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ABSTRACT

This report describes the development and testing of a screening method designed to describe the Cornell Infant Nursery environment and infant activities in quantitative terms. The scanning procedure developed is basically a time-sampling way of collecting data on the normal operation of the nursery. Two long lists of variables (categories of infant behavior and nursery environment), are carried into the observation booth and checked off by the observers according to what they see. Detailed charts of interobserver reliability on environment and infant behavior scales are presented as well as charts of frequency and percent of occurrence of a variety of infant activities. The scanning method appears successfully able to record the environment and activities of infants in the nursery and has potential value to other investigators. (MS)

Scanning the Infant Nursery Environment[1]

Joan Evelyn Johnston[2]

CORNELL RESEARCH PROGRAM
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Introduction

It has been our intention to develop a procedure for describing the environment of the Cornell Infant Nursery as well as the activities of the infants in the hope that we may be able to quantify some of the relevant aspects of early experience in the development of the infant. The results of the methodical recording of the nursery environment can be fed back to the caregivers and used to regulate their handling of the infants. This information would have broad application in aiding the establishment and maintenance of good day care centers for infants of working mothers.

The present report describes the scanning method in detail along with its gradual development over a period of two years, including several studies of interobserver reliability. Results obtained in describing the nursery environment and the activities of the infants are reported for the program operating during 1970-1971 and 1971-1972. We think in general that the scanning method has been successful in its aims and can be used in a variety of situations.

Sample

Parents of the children in the Cornell Infant Development Center have been, without design, mainly professors, students, or staff of the university. During the period studied, care was provided on a half-day basis with the infant being at home the remainder of the day. The first infants were admitted as young as six weeks in the spring of 1970. A second group of children was admitted to afternoon care beginning September 1970, while the first

group remained in the morning. All these children left the program at the end of July 1971, and two new groups were begun in September 1971. All infants entering the program at the beginning of the terms were between six weeks and six months of age, though among those few admitted later, some were of an age to fit with the rest of the group. All the children left the program at the end of July 1972. Each of the groups over the two years contained a maximum of six infants with two caregivers in charge. Although new infants entered the nursery in September 1972, some for full-day, some for half-day care, the present report deals only with the data gathered on the previous groups, September 1970 through July 1972.

The Scanning Procedure

We have been monitoring the infant activity and the environmental inputs to them from the nursery by systematic observing using a time sampling procedure. This process, which we call "scanning," was systematically begun in December 1970 and was used through June 1972. The procedure was to observe one baby at a time and record the environment impinging upon him as well as his activities in interacting with the environment. His environment and behavior were recorded by checking off a list of categories of events which occurred in a certain time period from a larger list of possible categories in his environment and from a larger list of possible behaviors he might perform. Behavioral and environmental variables to be used were originally set up on a conceptual basis and modified after trial observation runs by observers in the summer of 1970. Eventually there were about 70 categories or variables in the behavioral (Activity) section and about 70 in the Environmental section. (See list in Tables 7 and 8) Categories in

the Activity part were listed under the headings of Room, Location, Posture, Affect, Vocalizations, Visual Activities, and other Activities. The general groups in the Environmental section were labeled Location, Specific Noises, Near Environment, Other Baby Activities, and Caregiver Activities. Also included were the Light level and overall Noise level in the room. Many of the categories, especially under certain headings, were mutually exclusive, so that the scanning observer did not actually have to look for 70 possible variables at one time. In Location, for example, there was only one place a baby could be at once, and the other 8 categories in the section could be ignored for the time being. The same situation held for Room, Posture, and Affect. All the chosen variables were carefully defined in a Scanning definition Manual (See Appendix) and were listed in abbreviated form on data sheets for use by the observers. Since we allowed only ten seconds to observe and ten seconds to record by making checks on the data sheets, we found it was easier for an observer to code either the Activity or the Environment during a given observational session. Therefore, the Environment variables were listed on one data sheet and the Activity variables on another. The coding system was easy to learn and was flexible enough to allow for the addition and deletion of variables.

On each data sheet, the variables were listed vertically, with six columns for recording data. After observing the target infant for ten seconds, the observer checked off within a ten-second interval the pertinent variables in one column. The results of the next ten seconds of observation went into the adjacent column, and so on across the sheet. It took therefore two minutes to complete one data sheet with six columns. The terms we have been using in referring to the scanning procedure are:

1 observation = 1 column on the data sheet

1 run = 6 observations = 1 sheet = 1 infant scanned

1 round = 1 run x no. of infants

On scanning days all the infants were observed twice every hour, for three or four hours. There were thus two consecutive "rounds" per hour. At two minutes per run and a minimum of three babies for scanning to proceed, it resulted in a minimum of twelve minutes each observing session (time = 1 run (2 minutes) x no. of babies x 2 (rounds)). Thus the actual amount of time spent observing on any particular day depended upon the number of babies available. The maximum time was about one-half hour out of every hour.

At the same time as they were scanning, the observers were also collecting a different kind of information on the nursery environment. Data sheets consisting of a diagram of the nursery and the major furniture drawn to scale were filled out approximately every five minutes during the scanning process with the initial of every person and infant in the room placed as accurately as possible on the diagram. These data would then show how many and what kinds of groups are formed within the nursery. On a more detailed level of analysis, this procedure can reveal which infants are more likely to be found alone and which in groups, which tend to associate more with other infants and which with the caregivers. This information could also be used to check on the validity of other information gathered from the nursery such as the scanning and the infant rating scales. (The diagram results are not reported here.)

History of the Use of the Scanning Procedure

Scanning was begun in December 1970 with one observer using Version 7 of the scanning data forms. During December, the procedure was to observe only Activity one day and Environment the next. This was changed beginning January 5, 1971 to recording Activity one hour and Environment the next with two consecutive days meshing in the analysis to give a full day of Activity and a full day of Environment. Use of the diagrams was begun January 6, 1971 and continued through June 1972 unchanged. (See Table 6 in Results Section)

As of March 16, 1971 two observers at one time began to scan the nursery environment with one watching the Activity and the other the Environment of the same infant. The Activity observer from one hour coded Environment the next, and vice versa. Whereas the diagrams were coded by the observer during both the Activity and the Environment scanning sessions when only one observer was present at a time, with two simultaneous observers, the diagrams were recorded only by the observer coding the Environment.

In September 1971, a new group of young infants entered the nursery, the original group having left at the end of July. Three new scanning observers were trained and scanning was resumed at the end of October using Version 8 of the scanning procedure. Again two simultaneous observers, rotating Activity and Environment every hour, coded information on the same baby. The diagrams were recorded by the Activity observer. As far as circumstances allowed, the observers scanned the nursery two mornings and two afternoons a week or about twice as often as was possible the previous year. In December the data forms were again changed to permit a clearer analysis

of the data; the main change was to arrange to take into account when the caregivers' and babies' faces or bodies were not visible to the observer. Another change was to divide the "Person" in Person Near into "Baby" and "Adult." Otherwise this new Version 9 was the same as Version 8 and was used through June, 1972.

Interobserver Reliability

It was not difficult to train observers to use the scanning procedure. Training usually took about twenty hours and progressed from the trainee practicing alone with the manual and data sheets to practicing with the trainer and with the timer for speed. When the new observer was ready, a reliability study was begun. Trainer and trainee watched the same infants at the same time using the Activity scanning sheets for a total of eight rounds. Data were gathered for the Environment section in the same way. The total frequency of each of the 72 categories of behavioral or environmental characteristics for each round was obtained for each observer. For each of the 72 categories, Pearson's correlation coefficient for the sets of eight pairs was computed, thus producing an r for each of the categories. Using these same data, a percent agreement score for each category was also computed.

The table below is a summary of interobserver reliability studies over two years. It shows which measures of reliability were used for each Version of the scanning method.

Table 1

Interobserver Reliability Tests on Three Versions of the Scanning Method

	Version 7 June 1971	Version 8 October 1971	Version 9 January 1972	Version 9 June 1972
Activity	Pearson's r	Pearson's r % agreement		Pearson's r % agreement
Environment	Pearson's r	Pearson's r % agreement	Pearson's r % agreement	Pearson's r % agreement

Whenever there were two or more new observers to train, the reliability scores were always obtained between the trainer (Observer 1 Joan Johnston) and each of the trainees. See Tables 2 and 3 for the reliability coefficients of each category for all seven observers to date. These extensive tables show the Pearson's r for each pair of observers on each category used in the reliability studies for Versions 7, 8, and 9. The X in the table means that that particular category was not chosen for analysis or, more frequently, that the category did not exist in that version. The dash (-) in the table means that the variance was too low for computation; in two-thirds of these cases both observers had scored zero.

After the training and initial reliability study, observing proceeded on a regular basis, but a follow-up reliability study was done at regular intervals if possible. These were used as checks of the observers, but also served to clarify the Scanning Manual and to suggest changes in the scanning records. Categories which were too difficult for two observers to code correctly were altered or dropped. In Table 2, (the Activity table) Room,

Table 2

Scanning - Interobserver Reliability (Pearson's r)
Activity Categories

	Version 7 (January 1971)			Version 8 (October 1971)				Version 9 (June 1972)		
Observer Numbers	1:2	1:3	1:4	1:4	1:5	1:6	1:7	1:5	1:6	1:7
Room										
Kitchen	-	1.0	1.0	-	-	-	-	-	-	-
Nursery	X	X	X	1.0	.95	1.0	1.0	1.0	.99	.98
Playroom	X	X	X	1.0	.91	1.0	1.0	1.0	.99	.97
Outside	X	X	X	-	-	-	-	-	-	-
Location										
Crib	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Floor	.99	.99	.98	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Infant Seat	1.0	-	-	1.0	1.0	1.0	1.0	-	-	-
Swing	X	X	X	-	-	-	-	-	-	-
Jump Chair	-	-	-	X	X	X	X	X	X	X
Feeding Table	1.0	1.0	1.0	-	-	-	-	-	-	-
Stroller	-	-	-	X	X	X	X	X	X	X
Lap	.98	1.0	-	-	-	-	-	1.0	1.0	1.0
Posture										
Prone	.99	.76	.73	.91	.91	.88	1.0	1.0	.99	.99
Supine	.97	.99	.97	.94	1.0	1.0	1.0	1.0	1.0	1.0
Sitting Alone	.77	.97	.97	1.0	1.0	-	-	.98	.99	.99
Sitting with Help	-	-	-	.99	1.0	.44	.48	-	-	-
Standing Alone	.91	.88	.99	-	-	-	-	.96	.91	.94
Standing with Help	-	-	-	1.0	1.0	1.0	1.0	-	-	-
Hands and Knees	-	.54	.70	-	-	-	-	.87	.90	.96
Held Up	.98	.65	-	.81	.96	1.0	.99	1.0	1.0	1.0
Side	X	X	X	-	-	-	-	.98	1.0	1.0
Explanatory Code										
Baby not Visible	.92	.69	.97	.63	.57	.86	.72	1.0	1.0	1.0
Face not Visible	.73	.89	.66	-.05	.43	.76	.04	X	X	X
Affect										
Asleep	1.0	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Laugh	-	-	-.22	-	-	-	-	-	-	-
Smile	.98	.33	.86	.74	-.20	-	-	.74	-.07	.15
Neutral	.87	.97	.95	.87	.86	.97	.99	.98	.92	.87
Fuss	-.35	.80	.76	.77	.84	.75	.48	1.0	.82	.10
Cry	.60	-	.65	.89	.96	1.0	1.0	-	-	-
Face not Visible	X	X	X	X	X	X	X	-.39	.07	.63
Vocalization										
Babble-Coo	.80	.07	.51	.80	.27	1.0	.99	.60	.85	.55
Questionable	.40	-.17	-	-	.97	-	-	X	X	X

X = Not utilized
- = No variance, very low frequency

Table 2 (Continued)

