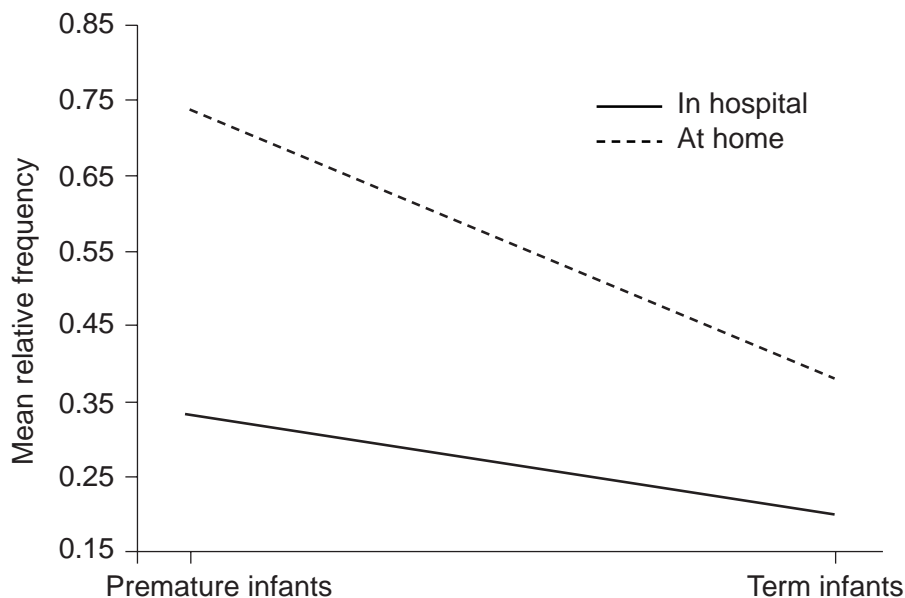


Figure 2 Mean relative frequency of maternal child-directed utterances following infant vocalizations in hospital and at home

vocalizations, followed significantly more often maternal utterances at home.

The more active behaviour of mothers of preterm infants in comparison with mothers of term infants, might have a detrimental effect. For example Field (1977) found that when preterm mothers were instructed to be less active, specifically by only imitating their infants' behaviour and vocalizations, rather than by actively trying to stimulate their infants to respond, the infants in turn became more active and attentive in their behaviour and showed less gaze aversion.

In summary, there is a difference in how the turn-taking routine is established. Term infants in this study seemed to be more likely than preterm infants to follow their mother's utterances with vocalizations. In contrast, the mothers of premature infants in this study followed significantly more often their infants' vocalizations during the turn-taking routine. This finding suggests that turn-taking routines are established differently for premature compared with term mother-infant pairs.

If turn-taking is an important framework within which the child's language can grow (e.g. Macnamara 1972; Bruner 1975; Bloom *et al.* 1987) it might be that premature infants are not yet ready to establish the routine and their mothers take over in establishing it. This then might lead to a mother rather

than child-led framework for language development. Menyuk *et al.* (1995), found that the structure of the communicative interaction is instrumental to the differential rates of development in premature and term children. They wrote, regarding the focus of maternal attention and use of maternal directives:

It was not what the mothers said to their children that had an effect on their rate of development but, rather, the structure of the communication interaction that took place. (1995, p. 194)

While the present study did not look at the rate of development of premature and term infants, the results nevertheless support that, at this very early stage in their development, there is a difference in the *structure* of the *interaction* which mothers of premature and term infants impose on the relationship. Mothers of preterm infants in comparison with mothers of term infants were found to impose more structure by following their infant's vocalizations more often. This very rigid interaction might have a detrimental effect on the premature infants' language development, given that the results of this study indicated that they vocalized significantly less frequently in comparison with term infants following their mother's child-directed utterances.

Acknowledgements

We thank the parents and infants for their participation in this project, John Shepherd for his comments on a previous draft of this paper and Melanie Dick and Morag Cruikshank for their coding of the data. We also thank the reviewer for detailed comments and suggestions which have been incorporated in this paper.

