An Experimental Analysis of the Generalization of Descriptions and Praises for Mothers of Premature Infants

Cynthia H. Jacobsen, Catalina S. Starnes and Valerie K. Gasser
The Children's Mercy Hospital, Kansas City, Missouri

Abstract

Premature infants are at risk for speech and language delays. Early patterns of parent language stimulation have been associated with subsequent developmental outcome of prematures. Mothers who do not talk frequently to their premature babies generally have infants who score lower on developmental scales than those babies whose mothers provide frequent language stimulation. This study reviews the effectiveness of an in-hospital training program designed to increase mothers' production of descriptions and praises directed to their infants. Four mothers with low baseline rates of talking to their premature infants were trained to produce descriptions and praises. They were tested for generalized production of these two verbal behaviors following the completion of training. Subsequent to training, mothers significantly increased their frequency of descriptions and praises of the babies' behaviors. The mothers also maintained these skills when tested approximately one month following the completion of training.

Introduction and Rationale for the Study

The primary purpose of this study was to train mothers of premature babies to talk to their infants and to examine whether generalization of trained and untrained behaviors occurs and is maintained one month following completion of training. There is a need to study the effects of short-term parent training in the NICU. Most experimental studies of parent training have involved long term training and home visits at considerable staff time and expense. There is a need to determine whether parents can be trained to provide and maintain appropriate language stimulation while their infants remain in neonatal intensive care.

Preterm infants, particularly those born in disadvantaged families, are at risk for language delay. In a study by Field (1980), low socioeconomic status mothers of preterm infants differed in their verbal interactions with infants. They talked less than middle class and adult parents, and their speech was less contingent on the infant's behavior. They also played fewer speech games with their infants. Parmelee, Beckwith, Cohen, and Sigman (1983) found that both disadvantaged and middle class mothers initially formed a responsive relationship with their medically at risk one month olds, but, by eight months, fewer of the lower class women were able to maintain that relationship. Field (1979) observed parents of full-term and premature infants in a variety of infant games associated with infant learning. The high-risk infant-parent dyads engaged in game playing less frequently than the normal infant-parent dyads. Beckwith and Cohen (1980) found that measures of parent-infant social and language interaction with preterm infants at one month contributed to predictions of child mental test performance at age two.

Premature infants show a variety of behavioral differences which may affect parent interaction particularly in disadvantaged families. Parmelee et al. (1983) studied the behavior of preterms during the first year of life. The infants were found to be awake a shorter period of time, spent a greater percentage of time fussing and crying, and at eight months were less successfully soothed by the mother's interventions. Beckwith and Cohen (1980) found that preterm infants vocalize less than full-term infants during the first three months.

Both risk factors, an infant's prematurity and family psychosocial disadvantage, can contribute to language and developmental delay. However, infants at medical risk for later developmental and behavioral problems can have the risk reduced by changes in the environment (Parmelee et al., 1983). Research suggests that more frequent social and language interactions are linked to increased infant competence by the end of the second year of life (Beckwith & Cohen, 1980; Cohen & Beckwith, 1979).

Determining the most effective way to offer intervention programs for premature infants and their families has been the subject of numerous studies. Intervention programs with parents of prematures have been offered in three arrangements: short-term in hospital; long-term, hospital based; and/or home follow up. Initially, short-term intervention programs were designed for the neonatal intensive care nursery with the aim of improving the premature infant's developmental status rather than working directly with parents. The effects of short-term supplemental stimulation studies have been mixed, suggesting that gains may have been temporary. However, these studies are difficult to interpret because of wide variability in subject selection and procedures employed. While infant stimulation programs have had mixed results, parent training programs also have shown wide variability. In many studies, mothers were not necessarily trained with similar procedures or to similar criterion levels. In addition, maintenance of parent behavior was not evaluated.

Sustained effects have been demonstrated most clearly by programs that have continued parent training and infant stimulation after discharge to the infant's home. However, home training programs with economically disadvantaged mothers are logistically and financially more difficult to manage than hospital based programs. If parent-language training could be effectively provided while mothers were visiting their infants in the intensive care nursery, there would be several advantages. Mothers would learn skills appropriate for early language stimulation and increased bonding. As Minde, Trehub, Carter, Boukyais, Cellhoffer, and Martin (1978) reported in an observational study of mother-child relationships in the premature nursery, mothers who interact most with their infants visit more often and for longer periods of time regardless of socioeconomic status. Descriptors of mothers at risk for failure to attach themselves to their infants correlate with descriptors of mothers of low interaction patterns in the neonatal intensive care nursery.

Developmental Problems in Premature Infants

Preterm infants suffer a variety of medical problems including respiratory distress, sepsis, hypoglycemia, hypocalcemia, apnea, and bradycardia. They frequently require resuscitation at birth. Many of the hazards to which premature infants are exposed can be anticipated to cause brain damage. Braine, Hermer, Wortes, and Freedman (1966) conducted a longitudinal study of the development of a group of over three hundred low socioeconomic status black prematurely born infants during the first fifteen months of life. Their study provided information of the extent to which impairment of development was related to a number of independent variables, many of which have been suspected of being sources of perinatal brain injury. The insult variables were divided into nursery complications and maternal complications. Factors such as hyperbilirubinemia, hypoxia, and neonatal weight loss were in the former group while toxemia, bleeding during labor, and the like were in the latter. A third group of independent variables consisted of mother's education and social status because previous studies had suggested that poor development in some premature infants was a result of poor environmental conditions. A variety of behavioral measures were obtained at four days, six weeks, four months, seven and a half months, and thirteen and a half months. Braine et al. (1966) found that infants weighing less than 1250 grams showed impaired motor developmental quotients on the *Cattell Infant Intelligence Scale* (Cattell, 1940). The mean difference in Cattell gross motor development was over 25 points when compared with term infants. Mental development also was impaired for infants weighing less than 1750 grams with at least 10.7 points difference between preterm and term infants. Social variables were not associated significantly with developmental status for examinations at 4 days, 6 weeks, or 4 months. However, both preterm and term infants were drawn from a low socioeconomic status population.

Of the risk variables, hypoxia and neonatal weight loss were associated with delayed development. The degree of prematurity and the number and severity of risk variables were positively interrelated.