Scanning - Interobserver Reliability (Pearson's r)

Activity Categories

	Version 7 (January 1971)			Version 8 (October 1971)				Version 9 (June 1972)		
Observer Numbers	1:2	1:3	1:4	1:4	1:5	1:6	1:7	1:5	1:6	1:7
Visual Activity										
Scan	.12		-	.69	.00	1.0	-	-	.31	.29
Look	X	X	X	.93	.45	.85	.90	.56	.27	.12
Looking at Object	.72		.36	X	X	X	X	X	X	X
Looking at Person	.83		.49	X	X	X	X	X	X	X
Looking at Baby	.47		-	X	X	X	X	X	X	X
Following	X	X	X	-	-	-	-	.73	.83	.50
Visual Touch	.74		-	-	-	-	-	.46	.18	.64
Face not Visible	X	X	X	X	X	X	X	-.10	.73	.44
Activities										
Touching Other Baby	.87	.81	.91	.86	.71	.98	.95	.98	.99	.72
Touching Caregiver	.37	1.0	.98	.79	.80	.97	.80	-	-	-
Touching Self	.51	1.0	.64	.98	.96	1.0	.94	.31	.58	-
Reaching	.92	.55	.68	.58	.83	.93	.93	.48	.86	.13
Banging	-	.68	.65	-.14	1.0	-	-	.87	.94	.80
Putting Things In	X	X	X	-	-	-	-	.94	.94	.94
Changing Position	X	X	X	-	-	-	-	.20	.94	.55
Locomoting	.99	.93	.85	-	-	-	-	.94	.97	.90
Jumping	X	X	X	-	-	-	-	1.0	1.0	-
Rocking	-	.94	-	-	-	-	-	1.0	.99	.88
Kicking-Waving	.96	-	.49	X	X	X	X	X	X	X
Eating	.97	.99	.99	1.0	.92	-	-	1.0	1.0	1.0
Sucking Bottle	-	1.0	.99	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sucking Pacifier	-	-	1.0	-	-	1.0	1.0	-	1.0	-
Sucking Thumb	.86	.81	.79	.57	.65	.98	.98	.45	.03	.25
Mouthing	.97	.83	.74	.93	.72	-	-	.83	.70	.45
Taking	-	.10	-	-	-	-	-	1.0	1.0	1.0
Init. Social Contact	X	X	X	X	X	X	X	-	.65	.65
Lifting Arms	X	X	X	X	X	X	X	1.0	-	1.0

X = Not utilized
- = No variance, very low frequency

Table 3

Scanning - Interobserver Reliability (Pearson's r)

Environment Categories

	Version 7 (January 1971)			Version 8 (October 1971)				Version 9 (January 1972)			Version 9 (June 1972)		
Observer Number	1:2	1:3	1:4	1:4	1:5	1:6	1:7	1:5	1:6	1:7	1:5	1:6	1:7
Room													
Nursery	X	X	X	.76	.76	.88	.88	X	X	X	X	X	X
Playroom	X	X	X	.90	.88	.77	.77	X	X	X	X	X	X
Hall	-	-	-	1.0	1.0	1.0	1.0	X	X	X	X	X	X
Location													
Crib	1.0	1.0	1.0	.91	.37	1.0	.99	1.0	1.0	1.0	1.0	1.0	1.0
Floor	.99	.98	.96	.94	.90	.82	.74	.00	1.0	1.0	.92	.96	1.0
Infant Seat	-	-	-	-	1.0	.94	.94	.99	.99	.99	-	-	-
Feeding Table	1.0	1.0	.90	-	-	-	-	-	-	-	1.0	.99	1.0
Lap	.99	1.0	-	.99	.99	.64	.56	.97	.74	1.0	.99	.97	1.0
Other	.96	.88	1.0	-	-	-	-	1.0	1.0	1.0	-	-	-
Noises													
Other Baby Voc.	.80	.48	.86	.78	.47	.84	.41	.11	.98	.97	.41	.62	.38
Other Baby Cry.	.98	.79	.98	.99	.98	.59	.85	.98	.86	.79	.98	.97	.97
Adult Talking	.96	.91	.95	.98	.98	.81	.85	.97	.97	.97	.87	.93	.96
Playgr. Noise	-	-	-	-	-.14	.98	1.0	-	-	-	-	-	-
Kitchen Noise	.95	-.30	.14	-	-	1.0	1.0	.60	.65	-	.65	-.14	.65
Toy Noise	X	X	X	.16	.05	.62	.50	.86	.97	.72	.93	.91	.97
Radio	X	X	X	-	-	-	-	.98	1.0	1.0	.99	1.0	1.0
Other	.99	-	1.0	-	-	-	-	-	-	-	-	.88	.54
Near Environment													
Toy in Reach	.89	.48	.55	.00	.12	.72	.92	.93	.99	1.0	.93	.98	.98
Toy in View	.86	.86	.69	.31	.15	.77	.98	.95	.96	.95	.89	.13	.07
Adult Near	X	X	X	X	X	X	X	.96	.98	.94	.78	.79	.86
Adult in View	X	X	X	X	X	X	X	.94	.95	1.0	.89	.98	.81
Baby Near	X	X	X	X	X	X	X	1.0	1.0	.97	.68	.94	.86
Baby in View	X	X	X	X	X	X	X	.92	1.0	.99	.73	.88	.69
Person Near	.90	.98	.96	.86	.40	.91	.90	X	X	X	X	X	X
Person in View	.98	.92	.93	.47	-.00	.88	.84	X	X	X	X	X	X
Environ. not Vis.	X	X	X	-	.52	.48	-	.93	.90	1.0	.92	.99	.96
Baby not Visible	.99	.64	.88	-	.63	.89	.42	X	X	X	X	X	X
Face not Visible	.66	.97	.88	X	X	X	X	X	X	X	X	X	X
Blanket	.77	-	-	1.0	.58	-	-	-	-	-	-	-	-
Other Baby													
Look	-	.91	-	-	-	-	-	-	1.0	-	.99	-	.99
Touching	-	.65	-	-	-	-	-	-	-	-	-.18	.49	.15
Taking	-	.10	-	-	-	-	-	-	-	-	.74	.54	.86
Baby Nurse													
Adult's Name	.93	.79	.55	X	X	X	X	.83	.95	.99	.96	.91	.97
Talking	.92	.92	.95	.80	.93	.50	-.22	.96	.95	.50	.18	.90	.63
Singing	.65	.65	1.0	1.0	-	-	-.14	-	-	.65	1.0	1.0	1.0

X = Not utilized
- = No variance, very low frequency

Table 3 (Continued)

Scanning - Interobserver Reliability (Pearson's r)

Environment Categories

	Version 7 (January 1971)			Version 8 (October 1971)				Version 9 (January 1972)			Version 9 (June 1972)		
Observer Number	1:2	1:3	1:4	1:4	1:5	1:6	1:7	1:5	1:6	1:7	1:5	1:6	1:7
Baby Nurse (Con't)													
Look Baby's face	.55	.47	.27	.76	.27	.71	.72	.75	.65	.89	-.33	.67	-.25
Smiling	-	.57	-	.96	.64	.57	.21	.47	.88	.84	-	.82	.15
Face not Visible	X	X	X	X	X	X	X	-	-	-	.90	.19	.94
Touching	.65	.2[illegible]	.18	.98	.93	.89	.96	.73	.08	.78	.84	-0.0	.88
Holding	.99	.88	-	.99	.92	.57	.68	.00	.79	.90	.99	.99	.99
Carrying	.65	1.0	1.0	.41	.33	.80	.70	1.0	.33	.11	.80	1.0	-
Rocking	-.14	.88	-	1.0	.97	.76	.47	-	-	.88	1.0	1.0	1.0
Physical Play	-	-	-	-	-	1.0	-	.93	1.0	-	-	-	-
Changing Pos.	X	X	X	X	X	X	X	.65	-	.65	.65	.49	.65
Showing Object	1.0	1.0	.65	.96	.97	.24	.18	.78	1.0	1.0	.84	.96	.74
Putting Obj. Near	X	X	X	-	1.0	.49	.49	-.14	-	-	-	-	-
Giving Toy Obj.	1.0	-	-	-	-	.49	.65	-	-	-	-	-	-
Feeding	-	.94	-	1.0	1.0	.95	.96	1.0	.99	1.0	.99	.97	.92
Changing	.96	1.0	.99	-	-	.92	.95	1.0	-	1.0	1.0	-	.97
Soc. Soothing	X	X	X	.56	.77	.90	-	-	-	.14	1.0	1.0	.93
Soothing	.82	.65	-.38	X	X	X	X	X	X	X	X	X	X
Encourage Motor Activity	X	X	X	.73	.58	-	-	.33	.70	.38	.41	.89	1.0
Encourage Percep. Cognitive	X	X	X	-	-	-	-	-.22	.94	1.0	-	-.14	-.14
Room Conditions													
Light	X	X	X	.81	-.03	.61	.74	1.0	.95	1.0	1.0	1.0	.93
Noise	.94	.72	.79	.79	.31	-.03	.10	.92	.92	.82	.72	.84	.43
Daylight	.52	.92	.85	X	X	X	X	X	X	X	X	X	X
Room Lights	.99	1.0	1.0	X	X	X	X	X	X	X	X	X	X

X = Not utilized
- = No variance, very low frequency

Location, and Posture, were quite good, being usually .9 or higher, but Vocalization and Visual Activity were not being scored as accurately as possible, often below .5. Since both these latter involved problems of seeing or hearing on the observer's part, changes were made in the Visual Activity so that the observer no longer had to distinguish between Looking at Baby and Looking at Object, for example, but only had to know if the baby was Looking at anything. These consolidation changes were effective, as shown by the improvements in the correlations from Version 7 to Version 8. Unfortunately the Visual Activity reliability scores again dropped in Version 9 (June) with half of them being under .5.

Another problem group of categories, the Explanatory Code, which was supposed to explain if the observer had any difficulty in recording some groups of categories because of obstructed visibility, caused many problems and was changed in each version till in Version 9 it was removed as a separate group of categories. Instead, each section contained an 'explanatory' category, if it was felt necessary. Under Affect, for example, a Face Not Visible was included for use in the Affect section alone. In general, Activities, the last group of categories on the Activity coding sheet, gave little trouble and the correlations were usually over .8 for all the Versions.

Table 3 shows the inter-observer reliabilities for the categories in the Environment scanning record. Once again there were not many problems with the Room and Location, but there were with other groups of categories. The Environment record was much harder to code than the Activity record, because the Environment observer had to watch and listen for everything in

the nursery, while the Activity observer had only to watch the baby. At any rate, in Versions 7 and 8 under Specific Noises, it can be seen that there was much agreement (r greater than .8) on the louder noises in the room (adults talking, baby crying), but less on the softer sounds (many under .6). A general awareness of this problem resulted in greater agreement in Version 9. In the Near Environment, the reliability greatly improved from versions 7 and 8 and 9 when Person (Within View, Near) was divided into Baby and Adult. Much discussion led to some improvement in the Caregiver categories from many reliabilities below .7 in Version 7 to most above .8 in version 9. More agreement might not be possible. These categories were difficult because there were so many of them and because some of them occurred so infrequently that the observer became out of practice. The best thing to do in the future might be to put the Caregiver categories on a separate sheet and record that group by itself, if much data are to be collected on those categories.

Following the correlation tables are those showing the % agreement of the different observers. The same eight pairs of sums used for the correlations were used for the percent agreement computations, which were based on a fairly strict criterion of agreement. An agreement was considered to be in the range of ± 1 in the difference scores of the two observers. The percentage was figured on the basis of the eight scores, so that the numbers given in the tables all indicate how many agreements there were out of a possible eight, for each category. It should also be mentioned that in both the correlations and % agreement, the scores were obtained as much as possible on those categories which were used relatively often by the observers.