References

- Aram, D., Hack, M., Hawkins, S., Weissman, B. & Borawski-Clark, E. (1991) Very-low birthweight children and speech and language development. *Journal of Speech and Hearing Research*, **34**, 1169–1179.
- Bateson, M. C. (1975) Mother-infant exchanges: the epigenesis of conversational interaction. In: *Developmental Psycholinguistics and Communication Disorders* (eds D. Aronson & R. Rieber), New York Academy of Sciences, New York, NY.
- Bloom, K. (1988) Quality of adult vocalizations affects the quality of infant vocalizations. *Journal of Child Language*, **15**, 469–480.
- Bloom, L., Margulis, C., Tinker, E. & Fujita, N. (1996) Early conversations and word learning: Contributions from child and adult. *Child Development*, **67**, 3154–3175.
- Bloom, K., Russell, A. & Wassenberg, K. (1987) Turn taking affects the quality of infant vocalizations. *Journal of Child Language*, **14**, 211–227.

- Bohannon, J. N. & Marquis, A. (1977) Children's control of adult speech. *Child Development*, **48**, 1002–8.
- Brown, J. & Bakeman, R. (1980) Relationships of human mothers with their infants during the first year of life. In: *Maternal Influences on Early Behavior* (eds R. Bell & W. Smotherman), 437–447, Spectrum, New York, NY.
- Bruner, J. S. (1975) The ontogenesis of speech acts. *Journal of Child Language*, **2**, 1–19.
- Crníc, K., Ragozin, A., Greenberg, M., Robinson, N. & Basham, R. (1983) Social interaction and developmental competence of pre-term and full-term infants during the first year of life. *Child Development*, **54**, 1199–1210.
- Field, T. M. (1977) Effects of early separation, interactive deficits, and experimental manipulations on mother-infant face-to-face interaction. *Child Development*, **48**, 763–771.
- Greenberg, M. & Crníc, K. (1988) Longitudinal predictors of developmental status and social interaction in premature and full-term infants at age two. *Child Development*, **59**, 554–570.
- Kaye, K. (1982) *The Mental and Social Life of Babies*. Harvester Press, Brighton.
- Lieven, E. V. N. (1994) in crosslinguistic and crosscultural aspects of language addressed to children. In: *Input and Interaction in Language Acquisition* (C. Galloway & B.J. Richards eds), CUP, Cambridge.
- Macnamara, J. (1972) Cognitive basis for language learning in infants. *Psychological Review*, **79**, 1–13.
- Menyuk, P., Liebergott, J. W. & Schultz, M. C. (1995) *Early Language Development in Full-Term and Premature Infants*. Lawrence Erlbaum, Hillsdale, NJ.
- Observer (1995) Version 3.0. Noldus Information Technology.
- Oller, D. K. (1980) The emergence of the sounds of speech in infancy. In: *Child-Phonology, 1: Production* (eds G. Yenikomshian, J. F. Kavanaugh & C. A. Ferguson). Academic Press, New York, NY.
- Paul, R. (1991) Profiles of toddlers with slow expressive language development. *Topics in Language Disorder*, **11**, 1–13.
- Paul, R. & Alforde, S. (1993) Grammatical morpheme acquisition in 4-year olds with normal, impaired and late developing language. *Journal of Speech and Hearing Research*, **36**, 1271–1275.
- Rescorla, L. (1984) Individual differences in early language development and their predictive significance. *Acta Paedologica*, **1**, 97–116.
- Roth, P. L. (1987) Temporal characteristics of maternal verbal styles. In: *Children's Language*, Vol. VI, (K. E. Nelson & A. van Kleeck eds) Erlbaum, Hillsdale, NJ.
- Sameroff, A. & Chandler, M. (1975) Reproductive risk and the continuum of caretaking causality. In: *Review of Child Development Research*, Vol. 4 (F. Horowitz ed.), University of Chicago Press, Chicago, IL, 187–224.
- Schiefflin, B. B. (1983) Talking like birds: sound play in a cultural perspective. In: *Acquiring Conversational Competence* (E. Ochs & B. B. Schiefflin eds) Routledge & Kegan Paul, London.
- Siegel, S. (1956) *Nonparametric Statistics for the Behavioral Sciences*. McGraw-Hill Kogakusha Ltd, London.
- Thal, D. (1994) Relationships between language and gesture in normally developing and late talkers. *Journal of Speech and Hearing Research*, **37**, 157–170.
- Tomasello, M. & Mannle, S. (1985) Pragmatics of siblings speech to one-year-olds. *Child Development*, **56**, 911–917.
- Trevarthen, C. (1979) Communication and cooperation in early infancy: a description of primary intersubjectivity. In: *Before Speech* (M. Bullowa ed.), CUP, Cambridge, 321–347.