Field, Dempsey, Rydberg, and Shuman (1979) studied developmental assessments of early respiratory distress syndrome (RDS) survivors (first Neonatal ICU Units), more recent survivors of RDS, and their controls. Assessments were made annually through age four for IQ, minimal brain dysfunction, speech, and hearing. The respiratory distress syndrome survivors averaged 32 weeks gestational age, 1700 grams birthweight (S.D. 445 gms.), 2.6 days of intermittent positive pressure respiration, and 37 days hospitalization. The control subjects averaged 39 weeks gestation and 3300 grams birthweight. On the four year outcome assessments, five of the 21 early RDS survivors and four of the later RDS survivors had hearing deficits and language production delays, while none of the control group subjects was impaired.

Nance (1982), in a survey of 100 middle class parents with premature infants now at least two years old, examined speech, language, and/or hearing problems. Twenty families reported that the baby's development was progressing slowly. Twenty-six reported ear infections. Four reported hearing difficulties; four reported speech difficulties.

Prematurity in association with caregiver-child interaction is related to the categorization of premature infants as high or low risk for developmental delay at age two (Sigman & Parmelee, 1979). Sigman and Parmelee (1979) found that the developmental risk score of prematures was related to parent language background and socioeconomic status.

In summary, prematurity, in association with medical complications, can affect the developmental status of infants. The degree of handicap depends upon the severity of complications and social risk factors.

Effects of Short Term Auditory Stimulation Programs

The rationale for auditory stimulation programs derives from the fact that babies influence the kinds of interaction that occur with caregivers. Alert active babies make it easier for mothers to respond to them. Therefore, some researchers have studied the effects of providing early sensory stimulation to prematures. Auditory stimulation has included recordings of heartbeat, recordings of mother's voice, and/or music (Katz, 1971). Auditory stimulation has been provided in combination with tactile, kinesthetic, and visual stimulation (Chapman, 1978; Scarr-Salapetek & Williams, 1972; Segall, 1972).

Short-term auditory stimulation programs have been initiated as soon as possible after birth and have continued either until the infant attains term gestational age, regains birthweight, or is discharged. The amount, duration, and timing of stimulation has varied across studies. Subject populations

differed in variables such as birthweight and gestational age. In some studies, there were matched controls, while in others, subjects were randomly assigned to treatment groups.

Dependent variables have included growth measures, heart rate activity level, sleep-wake state organization, and developmental performance on scales such as the Graham-Rosenblith (Graham, 1956; Rosenblith, 1961), Dubowitz, Dubowitz, and Goldberg (1976), or Brazelton NBAS (Brazelton,1973). Results of the auditory stimulation programs are mixed. Some benefits cited included better weight gain (Scarr-Salapetek & Williams, 1972), better developmental assessment scores (Katz, 1971; Scarr-Salapetek & Williams, 1972), and more quiet sleep (Katz, 1971). Scarr-Salapetek and Williams (1972) used an infant enrichment program including increased handling, mobiles, talking, and rocking. Katz (1971) and Segall (1972) exposed premature infants to a tape recording of mother's voice. In Segall's study, infants receiving auditory stimulation reportedly performed better on tasks requiring orienting, demonstrating more auditory exploration.

In summary, there is a trend for infants in short-term auditory stimulation programs to score higher on developmental indices, but the results are not conclusive. There is insufficient data to describe the mechanisms and causal relationships between stimulation and outcome (Cornell & Gottfried, 1976).

Effects of Parent Training Programs

The rationale for parent training is derived from the risk factors of the mother's low socioeconomic status or low educational achievement level. In addition, parents of premature babies often feel helpless and confused, and uncertain about what interaction is appropriate with their tiny infant (Nance, 1982). Mothers' early interaction patterns with preterm infants appear to persist beyond infancy and may relate to infants' later language production (Field, 1979; Parmelee et al., 1983). Teenage mothers have been found to be less verbal in their interactions with their infants (Sandler, Vietze, & O'Connor, 1981). Since parents have the responsibility for management of their premature infant after discharge, acquisition of skills to enhance language could be useful for home as well as in the hospital.

Widmayer and Field (1980) studied the effects of Brazelton demonstrations on early interactions of preterm infants and their teenage mothers. Field (1977) previously observed that instructions to the mother to modify her activity tend to increase maternal sensitivity to the interactional signals and rhythms of the preterm infant, and to enhance responsivity as well as reduce gaze averting of the infant. In the 1980 study, Widmayer and Field demonstrated the administration of the Brazelton Scale to each of the preterm infants in the presence of the mother. After completion of the assessment, and at each of four subsequent weeks, the mothers were asked to complete a form entitled the *Mother's Assessment of the Behavior of the Infant* (MABI) (Field, Dempsey, Hallock, & Shuman, 1978). These infants were compared on the MABI scale to other preterm and term infants who also were administered the Brazelton at birth and at a one month home follow-up visit.

At the one month follow-up, mothers were assessed for the proportion of time spent vocalizing to infants and the proportion of time that the infants' gaze averted. The four subject groups included a term control, preterm control, preterm MABI, and a preterm Brazelton and MABI. The mothers of the last group, preterm Brazelton and MABI, spent more time vocalizing to their infants and the infants spent less time averting the gaze of the mother following the training program.

Field (1977) studied the effects of experimental manipulations on infant-mother face-to-face interaction. Premature and postmature infants with low Brazelton interaction scores and normal infants were observed 3 1/2 months post expected delivery date for the percentage of interaction time that the infant gazed at the mother and the percentage of infant gaze time that the mother was active. Mothers were videotaped under two experimental conditions: (1) trying to get the infant's attention; and (2) imitating the infant's behavior. A spontaneous condition also was videotaped. Infants gazed more at their mothers when the mothers imitated the infant's behavior, than when they tried to make the infant pay attention. There were no differences between pre- and postmature infants.

Brown, LaRossa, Aylward, David, Rutherford and Bakeman (1980), however, did not obtain effects from short-term intervention. These investigators conducted a nursery based intervention program with premature infants designed to compare the effects of three conditions: infant stimulation by staff, no stimulation, and mother training. The infant stimulation group received approximately one hour daily of tactile, vestibular, auditory, and visual stimulation. The mother training group received from one to four training sessions in the stimulation program from the project nurse. The quality of mother-infant interaction was assessed by frequency of visits and by mother-infant interaction as measured on several scales. In addition, the infant's developmental status was assessed on the *Bayley Scales of Infant Development* (Bayley, 1969) subsequent to discharge. The project nurse experienced many difficulties in conducting parent training. It was difficult to get the the parents to the hospital for training. No differences were found on any measures.