Table 4

Scanning - Interobserver Reliability:

Percent Agreement

Activity

	Version 8 (October 1971)				Version 9 (June 1972)		
Observer Numbers	1:4	1:5	1:6	1:7	1:5	1:6	1:7
Room							
Nursery	X	X	X	X	87	87	100
Playroom	X	X	X	X	87	87	100
Location							
Crib	100	100	100	100	100	100	100
Floor	100	100	100	100	100	100	100
Infant Seat	100	100	100	100	X	X	X
Swing	100	100	100	100	X	X	X
Feeding Table	X	X	X	X	100	100	100
Lap	100		100	100	100	100	100
Posture							
Prone	75	62	75	100	62	75	100
Supine	87	100	100	100	100	100	87
Sitting Alone	100	100	87	87	100	100	75
Sitting With Help	100	100	87	87	X	X	X
Standing Alone	X	X	X	X	100	87	100
Hands and Knees	X	X	X	X	75	75	50
Held Up	87	100	100	100	100	100	100
Side	X	X	X	X	100	100	87
Affect							
Asleep	100	75	100	100	100	100	100
Smile	100	75	100	100	87	87	87
Neutral	75	37	87	87	50	50	62
Fuss	75	87	87	87	87	87	87
Cry	75	87	100	100	87	87	87
Vocalizations							
Babble-Coo	100	87	87	87	50	87	62
Questionable	87	87	100	100	X	X	X
Visual Activity							
Scan	87	62	100	87	62	0	62
Look	62	75	87	87	37	25	50
Visual Touch	75	75	100	87	62	75	62
Activities							
Touching Other Baby	62	87	37	75	37	100	87
Touching Caregiver	50	75	100	87	100	100	100
Touching Self	87	50	100	100	75	87	87
Reaching	75	87	100	100	75	87	87
Banging	100	100	100	100	87	87	87
Changing Position	X	X	X	X	75	100	62
Locomoting	X	X	X	X	75	100	87
Eating	100	87	100	100	100	100	100
Feeding Self	X	X	X	X	100	100	100

Table 4 (Continued)

Scanning - Interobserver Reliability:

Percent Agreement

Activity

	Version 8 (October 1971)				Version 9 (June 1972)		
Observer Numbers	1:4	1:5	1:6	1:7	1:5	1:6	1:7
Activities (Continued)							
Sucking Bottle	100	100	100	100	100	100	100
Sucking Pacifier	100	100	100	100	X	X	X
Sucking Thumb	75	87	87	87	87	75	87
Mouthing	100	100	100	100	75	62	75
Initiating Social Contact	X	X	X	X	100	100	100

Table 5

Scanning - Interobserver Reliability

Percent Agreement

Environment

	Version 8 (October 1971)				Version 9 (January 1972)			Version 9 (June 1972)		
	1:4	1:5	1:6	1:7	1:5	1:6	1:7	1:5	1:6	1:7
Room										
Nursery	87	75	87	87	X	X	X	X	X	X
Playroom	87	75	87	87	X	X	X	X	X	X
Location										
Crib	100	87	100	100	100	100	100	100	100	100
Floor	87	87	87	75	100	100	100	87	100	100
Infant Seat	87	100	87	87	100	100	100	X	X	X
Swing	100	100	87	87	100	100	100	X	X	X
Feeding Table	X	X	X	X	X	X	X	100	100	87
Lap	87	87	87	87	100	100	100	100	100	87
Other	X	X	X	X	100	100	100	X	X	X
Specific Noises										
Other Baby Vocalizing	50	87	50	62	50	87	75	0	25	37
Other Baby Crying	87	75	62	62	87	87	75	62	75	75
Adult Talking	87	87	75	50	75	62	50	62	75	62
Playground Noise	100	87	75	87	X	X	X	X	X	X
Kitchen Noise	75	100	100	100	75	87	87	X	X	X
Toy Noise	50	62	25	37	75	75	75	37	37	12
Swing Noise	X	X	X	X	87	100	100	X	X	X
Radio	100	100	100	100	87	100	100	87	100	100
Near Environment										
Toy in Reach	37	62	50	62	75	87	100	37	62	50
Toy in View	37	50	37	87	75	87	87	75	50	75
Adult Near	X	X	X	X	62	87	75	50	50	37
Adult in View	X	X	X	X	75	87	100	75	62	87
Baby Near	X	X	X	X	100	100	87	50	37	62
Baby in View	X	X	X	X	50	100	87	62	25	75
Person Near	87	62	75	62	X	X	X	X	X	X
Person in View	50	50	62	62	X	X	X	X	X	X
Envir. not Visible	X	X	X	X	75	75	100	X	X	X
Other Baby										
Baby's Name	100	100	100	100	X	X	X	87	75	75
Vocalizing	X	X	X	X	X	X	X	100	100	100
Look	100	100	100	100	X	X	X	87	100	87
Touching	X	X	X	X	X	X	X	87	100	100
Taking	X	X	X	X	X	X	X	100	100	87

Table 5 (Continued)

Scanning - Interobserver Reliability

Percent Agreement

Environment

	Version 8 (October 1971)				Version 9 (January 1972			Version 9 (June 1972)		
	1:4	1:5	1:6	1:7	1:5	1:6	1:7	1:5	1:6	1:7
Baby Nurse										
Adult's Name	87	100	87	100	75	75	100	X	X	X
Talking	75	75	75	75	100	87	50	75	62	100
Singing	X	X	X	X	100	100	100	X	X	X
Looking Baby's Face	75	87	50	50	87	75	87	100	87	100
Smiling	100	87	87	87	87	100	87	100	100	100
Touching	87	75	75	100	62	75	50	100	100	75
Holding	87	87	62	87	87	100	87	100	100	100
Carrying	87	100	87	87	100	100	100	100	87	100
Rocking	100	87	75	75	100	100	100	100	100	100
Physical Playing	100	100	100	100	100	100	100	X	X	X
Changing Position	100	100	100	100	100	100	100	X	X	X
Showing Object	100	100	87	87	87	100	100	87	75	100
Putting Object Near	X	X	X	X	100	100	100	X	X	X
Feeding	100	100	87	87	100	100	100	100	87	87
Changing	100	100	87	87	100	100	100	100	100	87
Social Soothing	75	87	100	75	100	100	87	100	100	100
Distant Soc. Soothing	X	X	X	X	87	100	100	X	X	X
Non-Social Soothing	100	100	100	100	X	X	X	X	X	X
Encouraging Motor Ability	87	87	100	100	100	100	87	87	100	87
Encouraging Perceptual Cognitive	75	87	100	87	87	100	100	87	75	87
Room Conditions										
Light	87	37	62	62	X	X	X	100	87	100
Noise	87	50	25	62	X	X	X	100	87	100

For the most part, categories which neither observer checked off during the reliability studies were not entered into the computations although such evidence of agreement was certainly important.

Overall, the same trends which emerged from the correlation scores are shown in the % agreement scores. (See Tables 4 and 5) That is, categories representing the most long-lasting and visible variables of behavior and environmental input, such as Location and Posture, were the ones on which the reliability was best. Other variables, which involved seeing or hearing difficulties from the observation booth, such as Visual Activities or soft Specific Noises, were those on which it was difficult to obtain high reliability scores.

Table 4 gives the percent agreement for the Activity categories in Versions 8 and 9. As usual Room and Location had almost perfect agreement with Posture slightly lower. The only problem in coding Posture was not that the observer could not tell what position the baby was in, but that the infant changed posture in mid-observation. In the Affect categories, Neutral was somewhat lower in agreement than the other categories (38-88%), as was Babbling-Cooing under Vocalizations. Visual Activities, which proved relatively unreliable in the correlation studies, also appeared relatively unreliable here, especially Looking and Scanning. All the other Activities though, which are much easier to see, proved quite reliable, as the correlations also showed.

In the Environment observations, shown in Table 5, Room and Location presented no reliability difficulties. Under Specific Noises, the quiet sounds of babies vocalizing and playing with toys seemed to be hard for the

observers to hear reliably, as the scores were often below 62%. The Near Environment, indicating toys or people near or in view, which looked satisfactory in the correlations figures, did not do as well in percent agreement. Although the scores were mostly between 75 and 100% in the January 1972 figures, the reliability actually decreased in the June study, possibly because the infants were more mobile then. Finally, among the most important of the groups of categories, the Caregiver behaviors were quite good overall, ranging mostly from 75 to 100%.

In general, the observers felt that the reliability checks were very instructive and that their performance was reasonably good as observers. It was felt on the basis of discussions of difficulties in scanning that most problems arose because one observer saw or heard something another did not; it was not as often the case that two observers defined the same categories in different ways. So the observers felt that if errors were to be made, at least they were mainly on the side of under-scoring, not wrongly scoring.

Processing and Analysis of Descriptive Data

The data sheets obtained during a scanning day were key-punched onto IBM cards, at a rate of one sheet per card. These cards, representing any period of time desired for study, were then fed into the computer so that the frequency of occurrence of each variable of behavior or environment could be tabulated for a certain period of time and the percent of occurrence computed. The percent of occurrence was determined by dividing by the denominator which was most appropriate for each variable or group of variables

and multiplying by 100. The denominators are described in detail in the Scanning Manual. Different denominators were used for particular variables so that the actual amount of time the target baby could be seen was taken into account, instead of the larger amount of time he was in the nursery. For instance, his Location was always known, though if he could not be seen, his Posture, Affect, and Activities were unknown. However, the Specific Noises in the Environment could be recorded, as well as many Caregiver Activities, but his Near Environment was probably unknown. Or, if the target baby could be seen, but his face was turned away, most categories in Activity and Environment could be recorded except the non-vocal Affect and Visual Activities. So the denominators, as much as the system allowed, were designed to reflect the occurrence of a variable in the amount of time that it was possible to observe whether or not it occurred. If this were not taken into account, the percents obtained would mostly be much lower than they are in the tables and figures of the results. Version 9 is the most complete in terms of allowing for the subtraction out of complicating factors, (see the Scanning Manual for details). The denominators for Versions 7 and 8 were simpler but allowed more confounding of the data. An attempt at clarity was the main reason for the changes resulting in Version 9.

It was possible to process any assortment of data desired, as for example, by individual baby or day of the week. Such fine analyses have not yet been done, but most of the data were analyzed by the total amount of time spent in the nursery, some by the time spent awake only and the time spent asleep only. These are discussed more fully in the text of the results.

Results

Over a two-year period, many data were gathered on the infants in the nursery. The following table illustrates when the different versions of the scanning procedure were in use for easy reference, since Version 7 will be discussed separately from Versions 8 and 9.

Table 6

Version 7	Version 8	Version 9
5 4-week periods, roughly Jan 1971 to May 1971	1 4-week period, roughly Nov 1971	7 4-week periods, roughly Dec 1971 to June 1972

The first data to be shown in these results will be a sample of daily variability in the percent occurrence of all the categories in Version 9, then a short presentation of some of the categories from Version 7, which represents the first systematic data collected using the scanning method. The main body of the results is concerned with the extensive data gathered with Versions 8 and 9. This data is mostly in graph form and shows the results of many categories over an eight-month period. It includes the Environmental and Activity records when the babies were awake as well as some from when they were asleep.

Day to Day Variability

When the frequency and percent of occurrence of each variable were obtained on a daily basis, it was obvious as expected, that there was considerable day to day variability, although the rank ordering of the different variables remained fairly consistent. For illustrative purposes, Tables 7

Table 7

Frequency of Occurrence (%) of Activity Categories on Five Different Days
(P.M. Group, January 1972, Version 7)

Category	Jan 6 N=192	Jan 11 N=240	Jan 12 N=192	Jan 20 N=234	Jan 26 N=180	Jan 28 N=180	January N=1218
(N = Total Number of 10 Second Observations) Mean age of infants = 5.4 months							
Room							
Kitchen	0.0	0.0	0.0	2.1	0.0	0.0	0.4
Nursery	21.9	25.4	52.6	41.5	26.7	40.0	35.5
Playroom	78.1	74.6	44.3	56.4	73.3	57.2	63.2
Outside	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hall	0.0	0.0	3.1	0.0	0.0	2.8	0.9
Location							
Crib *x	21.9	27.0	54.3	42.4	32.8	44.6	37.7
Floor	40.6	48.9	31.2	38.9	28.9	22.3	35.5
Infant Seat	11.5	8.9	8.1	2.6	16.7	7.4	8.8
Swing	3.1	0.8	0.0	5.2	6.7	8.0	3.8
Feeding Table	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lap *x	12.5	11.8	6.5	3.1	8.3	10.9	8.6
Window Seat	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Slide	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other	10.4	2.5	0.0	7.9	6.7	6.9	5.6
Posture							
Prone *	40.3	52.5	73.2	57.8	40.6	60.1	54.7
Supine *x	15.1	19.5	4.8	11.8	8.5	8.0	11.6
Sitting Alone *	27.4	13.1	8.9	18.0	36.4	25.2	20.7
Sitting With Help*	7.5	5.4	4.2	3.3	3.0	5.5	4.8
Standing Alone	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Standing With Help*	1.1	1.4	1.8	0.0	0.0	0.0	0.7
Hands and Knees *	7.5	6.8	6.0	6.6	4.8	0.0	5.4
Held Up	1.1	1.4	0.6	0.5	5.5	0.6	1.5
Side	0.0	0.0	0.6	1.9	1.2	0.6	0.7
Baby Not Visible	3.1	5.0	9.4	9.8	8.3	6.7	7.0
Affect							
Asleep *	15.6	20.3	48.4	36.7	20.0	30.9	29.6
Laugh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Smile *	0.0	3.4	3.2	2.2	2.8	0.0	2.0
Neutral *	53.6	49.4	24.7	38.4	43.3	54.9	43.4
Fuss *	10.9	10.5	2.2	3.1	5.0	4.6	6.1
Cry *x	4.7	1.3	0.5	2.6	2.8	0.0	2.0
Mixed	0.0	0.0	0.0	0.0	0.0	0.6	0.1
Face Not Visible	15.6	15.4	23.2	18.0	28.5	9.2	17.8
Vocalization							
Babble-Coo *	0.5	6.3	1.6	7.0	6.1	1.1	3.9
Questionable	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Visual Activity							
Scan *	8.7	7.4	9.1	8.2	10.4	13.1	9.2
Look *	38.3	17.6	25.0	29.4	35.6	19.3	26.8
Follow	0.7	2.8	1.5	0.5	3.7	1.4	1.7
Visual Touch *	4.7	8.5	3.8	6.7	8.1	6.2	6.3
Face Not Visible	19.9	20.4	21.4	8.1	18.2	11.0	16.2

Table 7 (continued)

Frequency of Occurrence (%) of Activity Categories on Five Different Days
(P.M. Group, January 1972, Version 7)

Category	Jan 6 N=192	Jan 11 N=240	Jan 12 N=192	Jan 20 N=234	Jan 26 N=180	Jan 28 N=180	January N=1218
(N = Total Number of 10 Second Observations) Mean age of infants = 5.4 months							
Activities							
Touching Object *x	30.6	23.5	21.4	32.7	27.3	31.3	27.4
Touching Caregiver *	3.2	2.7	4.2	0.5	4.8	1.8	2.7
Climbing	0.0	0.0	0.0	0.0	0.6	0.0	0.1
Touching Baby	0.0	1.4	0.0	1.9	0.0	0.0	0.6
Touching Self	3.2	6.3	1.8	3.3	7.9	8.6	5.1
Reaching *	10.8	8.1	6.5	7.6	9.1	6.1	8.0
Banging	5.4	3.6	3.0	6.6	4.2	4.3	4.5
Stacking	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Putting Things In	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Finding Hidden Object	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Changing Position	3.2	0.0	0.0	0.0	0.0	0.0	0.5
Locomoting *x	2.7	1.4	0.6	0.9	0.6	0.6	1.1
Climbing	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jumping	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rocking	0.0	0.9	0.0	3.3	0.0	0.0	0.8
Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eating *	9.7	3.2	3.6	5.2	0.0	0.0	3.7
Feeding Self	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sucking Bottle *	3.8	2.7	0.0	3.3	0.0	3.7	2.3
Sucking Pacifier	3.2	0.0	0.0	0.0	3.6	3.7	1.6
Sucking Thumb *	10.8	7.2	4.2	7.1	7.9	14.7	8.4
Mouthing *x	1.1	3.6	3.6	4.7	3.6	12.9	4.7
Playful Interaction	0.0	0.0	0.0	1.4	0.0	0.0	0.3
Following Person	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Avoiding Person	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Taking	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Giving	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initiating Social Contact	0.0	0.0	1.8	2.4	3.6	0.0	1.2
Lifting Arms	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pointing	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Obeying Instructions	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Imitating	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Categories Selected For Periodic Analysis in:

* Version 9, Figures

* Version 7, Tables

Table 8

Frequency of Occurrence (%) of Environment Categories on Five Different Days
(P.M. Group, January 1972, Version 7)

Category	Jan 6 N=192	Jan 11 N=240	Jan 12 N=192	Jan 20 N=234	Jan 26 N=180	Jan 28 N=180	January N=1218
	(N = Total Number of 10 Second Observations) Mean age of infants = 5.4 months						
Location							
Crib *x	21.9	27.0	54.3	42.4	32.8	44.6	37.7
Floor *	41.1	49.8	31.2	38.4	28.9	22.3	35.7
Infant Seat *	12.0	8.9	7.5	2.6	16.7	7.4	8.8
Swing	3.1	0.8	0.0	5.2	6.7	8.0	3.8
Feeding Table	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lap *	12.5	11.0	7.0	3.5	8.3	10.9	8.6
Window Seat	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Slide	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other	9.4	2.5	0.0	7.9	6.7	6.9	5.4
Specific Noise							
Other Baby Vocalization *x	12.0	11.0	6.5	20.1	32.2	22.3	16.8
Other Baby Crying *x	16.7	22.4	0.0	7.0	28.9	17.7	16.0
Adult Talking *x	58.9	46.4	34.4	47.2	57.2	39.4	46.9
Playground Noise	3.1	0.0	0.0	0.0	0.0	0.0	0.5
Kitchen Noise	4.2	0.8	0.5	3.5	0.6	4.6	2.3
Toy Noise *	30.2	33.8	17.2	29.3	22.2	26.3	26.5
Swing Noise	7.8	3.0	0.0	13.5	21.7	21.7	10.7
Radio	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other	0.0	3.0	1.1	0.9	0.0	1.1	1.1
Near Environment							
Toy in Reach *	43.9	61.5	28.9	45.2	63.1	62.0	50.0
Toy in View *	80.6	78.9	43.4	62.8	78.0	73.6	68.6
Adult Near *	49.0	41.4	27.4	34.9	20.0	19.4	32.3
Adult in View *x	82.2	70.6	44.5	67.3	69.6	62.6	65.4
Baby Near *	2.8	16.1	4.6	26.6	0.6	11.0	10.7
Baby in View *	72.2	68.3	24.9	63.8	61.3	53.4	57.1
Blanket over Crib	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Environment not Visible	6.3	8.0	7.0	13.1	6.7	6.9	8.1
Swing in Motion	3.1	0.8	0.0	5.2	6.7	0.0	2.6
Other Baby							
Crying	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Vocalizing	0.0	0.0	0.0	0.9	0.0	0.0	0.2
Smiling	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Looking *x	0.5	1.7	0.0	2.2	1.1	1.1	1.2
Face not Visible	0.0	0.0	0.0	41.7	0.0	0.0	23.8
Touching	0.0	0.0	0.0	1.5	0.0	0.0	0.3
Taking	0.0	0.0	0.0	0.5	0.0	0.0	0.1
Giving	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Playful Interaction	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 8 (continued)

Frequency of Occurrence (%) of Environment Categories on Five Different Days
(P.M. Group, January 1972, Version 7)

Category	Jan 6 N=192	Jan 11 N=240	Jan 12 N=192	Jan 20 N=234	Jan 26 N=180	Jan 28 N=180	January N=1218
	(N = Total Number of 10 Second Observations) Mean age of infants = 5.4 months						
Other Baby							
Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Baby Nurse							
Talking *x	11.5	12.2	10.8	13.1	11.7	2.9	10.4
Singing	0.0	0.8	0.0	0.0	0.0	0.0	0.2
Look Baby's Face*	2.7	7.2	5.5	7.1	4.4	2.3	5.0
Smile*	0.5	0.4	3.8	4.9	0.6	0.0	1.8
Laugh	0.0	0.0	0.0	1.3	0.0	0.0	0.2
Face Not Visible	9.9	3.1	9.5	5.6	0.0	0.0	5.6
Touching *	8.3	8.0	11.8	8.7	2.2	2.9	7.1
Holding *x	13.0	11.4	7.0	4.4	8.3	10.9	9.0
Carrying	1.0	0.8	0.5	0.4	2.2	1.7	1.1
Rocking *	5.2	1.3	0.0	0.4	1.7	0.0	1.4
Physically Playing*	1.6	0.8	0.5	0.9	0.6	0.0	0.7
Changing Position *	1.0	0.8	0.5	0.4	0.6	1.1	0.7
Showing Object *x	8.9	2.1	3.8	3.1	0.6	5.1	3.8
Placing Object Near	3.1	0.8	0.5	0.4	0.0	1.7	1.1
Giving Toy Object*	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Removing Object	0.0	0.0	0.0	0.0	0.0	0.6	0.1
Placing Baby	0.0	0.0	0.0	0.4	0.0	0.0	0.1
Removing Baby	0.5	0.0	0.0	0.0	0.0	0.0	0.1
Feeding	13.0	6.8	3.2	6.6	0.0	3.4	5.6
Changing *	6.3	4.2	2.7	6.1	4.4	0.0	4.0
Social Soothing *x	2.6	0.4	0.0	0.9	7.2	0.0	1.7
Distant Social Soothing *	1.6	0.0	0.0	0.0	1.7	1.1	0.7
Non-Social Soothing	1.0	0.0	0.0	0.0	0.0	0.0	0.2
Protecting	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Playful Interaction	0.0	0.0	2.7	0.0	0.0	0.0	0.4
Encouraging Motor Activity *	3.6	0.8	0.5	0.9	0.6	0.0	1.1
Encouraging Perceptual-Cognitive*	3.1	0.8	1.1	0.9	0.0	4.0	1.6
Encouraging Vocal Activity	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Redirecting	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Discouraging	1.0	0.0	0.5	0.0	0.0	0.0	0.2
Light	$\bar{x}$ = 1.4	1.4	2.0	1.9	1.5	1.6	1.7
Noise	$\bar{x}$ = 1.2	2.1	2.7	2.4	2.1	2.6	2.3

* Categories Selected for Periodic Analysis in Version 9, Figures
* Version 7, Tables

and 8 show the daily variability for the month of January 1972 in terms of percent of occurrences of each category. The tables also give the total percents for this four-week period. The four-week period was chosen as the unit of analysis for further analysis of all the data because it contained enough data to ensure relative stability.

Version 7

In Version 7, the frequency of each variable in the Activity and Environment sections was computed weekly for the first twenty weeks of 1971. Afternoon and morning groups were treated separately. Also all the data on two morning and one afternoon infant were excluded from the analysis because of sporadic attendance. For the purpose of preliminary analysis, only 16 of the possible 60-odd variables were chosen to study on the basis of high frequency and interest. The twenty-week period was divided into five four-week periods for which means were obtained for each of the 16 variables in Activity and Environment for both the morning and afternoon groups of infants.