Long-term Parent Training Programs

There have been a number of parent education programs providing longer term training either in the hospital or at home. Williams and Scarr (1971) trained disadvantaged mothers of low birth weight children in each of four age groups to provide infant stimulation and assessed the child's social maturity, motor development, and receptive vocabulary prior to and following intervention. Four groups of children, ages 0-1, 1-2, 2-3, and 3-4, were assigned to either a three times weekly

tutoring program, a toys only program, or a control program. The general program of parent training that was provided was based upon the child's age group. In addition, test results were examined in light of the child's neurologic status. Results indicated that among neurologically impaired children, only those who received tutoring showed gains in motor development. Conversely, only the neurologically intact group showed gains on Peabody receptive vocabulary at ages three and four. In general, test scores were lower in homes of very disadvantaged families regardless of the infant's status. The tutoring program was effective particularly in improving the verbal status of neurologically intact children. No treatment effect was seen with the provision of educational materials alone.

Scarr-Salapetek and Williams (1972) and Field, Widmayer, Greenberg, and Stolber (1982) studied the effects of parent training on infant growth and development. The first authors trained single low socioeconomic status mothers of low birth weight infants to stimulate their infants. The home stimulation program included visual, auditory, and tactile stimulation. Mothers also were provided with educational materials and toys. At one week and at four weeks, infants were administered the Brazelton scale (Brazelton, 1973). At one year of age, a pediatric assessment and the *Cattell Infant Intelligence Scale* (Cattell, 1940) were administered. The experimental group at four weeks showed greater alertness to sound. At one year, the experimental infants scored nearly 10 points higher on the Cattell.

Field, Widmayer, Stringer, and Ignatoff (1980) assessed the effects of a home based early intervention program for teenage lower class black mothers on the infant's growth and mother-child interactions. Teen, adult, term, and preterm groups were compared. Biweekly home visits were provided to teach the mothers exercises and age appropriate stimulation. Auditory stimulation items during home visits included exercises from the auditory items of the Brazelton (Brazelton, 1973) and singing to the infant. Follow-up developmental assessments were made at four months and eight months using the *Bayley Scales of Infant Development* (Bayley, 1976), the *Caldwell Home Stimulation Inventory* (Caldwell, 1964), and the *Carey Infant Temperament Questionnaire* (Carey, 1973). The preterm infant, in comparison with the term infant, had lower weight and length measures and lower *Denver Developmental Screening Test* scores (Frankenburg & Dodds, 1967) at four months, but, by eight months, there were no significant differences. The mothers in the preterm intervention group had more realistic developmental expectations (Caldwell, 1964).

Field (1981) provided parent training in two settings and studied the growth and development of infants of teenage mothers. There were two intervention groups, one group received a home program while parents in the other group received employment in a daycare and training at the hospital. In the home intervention program, six months of biweekly visits were provided to train mothers in infant stimulation (care-taking, and sensorimotor and mother-infant interaction exercises). In the second group, the intervention program was provided at the hospital. The teenage mothers worked after school as teacher's aides in an infant nursery in which their children were enrolled. The mothers in this group were trained in the same infant stimulation exercises, but also were exposed to modeling of child-care techniques by the day care staff. A third control group of mothers also was followed. The growth and development of these three infant groups, their interactions with their mothers, the mother's knowledge of growth and development, and the mother's attitudes toward child rearing were assessed at four, eight, and 12 months, and at two years. Results showed that both the home and day care intervention groups weighed more, obtained better *Denver Developmental Screening Test* scores (Frankenburg & Dodds, 1967) and temperament ratings (Carey, 1973), and had higher ratings on mother-child interactions. The infants of the nursery intervention program eventually showed the greatest improvement in mental and motor development.

In another study, Field, Dempsey, Rydberg, and Shuman (1979) provided seven home training sessions to teenage mothers to promote infant sensorimotor and cognitive development. At four months of age, the preterm intervention infants were compared with the nonintervention group. The intervention preterm infants showed greater weight and height gains. The mothers' assessment of developmental milestones was more realistic. Mothers were more active during face-to-face interactions with their infants.

In summary, studies of the effects of longer-term parent training programs have demonstrated beneficial results for infant motor and mental development, and for parent-child interactions. However, some of these results may not appear on formalized tests for the first year of life because the child has not yet acquired sufficient expressive language to affect test scores. Results of short-term parent intervention programs are less clear. It is uncertain whether parent training in the nursery is sufficient for effecting a change in parent behavior or whether outcome measures on the infants cannot measure the effects of training in that time period. The focus of this study, therefore, was to investigate the effectiveness of a training program, provided during the infant's hospitalization, on modifying parent language stimulation.

Method

The purpose of this study was to investigate parent acquisition, generalization, and maintenance of verbal behavior with premature infants when mothers were trained by the examiner. Specifically, this study measured the effectiveness of a training program designed to train mothers to increase the frequency of use of descriptions and praises when talking to their premature infants. The study included mothers of premature babies who

had low baseline occurrences of descriptions and praises when talking to their infant. The following questions were investigated.

1. Will correct production of descriptions in training sessions generalize to untrained probes?

2. Will correct production of praises in training sessions generalize to untrained probes?

3. Will mothers maintain production of descriptions and praises when probed one month following the completion of training?

Subjects

Four mothers of premature infants who did not describe or praise their premature infant's behavior in more than three of 36 five-second intervals sampled at each of three baseline observations were chosen as subjects. Potential subjects were identified from the mothers of premature infants at Truman Medical Center (TMC) or Children's Mercy Hospital (CMH). Three mothers had babies hospitalized at Children's Mercy Hospital and one at Truman Medical Center. Mothers were selected from those who met the following criteria.

1. The mother had no other children living at home.

2. The mother was between 15 and 25 years of age.

3. The mother was not employed at the time of the study.

4. The mother had completed the ninth grade but had no more than one year of schooling beyond the high school diploma.

5. The mother had transportation to visit her infant.

6. The mother had visited her infant at least twice prior to the study.

A description of the subjects is found in Table 1.

Table 1. Subject characteristics.

SUBJECT	AGE	EDUCATION	PARA	# VISITS INFANTS PRIOR TO STUDY	MARITAL STATUS
1	15	9th	3[1]	21	S
2	17	GED	1	23	M
3	20	High School diploma	1	17	M
4	23	High School diploma vocational training	2[3]	N.A.[2]	S

Note: [1]Subject 1 had given up first child, now had twins.
[2]Subject 4 mother was still in hospital.
[3]Subject 4 had given first child to grandparent.