Table 9 shows the percent of occurrence of selected variables for both groups over the five periods. This table shows any systematic change over time and reveals whether the frequency of occurrence of particular variables has remained constant as the year progresses. If trends in the data were evident, we would be encouraged that the Version 7 scanning method was in fact picking up information we would be interested in. In any comparison across groups it must be remembered that the average age of each group differed markedly. The bottom of Table 9 gives the mean ages of the groups at the different periods of the study. In general, the AM group was six months

Table 9

Mean Frequency of Occurrence (%) of Selected Categories on Version 7 (first twenty weeks of 1971)

1971	A.M. 4 Week Periods					P.M. 4 Week Periods				
	Jan 1	Feb 2	Mar 3	Apr 4	May 5	Jan 1	Feb 2	Mar 3	Apr 4	May 5
CRIB (Env)	45	36	41	32	45	41	44	26	30	60.0
Other Baby Vocalizing	36	42	57	42	55	13	22	18	20	16
Other Baby Crying	25	17	15	17	3	35	17	25	26	44
Adult Talking	75	71	73	76	69	54	67	52	60	38
Person Near	43	40	40	43	50	59	36	37	45	28
Other Baby Looking	0	2	3	2	1	0	0	0	1	0
Other Baby Talking	7	11	9	15	11	8	10	12	17	16
Holding	6	5	1	4	2	12	5	3	8	0
Showing Object	1	1	1	1	0	0	1	0	1	2
Social Soothing	2	1	3	2	4	2	1	0	6	8
CRIB (Act)	42	27	46	35	44	54	45	27	30	59
Lap	12	8	2	6	2	11	8	2	9	1
Supine	13	12	6	7	5	24	10	12	11	2
Cry	2	3	0	5	0	12	6	2	11	6
Touching Object	40	55	45	41	38	21	31	51	37	37
Locomoting	18	17	15	13	11	0	2	2	4	6
Mouthing	6	7	3	2	2	11	9	14	9	8
Total #10 Second Observations	414	444	348	252	348	462	804	276	324	108
Mean Age in Months	11.5	12.5	13.5	14.5	15.5	5.8	6.8	7.8	8.8	9.8

older than the PM group.

Other Baby Crying is seen to decrease in the AM group while it fluctuates in the PM group. The amount of time the infants were Supine shows an overall decrease from January to May for both groups of children. An example of a constant variable occurs in Adults Talking! While Other Baby Vocalizing is higher for the AM group at all times, Other Baby Crying is lower for that group overall. Locomoting increases for the PM group as they mature from six to ten months, but it decreases for the AM group (probably reflecting the increased attention span and interest in 'quiet play'). So there did seem to be trends within each group of infants, as well as between each group, which seemed to agree with developmental trends and the actual nursery environment. More data were collected using Versions 8 and 9.

Versions 8 and 9

Over the eight-month period from the fall of 1971 to the spring of 1972, four scanning observers were able to collect much systematic data on the nursery environment and the infants' activities. There were a few changes in the methods of analysis from the previous year. Another way of obtaining the average percent of occurrence for each selected variable in any monthly period is not to take the mean of four separate weeks, as was done in Version 7, but to run the analysis on data which have been pooled for the four weeks. This method does not give a true mean or a standard deviation, it is quicker and easier to do. Since the slight difference resulting from the two methods of computation ranged from only 0 to 1% of occurrence, the analysis of the data from Versions 8 and 9 proceeded using the pooled method. The second change centered around whether the target

infant was asleep or awake. Originally, as in Version 7, the frequency percentages were computed for the entire time the infants were in the nursery, both asleep and awake. Then, however, the analyses were done separately for the asleep data (when the target infant was actually scored as being asleep) and the awake data (when the target infant was not scored as being asleep). The main findings that are discussed below are the percent of occurrence of different categories when the babies are awake; these are presented in graph form. Removing the asleep data had the effect of removing one confounding factor in the data: that the babies when young spent much more time sleeping than when they were older. Thus, although the shapes of the curves remain generally the same as in the graphs of the total time in the nursery, the curves tend to be higher overall with more of a rise on the left (younger) side than on the right. Some of the graphs later are included from the total time data because they illustrate those categories which most often occurred when the babies were asleep and so changed the most when asleep time was removed. A table showing the percent occurrence of categories when the infants were asleep only is included at the end of the results where it is discussed in some detail (See Table 11).

Not all the categories appearing on the raw data sheets have been graphed because many of them were rarely used, but most of the ones occurring with any frequency have been analysed. (See Tables 7 and 8) In examining the data presented in these graphs, it should be noted that in Period A (roughly corresponding to November), the data sheets were Version 8, while Periods B (December) through 6 (June) reflect the use of Version 9.

Once again there are age differences between the morning and afternoon groups, with the morning children being more than a month older than the afternoon children, as represented by the mean ages of each group. For reference in this matter, the mean age of the group for each month has been written on each graph. The AM and PM graphs are also aligned by age; this means that the PM graph is pushed one month to the left of the corresponding AM graph. The analysis of the AM and PM groups have remained separate partly because we wished to discover any differences between the groups as might be expected of different caregivers, but also because there may have been differences due to time of day. In fact, the morning and afternoon graphs look so much the same that in referring to the graphs, they will be treated as one, except where otherwise noted. The total number of ten-second observations providing the basis for each month's percent occurrence data may be found in Table 10. Most of the observations are above 500, with a range from 288 to 1626. In one case, the lowest, in the PM group in February, the data were entirely omitted from the graphs because the number of observations was judged to be too low to provide stable results. Therefore a dotted line connects January and March in each PM graph; the line is intended only to permit easy reading of the data.

Awake data: The first graph of the Awake data, Figure 1, shows the Locations of the babies over the eight months they were observed, from about three to ten months of age. It is clear that the infants spent most of their awake time on the Floor at all ages; it hovered mostly between 40% and 60%, such a large amount as to indicate how free they were to explore their environment. The precent occurrence of Crib levels off at about 15%.

Table 10

Versions 8 and 9: Number of 10 second observations comprising data for Activity or Environment Analysis

Period	Total time in Nursery		Awake only	
	A.M.	P.M.	A.M.	P.M.
A Nov.	1596	1596	756	1050
B Dec	1044	1320	732	870
1 Jan	954	1236	678	876
2 Feb	480	288	372	(234)
3 Mar	540	970	426	654
4 Apr	1146	1626	1054	1362
5 May	754	954	606	732
6 June	702	568	570	414

The main reason it appears during awake time, aside from the fact that the babies did not go to sleep immediately upon being put in the crib, was that there was a crib in the playroom in which babies were placed for diapering or undisturbable play. Lap time decreased somewhat over time from about 28% to about 6%, probably because bottle feeding decreased. (Other data and subjective observation have shown that bottle feeding, lap, a supine posture, sucking bottle, caregiver holding, and looking at the baby's face, all tended to occur together as a tightly clustered group of categories. Therefore, when bottle feeding decreased as the infants grew older, it was not surprising that the other closely associated categories also declined.) The Infant Seat occurred least often as a Location for the babies, it decreased sharply from 22% to 0%.

Many of the graphs presented here exhibit a change from the previous trend of the data during May and June when there was an addition of a very young infant to each of the nursery groups; all these changes agree with what one could expect of a dilution of the data with a young baby's limited abilities. It was reassuring to find that the scanning procedure was at least sensitive enough to pick up such a relatively large change in the composition of the nursery group.

As can be seen in Figure 1A (based on awake plus asleep data), the effect that the young babies who entered the data in May had upon the group data is considerably increased with the addition of sleep time, as illustrated by the Floor and Crib curves. When asleep data are included, the amount of time spent in the Crib (40% to 50% in November) decreased as would be expected (to 20-25%), while the amount spent on the Floor increased substantially from 20% to 50%. However, there was a drop in the incidence

of Floor in May and an increase in Crib at the same time; this effect of the younger babies almost disappears in the awake only graph.

Figure 2, on Posture, shows that at the beginning of the babies' year in the nursery, they were spending most of their hours either Supine or Prone, around 30% for either. After eight months however, over 40% of the time was spent Sitting Alone. There was a large decrease over time for Supine and Prone, an increase from zero to about 13% for Hands and Knees, and a large increase in Sitting Alone from about 23% to 40%. The high incidence of Sitting Alone in the early months does not mean that the babies could sit by themselves, but that they were 'sitting' without the help of an adult in an infant seat or jump chair. In Figure 2A, when sleep time is added, the sudden increase in the percent occurrence of Prone in May and June is shown more clearly than the moderate increases shown in Figure 2.

Smiling, Vocalizations, and Asleep are plotted in Figures 3 for total time, while 3A presents Smiling and Vocalization %'s for awake time only. Sleeping took up much of the infants' time when they were very young - as much as 49%, but it declined rapidly to as low as 12% until the addition of the new babies in May. Smiling and Babbling or Cooing both occurred at a low rate under 12% which nevertheless increased slightly over time. The increase is more apparent in the Awake graphs (Figure 3A), which also have the scale increased for clarity. Smiling in the PM group increased from 2% to 5%, while Babbling-Cooing increased from 3% to 12%. Only babbling increased in the AM group.

The negative and neutral aspects of Affect are shown in Figure 4. Neutral affect is the most common state (50-75% of awake time) and shows a

slight increase over time for the PM group but a somewhat U-shaped curve occurs in the AM. Fussing and Crying remain at a fairly level state below 10% most of the time with the percent of occurrence of Fussing generally higher than that of Crying. The negative affects totaled would show that the average baby fussed or cried about 10-15% of the time or slightly less. Only the very young babies exhibited more negative affect.

Of the Visual Activities, shown in Figure 5, Looking at some part of the environment occurred considerably more frequently than any of the others - fluctuating between 20% and 40% approximately. Scanning and Visually Guided Touching remained at a somewhat constant rate of about 10% in the AM group, but showed a clear increase in the PM group from 4% to 21% for Scanning and from 4% to 14% for VTC.

Among the many varied Activities categories, the motor and manipulative ones are illustrated in Figure 6. Touching an Object occurred most frequently and increased from between 24% and 32% to almost 60% before the decrease in May. Locomoting was the next highest category; it showed a slight increase over time to reach a high of 11%. Reaching and Touching Caregiver were of even lower frequency and remained constant over time at about 10% and 5% respectively. In the Oral Activities plotted in Figure 7, Eating generally increases as Sucking Bottle decreases, while Sucking Thumb shows a group difference (somewhat more thumb sucking in the afternoon). Mouthing, however, increases sharply in both the AM and PM group to reach a high point at 23% at the age of 7-1/2 months, after which it drops off sharply to reach a low of 6% (in the AM). This result is consistent with typical developmental changes, but such a large and clear effect was unexpected.

As a brief summary of the Activities of the infants, one can say that when they were not asleep, they were on the floor, mostly sitting, but often on their hands and knees. There was some smiling and vocalizing, a fair amount of fussing or crying, but a neutral expression was the most prevalent. The infants kept busy looking and scanning and/or touching and mouthing objects around them.

The final eight graphs all show the percent occurrence of various environment categories, i.e., what input from the environment was available to the target baby. Figure 8, Specific Noises in the room, shows that the sound of the human voice was a very common feature in the babies' everyday environment. The sound of an Adult Talking (to anyone but the target baby) occurred by far the most frequently (above 60%), with Toy Noise providing much additional sound (about 20% to 40%). Other Baby Vocalizing increased from 15% to 50% in the AM group with somewhat less of an increase in the PM group. Other Baby Crying decreased very slightly from 20% to 15% in the PM group, but the same curve for the AM group was irregular with a large increase in March and April. Other data suggest that one infant in particular was irritable during this period. Also, the very young infant, who did not enter the data as a target baby until May, was in fact in the nursery in April and her crying would have been picked up in scanning the environment.

In the baby's Near Environment, shown in Figure 9 and 10, toys and adults were a major feature. Toys are Within View over 80% of the baby's awake time, and Toys are Within Reach over 60% until May. The occurrence of a toy being 'within view' was always higher than one of being 'within reach' and the same relation holds with Adults and other Babies, as shown

in Figure 10. Adults Within View was extremely high during awake time, being about 90%, with Baby Within View being always slightly less. The high percent of Adult Within View is not surprising since the babies never had their view deliberately obstructed and that they were never left alone in the one room they used when they were awake. Adults are hard to hide under such circumstances, but other babies are not; this fact accounts for the differences between the adults' and babies' curves. The curves of Adult Near are likewise always higher than those of Baby Near and for equally obvious reasons, but it is interesting to see what a high percent of the time they did occur. Adult Near was usually between 40% and 50% on the Awake graphs, somewhat declining over time, with Baby Near between 10% and 30%, increasing over time as the babies grew more mobile, but with the usual decline in May.

The remaining figures cover some of the input directly from the caregiver to the target baby. As the infants grow older, the caregiver's practices might be expected to change from those types of care involving very dependent babies, to those dealing with increasingly independent and active ones. Some of the data reflect this trend. Table 11 shows that most of the input from caregiver at any age of the baby is in Talking to him (12% to 18%). Smiling and Looking at the Baby's Face occur less and decrease over time in our data. It is possible that the caregiver had less time for this kind of contact with the baby, but it was also quite likely that the observational situation became more difficult as the bottle feeding situation (a stationary, visible tableau group) decreased and table and self feeding became more prevalent. Holding and Touching which began between 20% and 30% (Figure 12 AM) also decline over time to 10% or below. Physically Playing and Changing Position, which were expected to occur fairly

Table 11

Frequency of Occurrence (%) of Environment Categories : Asleep Only

	A.M. Group			P.M. Group		
	Period			Period		
	B+1 Dec-Jan	3+4 Mar-Apr	5+6 May-June	B+1 Dec-Jan	3+4 Mar-Apr	5+6 May-June
Crib	99	88	99	98	100	100
Floor	1	0	0	1	0	0
Infant Seat	0	5	0	0	0	0
Swing	0	0	0	1	0	0
Feeding Table	0	2	0	0	0	0
Lap	0	2	1	0	0	0
Other Baby Vocalizing	5	14	13	8	7	4
Other Baby Crying	12	12	18	12	6	7
Adult Talking	7	13	7	9	3	3
Kitchen Noise	3	2	4	4	3	2
Toy Noise	2	0	1	1	0	0
Radio	0	2	0	0	1	3
Toy In Reach	0	0	0	4	0	4
Toy In View	9	15	11	4	0	12
Adult Near	1	2	2	1	0	0
Adult In View	2	14	2	2	1	0
Baby Near	0	0	0	0	0	0
Baby In View	0	11	1	1	0	0
Caregiver						
Talking	0	0	0	0	0	0
Touching	0	0	0	0	0	0
Holding	0	2	1	0	0	0
Rocking	0	2	1	0	0	0
Soothing	0	0	0	0	0	0
N =	582	258	420	846	432	360

frequently, actually were recorded very seldom; no trends are indicated. With the scale for Figure 13 expanded, it can be seen that Showing Object occurs erratically around 5% of the time, while Giving Toy Object is less than 1%.

Figure 14 represents a group of categories labeled 'subjective impressions' by the scanners because they involved trying to interpret and record the intentions of the caregiver as she was interacting with the baby. That the scanners felt uncomfortable using such categories is reflected in the low and erratic occurrence of the categories over time. The examples given here of Encouraging Perceptual-Cognitive activity and Encouraging Motor Activity discouraged us from further use of such categories in the scanning system, especially since the actual behavior of the caregiver was covered by Showing Object, Placing Object Near, Standing with Help, etc.

Figure 15 shows some of the common "obligatory care" activities of the caregiver. Feeding began taking from 13% to 15% of the baby's time and decreases rapidly as he learned and demanded to feed himself without the caregiver's help; there is an increase in the AM group in the spring. Changing remains constantly below 7%. Social Soothing and Distant Social Soothing both remained at a very low level - below 4%.

In summary, the categories representing the infant's environment indicate that the nursery is a place where the sounds of adults and other infants occur most of the time, and where toys and adults, as well as other babies, are visible and accessible a high percentage of the time. There were many caregiving activities being directed to the infant by the adult, with the most common input from the caregiver being talking.

Asleep data, Versions 8 and 9: As previously mentioned, all the data which were gathered when the target baby was sleeping were removed from the main body of data and analysed separately. Since the infants slept in a room separate from but adjacent to the playroom where they spent most of their waking time, they were effectively isolated from the awake environment except when the door connecting the rooms was left open. Therefore the assumption has been in discussing the data from the awake time that very little was going on either in terms of infant activity or outside environment in the sleeping room. This was in fact true, as can be seen in Table 11, where all the Environment categories which occurred are presented. The data from two four-week periods at a time were pooled to provide a large enough N so that the results would be stable enough. Period A (November) was excluded because the data were from Version 8, and Period 2 (February) was excluded because there were not enough data from the PM group during that time. The results show that except for the middle period in the AM group, the babies spent 90-100% of their sleeping time in the crib. Specific noises in the sleeping room included Other Baby Crying (6-18%, mean of 10%), Other Baby Vocalizing (4-14%), and Adult Talking at the lowest percent of all - only 3-13% (mean of 5%). There were virtually no Toys Within Reach, revealing the nursery practice of not giving the babies toys when they are put to sleep, but Toys Within View some of the time (0-15%), most of these being on the floor or mobiles. An Adult was Within View only about 2% of the time and another Baby Within View even more rarely. Once again the March-April period in the AM group shows a slightly different trend, which suggests that the caregivers were spending more time with an infant to get him to sleep. This agrees with the Other Baby Crying graph of the

Awake data (Figure 8) during the same period.

It seems then that while the babies slept in the sleeping room, there was little environmental input except the sounds of other babies. The amount of sound in general was less than that in the waking environment.

Discussion

The major concern of any method used for observing and recording the behavior of people in a certain situation as well as their immediate environment must be whether the objective results agree with what is actually happening. In describing the Cornell Infant Nursery, the scanning method seems to produce realistic trends, if not startling results. In fact, too many surprises in the data would suggest a misfit between the method and the real life situation. Most of the graphs which illustrate the results show some kind of long-term trend which suggests stability from one month to the next and reassures us as to the validity of the data. The system was sensitive enough to pick up the introduction of very young infants to the nursery in the spring and reveal the effects of an especially fussy baby in the AM group in March and April.

What kind of nursery do the data reveal? Nothing one might regard as obviously undesirable turns up, although it must be remembered at the same time that the percents obtained by us are in no way prescriptive for us or for anyone else. What is needed for better evaluation of absolute levels is contrasting data from other contrasting environments such as in the home or institution. The babies in the Cornell nursery are active, naturally becoming more so as they grow. They are on the floor a large percent of the

time so that they can move around and explore the readily available toys. The environment stimulates much exploration, as indicated by the high level of object touching, looking, and mouthing. The atmosphere of the room is often busy, with adults talking, babies cooing and crying, and making toys sound. Babies and adults are in close or near contact much of the time with opportunities for social interaction. Initially, when the babies are very young, the caregivers spend a considerable amount of time holding them. This percent declines as the babies grow more active and independent and spend less time drinking from bottles. But the caregivers do pay attention to the babies as especially indicated by the amount of time they spend talking to each one, and they do have time to spend on such non-obligatory activities as showing the babies a toy and what it can do. When the babies are sleepy, they are placed in their cribs in a separate sleeping room where there is little to disturb them. The most common sounds there are those of other babies crying or vocalizing.

In general, we believe that the nursery is a happy, healthy place for babies to be. Much of what we attribute to the atmosphere of the nursery seemed to be picked up by the scanning procedure. Some things were left out and none seemed to be falsely represented, but there still remains the problem of interpretation. One of the main limitations in the scanning procedure is that it is not designed to record interactions between babies or between babies and adults. In order for such interactions to be picked up, more attention would have to be focused on them by extending the time interval and excluding other types of observation. Since social interactions form a major part of the environment of the Cornell Infant Nursery, any system of observation which leaves them out and cannot adequately represent

them in another way presents a picture of the nursery which is misleading. For instance, the amount of time a caregiver spends holding an infant is about 10% at the low end of the range; that seems to be a low percentage but, translated into minutes, it would represent about twenty-four minutes during a four-hour period that the caregiver holds an infant. Also one must consider that much interaction can take place between infant and adult without the adult actually holding him. Another problem arises with the amount of interaction with the other infants in the room. Although there was a group of categories on the Environment data sheets to record the inputs from the Other Babies to the target baby, none of the variables from that group were judged frequent enough to be illustrated in the results in graph form. Does this mean the other babies had no contact with each other? Certainly not; they were free to move around and explore all parts of their environment, but the babies spent proportionately less time with the other babies than with toys or adults, and their contacts with each other were often very brief. Finally, the amount of crying versus smiling may be misleading. No one will dispute that young babies do cry and the amount found in our data is probably an accurate representation since there were few problems in observing it. Smiling, however, is not vocal, is very fleeting, and is easily hidden, so it is possible that the amount of smiling in the nursery is under-represented. But, even if it were not, a neutral expression, the most common, usually means that the baby is not unhappy, since he would cry if he were. So an infant crying rate of only 15% is probably normal and no reason for alarm.

Aside from problems in interpreting the data and picking up interactions between people in the nursery, some of the categories were left out

of the data analysis. What was left out and why? As can be seen from the list of variables the scanners were ready to code, there were many more than were eventually graphed, although the graphs represent all the variables that occurred with any regularity. The variables which were not successful seemed to be those that occurred very quickly, and/or infrequently, and/or required too much attention from an observer who was watching for seventy possibilities. Examples of these problems have been given in the preceding paragraph on social interactions. Thus, for general observational purposes, a list of categories comprised of those actually graphed would probably be adequate. However, for more specific purposes, such as recording the behavior of a caregiver throughout the day, those specific categories pertaining to that goal should be concentrated on.

Making the list of variables shorter would mean that probably both Activity and Environment could be coded by one observer, thus making the scanning procedure more practicable. The data we collected during 1971-1972 actually required much time and personnel, but it could easily be reduced if some categories were eliminated. The procedure as a whole is easy to learn and very adaptable to specific uses. It does not have to be carried out from an observation booth but can be used in the room in front of the infants as little equipment is required. Overall, the scanning procedure seemed to perform very well in two years of use and could be helpful in comparing one infant environment to another or in suggesting which aspects of the nursery environment could be improved upon.