The mothers' infants met the following criteria.

1. Birthweight less than 2000 grams.

2. The infant had no overt physical anomalies requiring surgery.

3. The infant was scheduled to remain in the nursery at Truman Medical Center or Children's Mercy Hospital.

4. The infant was stable and growing according to the physician.

5. The infant was at least three days old.

A description of the infants is found in Table 2.

Table 2. Infant characteristics.

	1	2	3	4
Birthweight (gms)	996	1,770	1,620	1,360
Hearing Screen	Pass	Pass	Pass	Did not test
Gestation (weeks)	24	34	32	31
Apgars	1'5	8'7	4'7	8'9
Length of Stay (days)	119	30	32	61
Diagnoses	VLBW Apnea Bradycardia RDS	RDS Hyperbili-rubinemia Apnea Anemia	RDS Apnea Bradycardia Anemia Retinopathy mild	Grade 3 IVH Hydrocephalus Bradycardia

Design

A single subject multiple baseline design across target verbal behaviors was used in this study. The dependent variable was the mother's average number of sampling intervals containing descriptions and/or praises during three minute baseline or probe sessions. The independent variable involved parent language training on the two verbal behaviors by the examiner. Figure 1 illustrates the design used with these four subjects.

Figure 1. Experimental design used in the study.

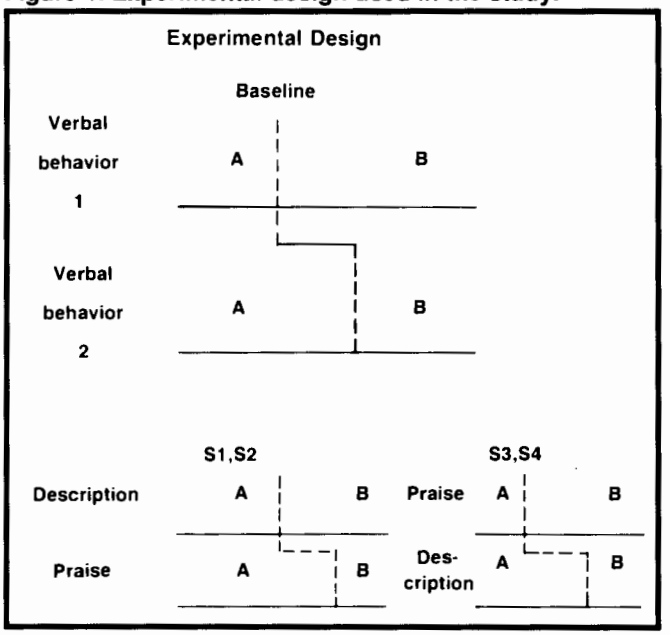


Figure 1 shows the two behaviors trained: verbal behavior one, description, and verbal behavior two, praise. The order of verbal behavior training was counterbalanced across subjects. As shown in the lower part of the figure, subjects 1 and 2 received training first on description followed by training on praise. Subjects 3 and 4 first received training on praise,

followed by training on description. There were two phases of the study. In phase A, baseline was taken on frequency of description and praise to establish the level of these behaviors prior to training. In phase B, descriptions and praises were trained by the examiner. The dotted line in Figure 1 separating the A and B phases indicates that one verbal behavior was trained while the other was tested creating the multiple baseline design. Following completion of verbal behavior one training, the second verbal behavior was trained.

Training Procedures

Each mother was trained to produce two verbal behaviors when talking to her infant in the intensive care nursery. Training was initiated to teach acquisition of the behavior and, then, was shifted to encourage spontaneous productions once the behavior was acquired.

Examiner Pretraining

The examiner who provided parent training was a speech aide with a B.A. in speech-language pathology. The observers were two speech-language pathologists.

Prior to the baseline phase, the examiner administered two sample training sessions, one teaching each verbal behavior to a mother who was not a subject in the study. Another speech-language pathologist agreed that the examiner modeled descriptions and praises accurately. Also, prior to baseline, the examiner and the two reliability observers practiced coding mothers' productions of descriptions and praises until 90% agreement was obtained.

Training Description or Praise

Individual training sessions were conducted by the examiner over a several day period and averaged 15 minutes in length. Each training session consisted of 100 stimulus-response trials. The 100 trials were divided into ten sets of ten trials. A training trial was one in which either: (1) the examiner modeled the verbal behavior to be spoken and the mother produced a description or praise; or (2) the mother spontaneously produced a description or praise.

The mother's correct responses were followed by verbal reinforcement from the examiner on a fixed ratio 3 schedule. Incorrect responses were followed by the examiner's model of what the target behavior should be. If there was no response from the mother for approximately ten seconds, then the examiner modeled the target behavior and asked the mother to imitate it. Then, the next training trial was presented. A plus was recorded for a correct imitative or spontaneous production. Other verbal behavior or lack of response was scored with a minus. Training sessions were held at the isolette for three of the mothers and in the Parent Care Unit of the Hospital (infant's room) for one mother. Three of the four babies were able to be removed from the isolette for brief periods during training. For three of four subjects, some training occurred while the infants were in the mother's arms.

Each mother was trained to produce two verbal behaviors. Since the two verbal behaviors were trained using identical procedures, training for one behavior only will be described in detail. For purposes of this study, a correct response was defined as a two or more word phrase or sentence describing or praising the infant's activity (motor or vocal), location, state, parental love, or future activity, spoken with falling intonation and directed at the infant.

Training consisted of three steps. During *Step 1*, the mother was trained to imitate the examiner's verbal behavior. The mother was told that she was going to learn a way to talk to her infant and that she would receive assistance from the examiner. She also was told that the method of talking to her baby would help her baby learn to talk. The examiner modeled the verbal behavior and requested the mother to imitate her. The examiner modeled one of 50 descriptions or 50 praises from a list of possible choices. Correct verbal response by the mother was followed by a random choice from one of ten preselected verbal reinforcements delivered on the fixed ratio 3 schedule. The descriptions and praises modeled by the examiner are listed in Appendices A and B; the verbal reinforcers used with the mothers are listed in Appendix C. Correct imitation was defined as a description or praise matching the examiner's content. Criterion for this training step was the correct imitation of ten consecutive verbal behaviors in two successive training sets. Following step 1, an unreinforced probe was administered.