Summary

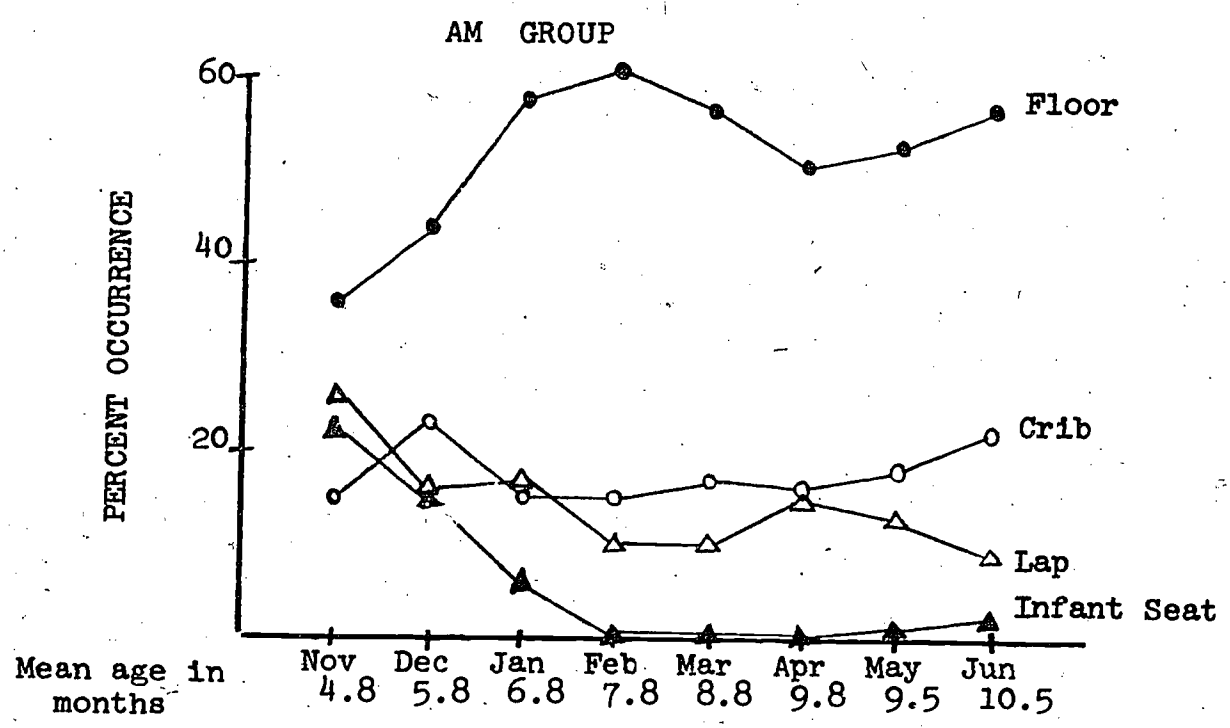
We have been trying for two years to develop a method by which our infant day care nursery can be described in more quantitative terms than simply "pleasant," "good," or "successful." The scanning procedure as developed is basically a time-sampling way of collecting data on the normal operation of the nursery. Two long lists of variables, categories of infant behavior and nursery environment, are carried into the observation booth and checked off by the observers according to what they see. Initially, much time was spent training observers and establishing inter-observer reliability. The reliability established by Pearson's correlation coefficient was usually over a mean of .8 and was judged adequate by the observers, although they were continuously trying to improve. The percent agreement was also quite good and revealed about the same strengths and weaknesses in the method as the correlations.

Over the two-year period, details of the scanning method were altered to provide more reliability as well as to make the computation of results more realistic. This latter type of change basically involved allowing the subtraction of confounding factors in the data. Therefore, the results of Version 7 are not strictly comparable to the results of Versions 8 and 9.

To date, data have been collected on four groups of infants by a total of seven observers. In the first year of the scanning method (Version 7), much of the data collected was by only one observer at a time. The next year, however, all data came from two simultaneous observers and these were enough observers that at least twice as many data were collected overall (in Versions 8 and 9). The main analysis of the data was concentrated on those collected from Versions 8 and 9.

The results showed that many categories were rarely recorded by the observers, but the ones most frequently used often showed stable trends over the eight months the data were collected. These trends were consistent with the infants' development, and with our subjective impressions of the nursery environment in general. We feel therefore that the scanning method was successfully able to record the environment and activities of the infants in the nursery, and that other investigators would be able to use the same method. There are, however, problems in interpreting the data gathered in one environmental setting; it would be useful and interesting to gather data from different environments.

Fig. 1 PERCENT OCCURRENCE OF SELECTED LOCATION CATEGORIES (AWAKE ONLY)



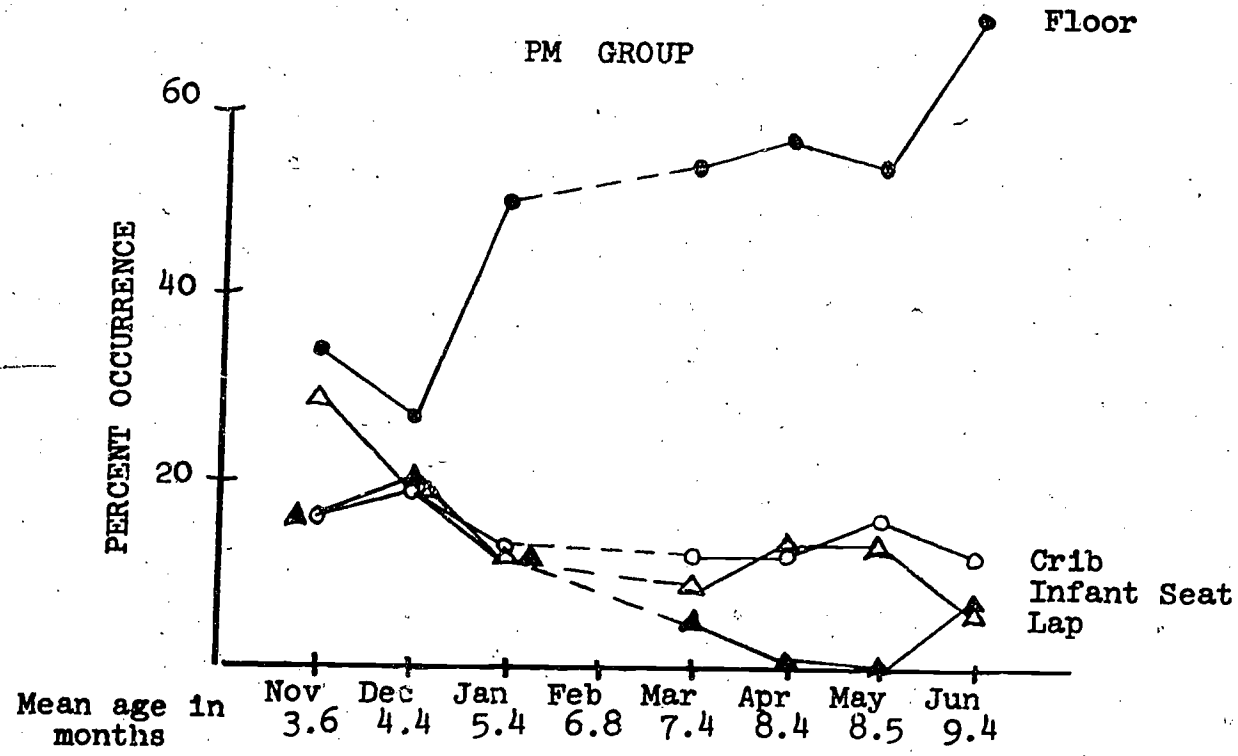
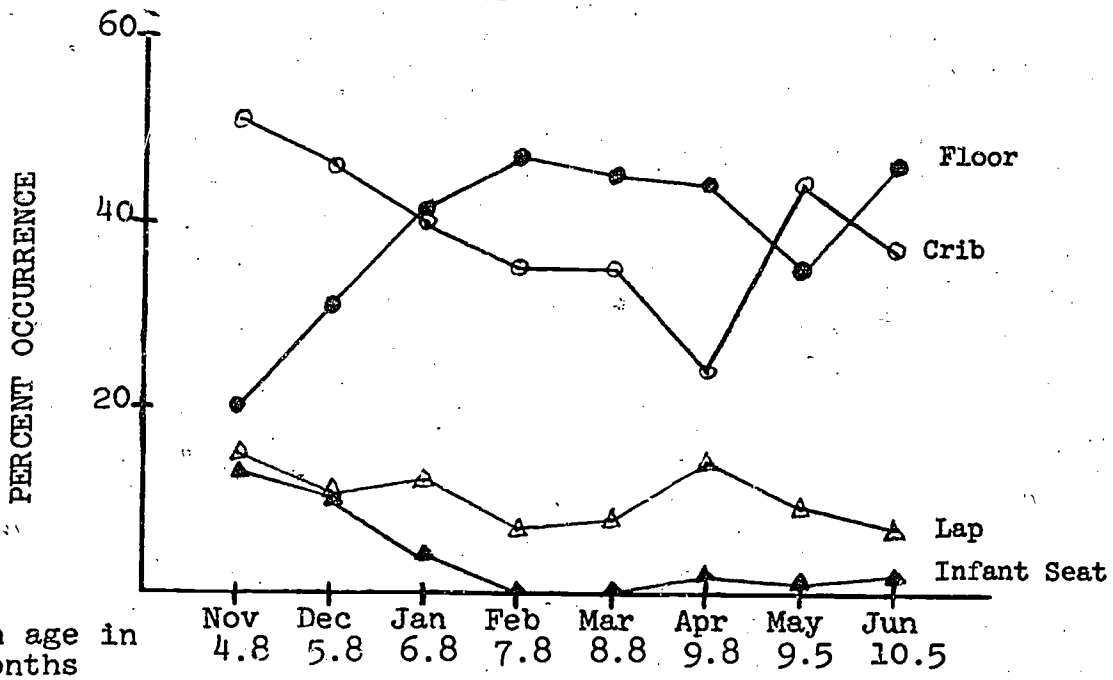


Fig. 1.A PERCENT OCCURRENCE OF SELECTED LOCATION CATEGORIES (TOTAL TIME)