Step 2 consisted of training the mother to produce some descriptions or praises spontaneously. The examiner presented a verbal behavior to be imitated, then, requested that the mother spontaneously produce the next description or praise. Each third correct response, either description or praise, was verbally reinforced. Incorrect responses were followed by suggestions to the mother such as, "Turn it around" or "Let's think of another one, that's a question" and by an examiner's model of a description or praise matching as closely as possible the content of the mother's utterance. If the mother made no response for 10 seconds, the examiner said something such as, "You could say you look better today" and then requested the mother to imitate. The examiner then continued with the next trial. Criterion for this step was eight out of ten correct productions of descriptions or praises in two consecutive training sets. Following training step 2, an unreinforced probe was administered.

Spontaneous production of descriptions or praises was trained in *Step 3*. The mother was trained to produce the target verbal behavior spontaneously. The examiner instructed the mother that she was ready to talk to her infant on her own. She was requested to say 100 descriptions or praises spontaneously. Correct production of the target verbal behavior was reinforced as in previous steps. Criterion for this step was correct production of eight out of ten descriptions or praises in two consecutive training sets. Following criterion an unreinforced probe was administered.

Training the Second Verbal Behavior

Training of the second verbal behavior was identical to the first. The second behavior was trained to the same criterion levels for all steps. After training was completed, the examiner instructed the mother to practice the two verbal behaviors in the nursery when the infant was awake and 15 minutes daily after the infant went home. Both the mother and child were given presents. The mother was then given written instructions summarizing language stimulation in the neonatal intensive care nursery. Following receipt of written instructions and presents, the mother was told she would be seen in one month. Additional presents would be available at that time.

Maintenance Testing

An unreinforced probe was administered to the mother at the one-month follow-up visit. She was observed with the infant held in her position of choice but within 10 inches of her face.

Measures During Baseline

Two types of mother behaviors were measured during baseline, descriptions and praises. Baselines consisted of three minute timed samples. In the three minute sample, 36 five-second intervals were coded as to the occurrence of descriptions and/or praises. The average number of intervals in the three minutes which contained descriptions or praises was recorded as the baseline rate for each of three baseline sessions.

Measures During Probes

During probes, each mother was tested for unreinforced production of descriptions and praises. The term unreinforced verbal behaviors refers to the mother's spontaneous productions of descriptions and praises during baseline and probes. No consequent event followed the mother's descriptions and praises during these sessions. A three-minute unreinforced probe interval was administered following the completion of each training step and also at the one month follow-up visit.

For scoring purposes the probe score sheet was divided into 36 five-second intervals. Each description or praise spoken by the mother was coded into the appropriate time interval at the end of each interval. The dependent variable was the average number of intervals in which descriptions or praises were spoken in a three minute timed sample. Each interval was counted once per behavior, but one interval could contain more than one type of verbal behavior. The average number of intervals containing descriptions or praises per minute was based on the examiner's score sheet.

Reliability

Interjudge reliability was computed in this study for mothers' responses during baseline and probe intervals and for one training session. An interval-by-interval method of comparing scores was used to derive a percentage of agreement between the examiner and the reliability observers. The number of agreements was divided by the total number of agreements and disagreements and then multiplied by 100 percent. A percentage of agreement was computed for each subject at each baseline, probe, and maintenance session.

Interjudge reliability for the training session was 100 percent. Interjudge reliability for baseline sessions and generalization probes was 90 to 100 percent with a mean of 97.6 percent.

Results

Analysis of Training

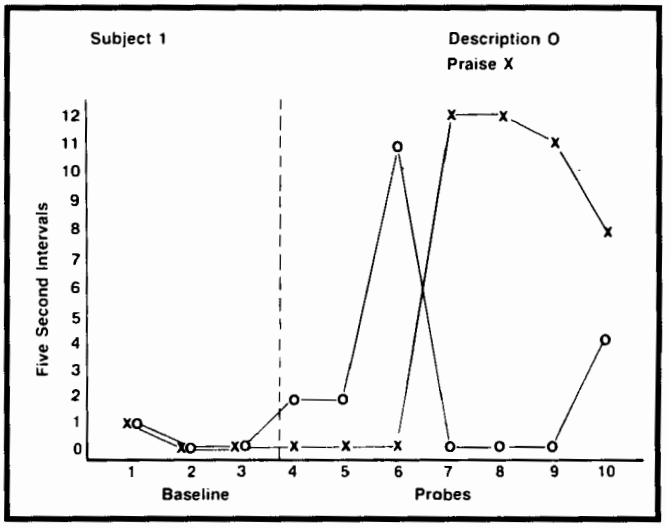
All subjects acquired both descriptions and praises during training, meeting the training criterion at each step. The multiple baseline design was maintained. Changes in production of the second behavior occurred only when the training procedures were applied to it.

Generalized Production of Descriptions and Praises

As discussed in the methods section, generalization probes for descriptions and praises were administered at the completion of each training step. In Figures 2, 3, 4, and 5, baseline sessions and generalization probes are numbered consecutively at the bottom of the graph. Baseline sessions 1, 2, and 3, were administered prior to training. Probe 4, was administered following imitation training; probe 5, following imitation and spontaneous training; and probe 6, following training of spontaneous production. Probes 7 through 9 were administered for the second target behavior in the same manner. Probe 10 was administered one month following completion of the study.

Data for subject 1 for descriptions and praises are shown in Figure 2. During the three baseline probes, there was one correct praise and one correct description. Subject 1 reached description generalization criterion on probe 6 following step 3, training of 100 spontaneous descriptions. Production of

Figure 2. Number of intervals containing descriptions and praises on each baseline measure and generalization probe for subject 1.



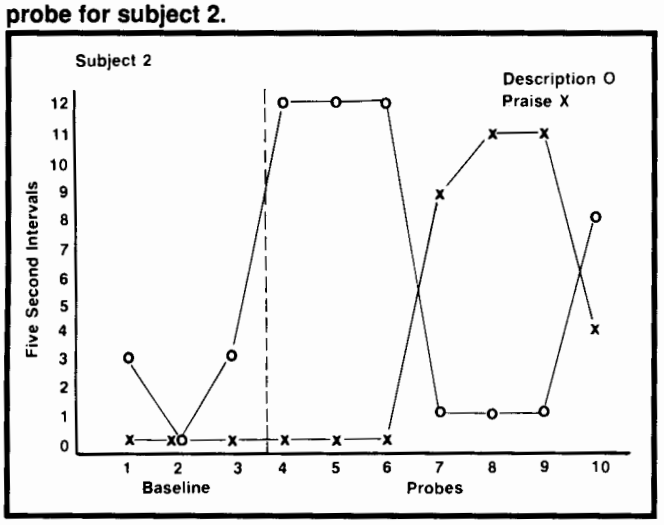
descriptions was not maintained after training began on the second target behavior, praises. The subject reached generalization criterion on praises on probe 7 following step 1, imitation training, and continued to maintain criterion on subsequent probes as additional training steps were provided. As the data show, subject 1 showed generalization of both descriptions and praises to untrained probes; however, generalization of the first behavior was not maintained after training was provided on the second behavior. Only one behavior was produced during a probe session, either descriptions or praises.

Subject 1 returned for maintenance testing seven weeks after completion of training. She had run away from the local juvenile justice center and had not been at the hospital to visit either of her twin infants prior to that time. Data for probe 10 (shown in Figure 2) indicate that subject 1 met the generalization criterion for praise, maintaining almost eight intervals per minute with praises for the three minute probe. Production of descriptions occurred in nearly four intervals per minute, well above baseline.

Data for subject 2 for descriptions and praises are shown in Figure 3. In baseline, there were no praises, while production of descriptions ranged from zero to three. Subject 2 generalized production of descriptions and praises to untrained probes on probes 4 and 7, following completion of imitation training for each behavior. However, when the subject was trained to produce praises, the second target behavior, production of descriptions decreased to baseline levels.

Maintenance data is shown in probe 10. Subject 2 showed generalized productions of descriptions at the one-month follow-up visit. She produced descriptions in an average of eight of 12 intervals. Praise production was increased from baseline to an average of four intervals per minute. Since twelve

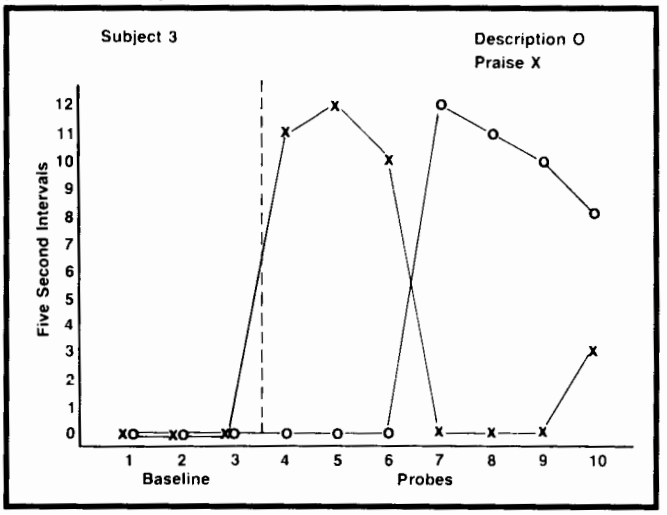
Figure 3. Number of intervals containing descriptions and praises on each baseline measure and generalization probe for subject 2.



intervals were scored per minute, the mother was producing either a description or praise in each available interval.

Data for subjects 3 and 4 are displayed in Figures 4 and 5. These subjects were trained first on praise, followed by training on description. During baseline, subject 3 produced no correct productions of descriptions or praises. However, after training on praise was completed, the subject reached generalization criterion on probe 4, the first generalization probe, and maintained criterion during subsequent praise training sessions. During training of descriptions, production of praises decreased to baseline levels. However, the subject generalized production of descriptions on probe 7, following imitation training. Correct production was maintained on probes 8 and 9. Following a one month hiatus in training, probe 10 was administered to assess maintenance. Subject 3 produced de-

Figure 4. Number of intervals containing descriptions and praises on each baseline measure and generalization probe for subject 3.

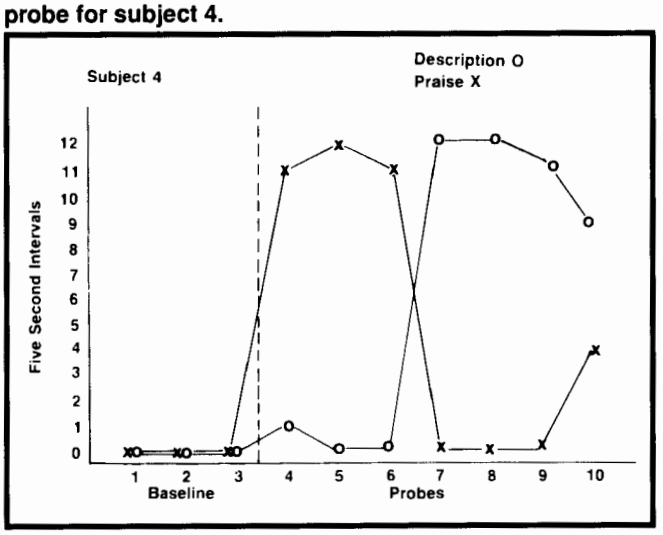


scriptions in an average of eight intervals per minute, maintaining generalized use of descriptions. An average of three intervals per minute contained praises. Although this mother was trained on praises first, the maintenance data show a predominance of descriptions.

Subject 4's performance (see Figure 5) was similar to subjects 1 and 3. The subject attained generalization criteria. No descriptions or praises were produced during baseline. During praise training, subject 4 attained generalization criterion on probe 4, following completion of imitation training, and maintained criterion on probes 5 and 6. Correct production of praises was not maintained during description training.

Maintenance testing for subject 4 occurred two months following completion of training because the mother did not

Figure 5. Number of intervals containing descriptions and praises on each baseline measure and generalization probe for subject 4.



return for the one-month follow-up. Probe 10 data show that subject 4 produced an average of eight descriptions and four praises per minute on the final probe as compared with none at baseline. Subject 4 showed generalized production of descriptions.

Summary

Results were similar across all four subjects. All subjects generalized production of descriptions and praises to untrained probes. Three of the four subjects generalized to probes following imitation training for the first behavior trained, while all generalized following imitation training for the second target verbal behavior. None of the subjects maintained the first behavior trained, while the second behavior was in training. However, following instructions to practice both verbal behaviors, subjects maintained generalization of either descriptions or praises in maintenance probes. Three of the four subjects produced more descriptions than praises, but both verbal behaviors were well above baseline levels.

Discussion

The first question investigated in this study was concerned with the ability of mothers of premature infants to generalize spontaneous production of description to unreinforced probes. Three of the four mothers trained generalized correct description usage for eight of 12 intervals sampled per minute in a three-minute probe following completion of one training session. One mother, however, required three training sessions before attaining generalization. This subject was different from the other three. She was an adolescent (age 15), in juvenile detention, had the least education, visited only when brought by a social worker, and was not planning to take her children (twins) home. She also was trained over seven days spanning a three week training period, while other subjects were trained over two to four different days spanning less than a 10 day period. Anecdotal reports by nurses suggested that subject selection variables other than the training procedure may have affected the length of training prior to generalization.

The second question was concerned with generalization of praise to unreinforced probes. All subjects increased production of praises during probes following imitation training, including subject 2. For subject 2, praise training was the second behavior trained.

Mothers increased the frequency and variety of verbalization directed at their infant only when training procedures were applied. The training program was accomplished during the infant's hospitalization. Although mothers only produced one behavior during probes, either description of praises, both behaviors were observed during maintenance testing.

The third question was concerned with maintenance of descriptions and praises during a follow-up visit approximately one month after completion of training. For two of four mothers, the infants had been discharged to the home, while two were still hospitalized. The mothers of the two hospitalized infants had not visited their infants during that time.

Mothers maintained correct productions of descriptions regardless of which behavior was trained first. They showed increased productions of both behaviors, producing one of the two verbal behaviors at generalization levels. In order to have generalized both behaviors, the mothers would have had to produce more than one verbal behavior per five-second interval. This did not occur.

Although all mothers successfully generalized correct use of descriptions and praises, a number of variables made it difficult to conduct this kind of training in the neonatal intensive care nursery. Mothers with low baseline rates of talking to their babies either visited infrequently or at unscheduled times. Several were unreliable at maintaining follow-up appointments, and two additional subjects initially entered into the study were lost due to lack of return for follow-up appointments. The health status of the baby was sometimes a factor such that training was deferred on one occasion at medical request. Tangible motivators for both mothers and infants appeared to be necessary for obtaining a mother's participation, but social support also appeared to be important. Once training was finished, the alertness or social responsiveness of the infant to the language stimulation appeared to motivate some of the mothers to participate. Due to the unscheduled nature of parental visits, nursing support was critical for notification of parent visits.

Training appeared to be most feasible when provided over a two day period. Because training sessions were brief, mothers could be provided several training sessions in one day, thereby reducing the number of trips the parent was required to make to the hospital.

In summary, an in-hospital training program was effective in increasing mothers' use of descriptions and praises when speaking to their infants. Mothers maintained correct productions when tested approximately one month following the completion of training. Future research might be directed at maintenance of the language stimulation over a longer period of time.

Acknowledgments

This paper was supported in part by a grant from the William Randolph Hearst Foundation. Special thanks to Donna K. Daily, M.D. and Robert T. Hall, M.D. and the staff nurses of the Neonatal ICU at The Children's Mercy Hospital and Truman Medical Center. The author is grateful to the mothers for their participation.

Address all correspondence to:
Cynthia Jacobsen, Ph.D.
Director, Hearing and Speech Department
The Children's Mercy Hospital
Twenty-Fourth at Gillham Road
Kansas City, MO 64108

References

Bayley, N. (1969). *Bayley scales of infant development*. New York: Psychological Corp.

Beckwith, L., & Cohen, S. E. (1980). Interactions of preterm infants with their caregiver and test performance at age 2. In T. M. Field (Ed.), *High risk infants and children* (pp.155- 177). New York: Academic Press.

Braine, M. D. S., Hermer, C. B., Wortes, H., & Freedman, A. M. (1966). Factors associated with impairment of the early development of prematures. *Monographs of the Society for Research in Child Development, 31*, (Whole).

Brazelton, T. B. (1973). *Neonatal behavioral assessment scale*. London: Spastics International Medical Publications.

Brown, J. V., LaRossa, M. M., Aylward, G. P., David, D. J., Rutherford, P. K., & Bakeman, R. (1980). Nursery-based intervention with prematurely born babies and their mothers: Are there effects? *Pediatrics, 97* (3), 487-491.

Caldwell, B. (1964). Mother-infant interaction during the first year of life. *Merrill-Palmer Quarterly, 10*, 119-128.

Carey, W. B. (1973). Measurement of infant temperament in pediatric practice. In J. C. Westman (Ed.), *Individual differences in children*. New York: John Wiley and Sons.

Cattell, P. (1940). *The measurement of intelligence of infants and young children*. New York: Psychological Corp.

Chapman, J. S. (1978). The effect of pre-term infants' decreasing mortality on their future morbidity: Preliminary examination of long-term outcomes of stimulation programs for pre-term infants. *Nursing Papers, 10* (3), 31-54.

Cohen, S.E., & Beckwith, L. (1979). Preterm infant interaction with the caregiver in the first year of life and competence at age two. *Child Development, 50*, 767-776.

Cornell, E. H., & Gottfried, A. W. (1976). Intervention with premature human infants. *Child Development, 47*, 32-39.

Dubowitz, L. M., Dubowitz, V., & Goldberg, C. (1970). Clinical assessment of gestational age in the newborn infant. *Journal of Pediatrics, 77* (1).

Field, T. M. (1977). Effects of early separation, interactive deficits and experimental manipulations on infant-mother face-to-face interaction. *Child Development, 50*, 767-776.

Field, T.M. (1979). Games parents play with normal and high risk children. *Child Psychiatry and Human Development, 10:1*, 41-48.

Field, T. M. (1980). Interactions of preterm and term infants with their lower and middle class teenage and adult mothers. In T. M. Field (Ed), *High risk infants and children* (pp. 113-133). New York: Academic Press.

Field, T. M. (1981). Early development of the preterm offspring of teenage mothers. In K. O. Scott, T. M. Field, & E. G. Robertson (Eds.), *Teenage parents and their offspring* (pp. 145-175). New York: Grune and Stratton.

Field, T., Dempsey, J., Hallock, N., & Shuman, H. H. (1978). Mother's assessment of the behavior of their infants. *Infant Behavior Development, 1*, 156-167.

Field, T. M., Dempsey, J. R., & Shuman, H. H. (1979). Developmental assessments of infants surviving the respiratory distress syndrome. In T. M. Field, A. Sostek, S. Goldberg, & H. H. Shuman (Eds.), *Infants born at risk; Behavior and development*. New York: Spastic Publications.

Field, T. M., Widmayer, S., M., Stringer, S. & Ignatoff, E. (1980). Teenage, lower-class black mothers and their preterm infants. An interaction and developmental follow- up. *Child Development. 51*, 426-436.

Field, T., Widmayer, S., Greenberg, R., & Stolber, S. (1982). Effects of parent training on teenage mothers and their infants. *Pediatrics, 69* (6), 703-707.

Frankenburg, W. K., & Dodds, J. B. (1967). The Denver Developmental Screening Test. *Journal of Pediatrics, 71*, 181-185.

Graham, F. (1956). Behavioral differences between normal and traumatized newborns, I: The test procedures. *Psychological Monographs, 70* (Whole).

Katz, V. (1971). Auditory stimulation and developmental behavior of the premature infant. *Nursing Research, 20*, 196-201.

Minde, K., Trehub, D., Carter, C., Boukyais, C., Cellhoffer, L., & Martin, P. (1978). Mother-child relationships in the premature nursery. An observational study. *Pediatrics, 61* (3), 368-378.

Nance, S. (1982). *Premature babies, a handbook for parents*. New York: Arbor House.

Parmelee, A. H., Beckwith, L., Cohen, S. E., & Sigman, M. (1983). Social influences on infants at medical risk for behavioral difficulties. In J. D. Call, E. Galenson, & R. L. Tyson (Eds.), *Frontiers of infant psychiatry* (pp. 247-255). New York: Basic Books.

Rosenblith, J. F. (1961). The modified Graham Behavior Test for Neonates: Test-retest reliability, normative data and hypotheses for future work. *Biology of the Neonate, 3*, 174-192.

Sandler, H. M., Vietze, P.M., & O'Connor, S. (1981). Obstetric and neonatal outcomes following intervention with pregnant teenagers. In K. G. Scott, T. Field, & E. G. Robertson (Eds.), *Teenage parents and their offspring*. New York: Grune and Stratton.

Scarr-Salapatek, S., & Williams, M. L. (1972). A stimulation program for low birthweight infants. *American Journal Public Health, 62*,(5), 662-667.

Segall, M. (1972). Cardiac responsivity to auditory stimulation in premature infants. *Nursing Research, 21*, 15-19.

Sigman, M., & Parmelee, A. H. (1978). Longitudinal evaluation of the preterm infant. In T. Field (Ed.), *Infants born at risk, behavior and development* (pp. 193-215). New York: Spastic Publications.

Tjossem, T. (1976). Early intervention: issues and approaches. In T. Tjossem (Ed.), *Intervention strategies for high risk infants and young children* (pp. 3-32). Baltimore: University Park Press.

Widmayer, S. M., & Field, T. M. (1980). Effects of Brazelton demonstrations on early interactions of preterm infants and their teenage mothers. *Infant Behavior and Development, 3*, 79-89.

Williams, M. L., & Scarr, S. (1971). Effects of short-term intervention on performance in low birth-weight disadvantaged children. *Pediatrics, 47*, (3), 289-298.

Appendix A

Descriptions of Premature Infants' Behavior Used In the Training Program

1. You opened your eyes.
2. You wiggled your toes.
3. You're stretching and yawning.
4. You're sucking your thumb.
5. You're in your isolette.
6. You're on top of your blanket.
7. You're lying on your side.
8. You're lying on your tummy.
9. You're wearing your hat.
10. You're sleepy.
11. You look cranky today.
12. You look happy today.
13. You look tired.
14. You're wearing a diaper.
15. You opened your hand.
16. You're smiling.
17. Your color looks good today.
18. You're looking at mommy.
19. You're being good today.
20. You're drinking your bottle.
21. You're sucking your pacifier.
22. You look cold.
23. You look warm.
24. You sneezed.
25. You wiggled your finger.
26. You've got a tube down your throat.
27. You've got an IV in your arm.
28. You have two eyes.
29. You have a nose.
30. You have a mouth.
31. You have two ears.
32. You have soft hair.
33. You have two arms.
34. You have two hands.
35. You have ten little fingers
36. You have ten toes.
37. Your legs are so long.
38. Your legs are so tiny.
39. You have such a little body
40. You look like mommy
41. You look like daddy.
42. You're so far down in your isolette.
43. Such a big stretch.
44. You have tiny hands.
45. Your skin is so soft.
46. You have hair on your back.
47. You're wet.
48. You're dry.
49 Your fingernails are so long.
50. You're wide awake.

Appendix B

Praises of Premature Infants' Behavior Used in the Training Program

1. You're such a good baby.
2. You're so beautiful.
3. You're doing a good job.
4. You look bigger today.
5. You're growing so fast.
6. You're such a great baby.
7. You're wonderful.
8. You're great.
9. You're such a pretty (handsome) baby.
10. You have such pretty eyes.
11. You have such pretty hair.
12. You have such pretty hands.
13. You have such cute toes.
14. You have such pretty lips.
15. I like the way you're drinking your bottle.
16. I like the way you wiggle your toes.
17. I like the way you stretch.
18. Mommy loves you.
19. Mommy is so happy to see you.
20. I am so proud of you.
21. You're terrific.
22. I like the way you're looking at me.
23. I like the way you're sleeping.
24. You're the best little baby in the whole world.
25. You're being so good.
26. I like the way you're lying in your isolette.
27. I like the way you smile.
28. You're the best.
29. You make mommy so happy.
30. You'll be a big boy.
31. Mommy's told all her friends about you.
32. Mommy can't wait to take you home.
33. You are my favorite baby.
34. You're really trying hard to get well.
35. I'm so happy you're not crying.
36. You're doing so well.
37. The doctor says you're showing progress.
38. Mommy adores you.
39. You're really trying hard to stay awake.
40. You're really breathing well.
41 You look better today.
42. You're the prettiest baby.
43. You have beautiful skin.
44. You're so strong.
45. You're the best baby in the nursery.
46. You have such pretty ears.
47. You're such a good listener.
48. You've gained weight.
49. Good boy (girl)!
50. Mommy is so happy to see you!

Appendix C

List of Verbal Reinforcements Provided the Mother During Training

1. I like the way you said that.
2. That's good describing (praising).
3. You're doing it.
4. That's what I want you to do.
5. That's great, keep it up.
6. I like that, do another one.
7. Great/Terrific
8. You really do a nice job of talking to your baby.
9. Good job Mrs. _____
10. You're such a talker.