AM GROUP



PM GROUP

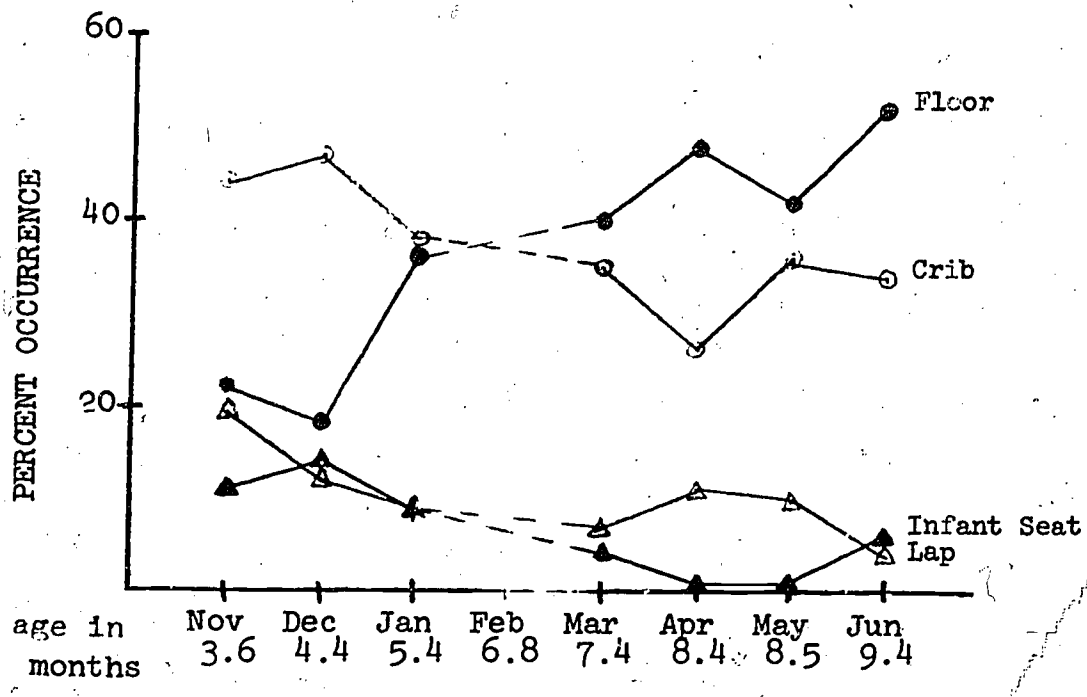
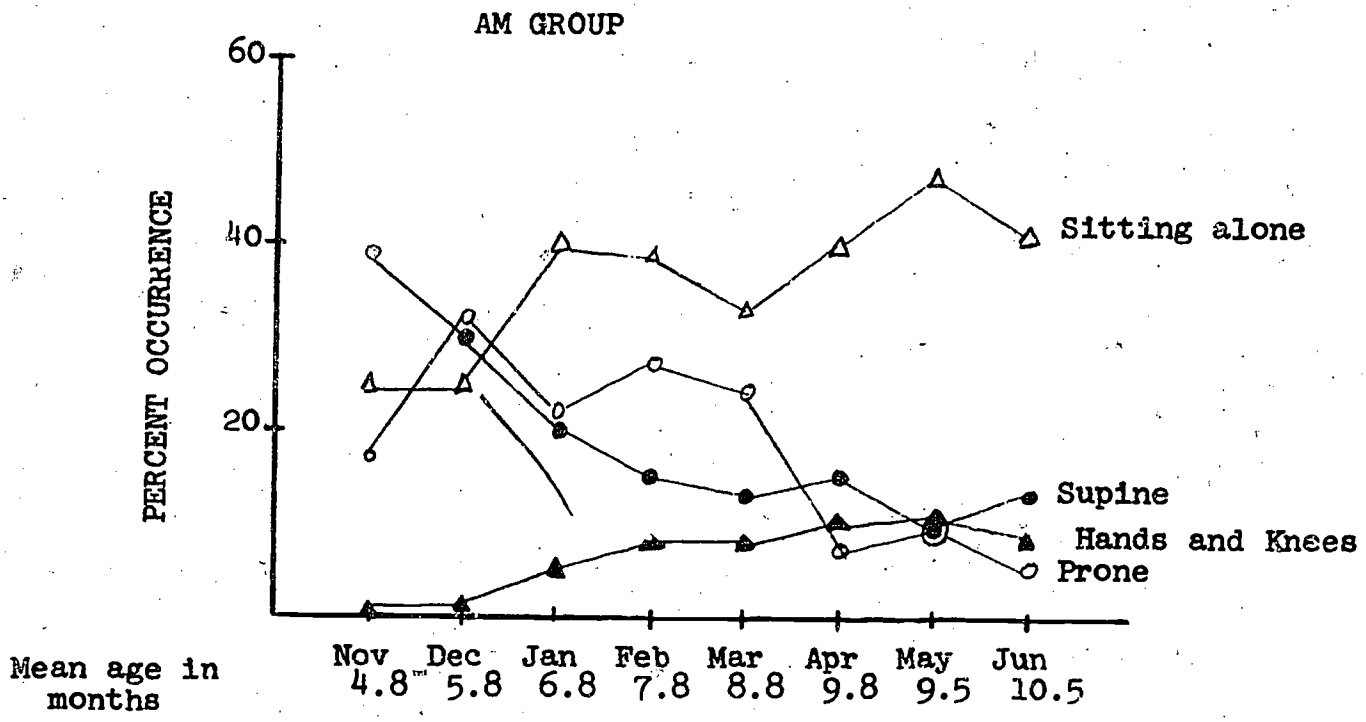


Fig. 2 PERCENT OCCURRENCE OF SELECTED POSTURE CATEGORIES (AWAKE ONLY)



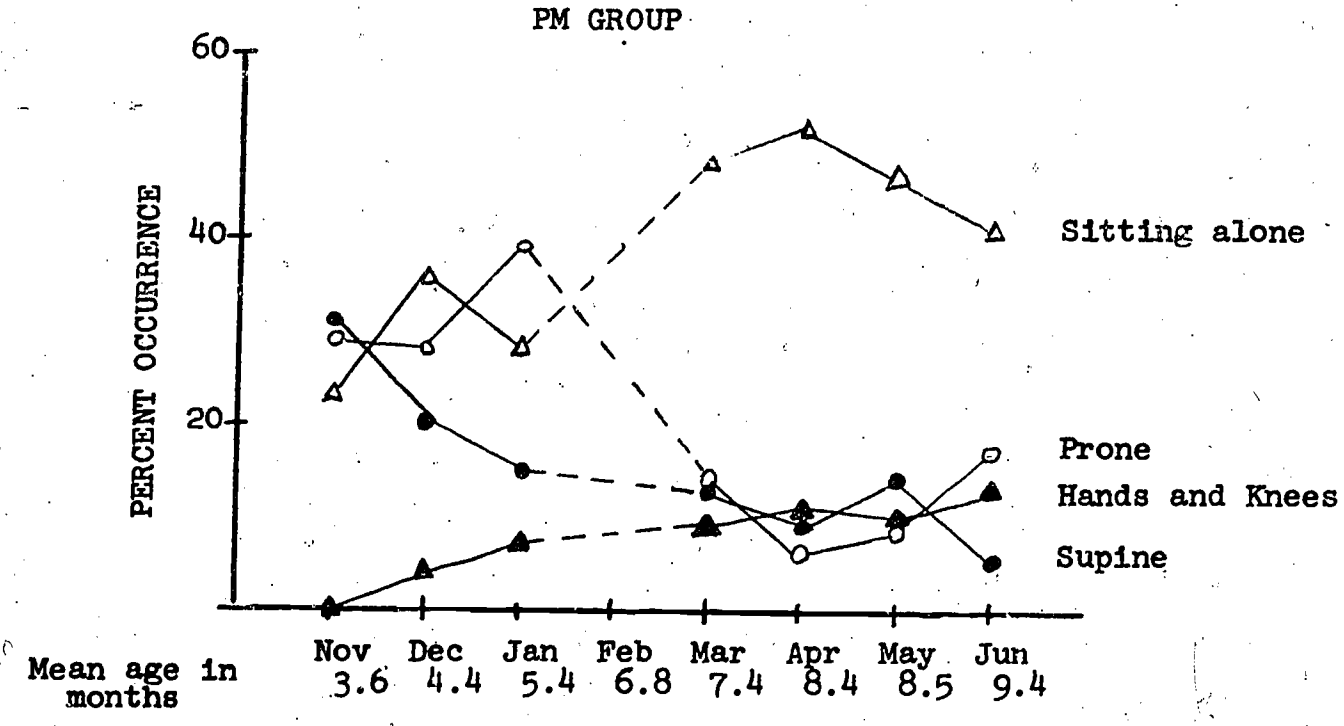
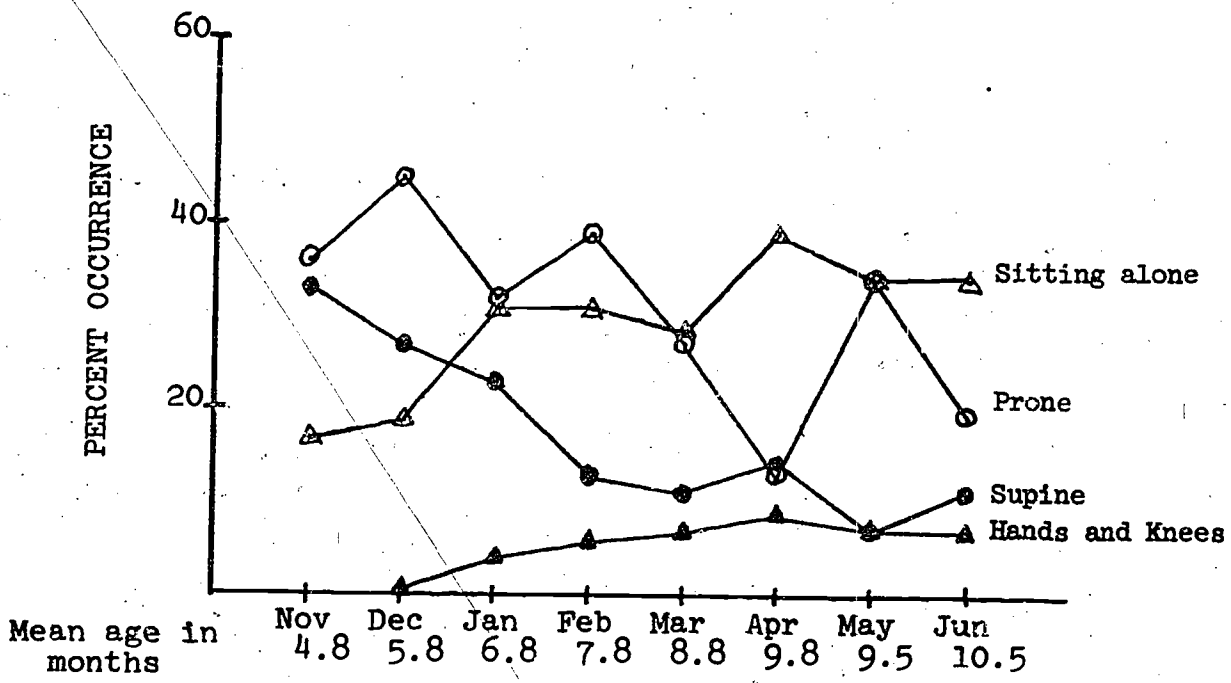


Fig. 2.A PERCENT OCCURRENCE OF SELECTED POSTURE CATEGORIES (TOTAL TIME)

AM GROUP



PM GROUP

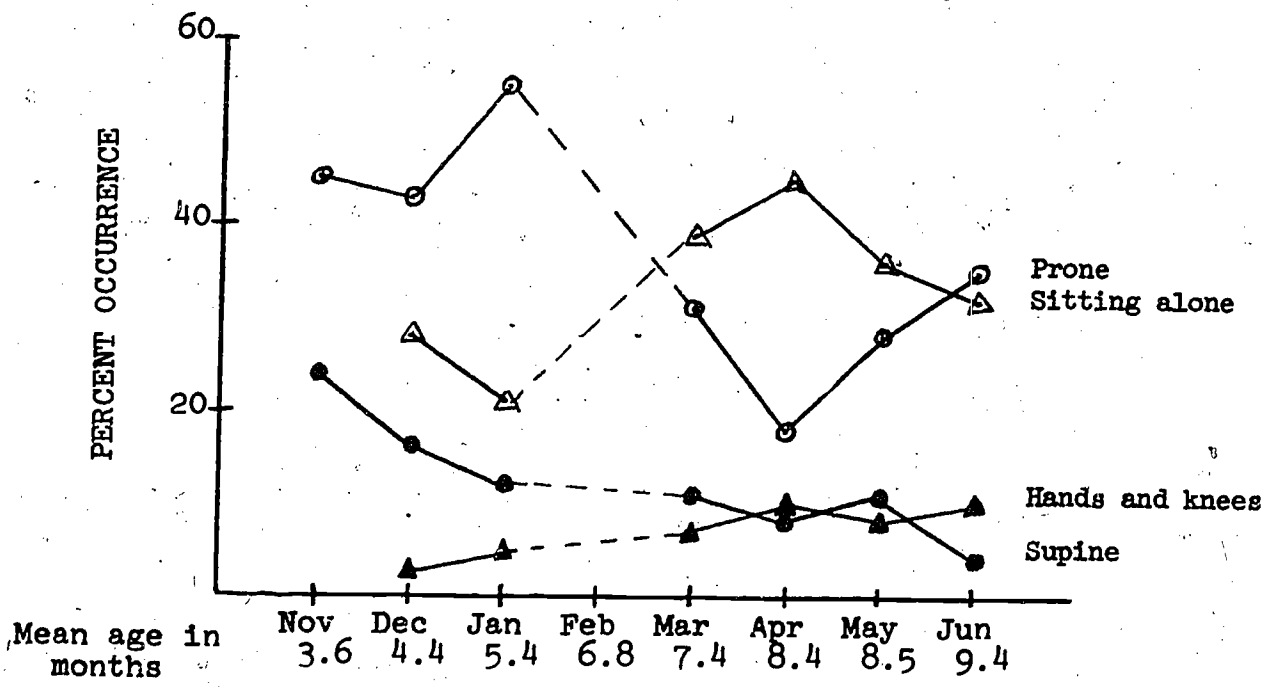
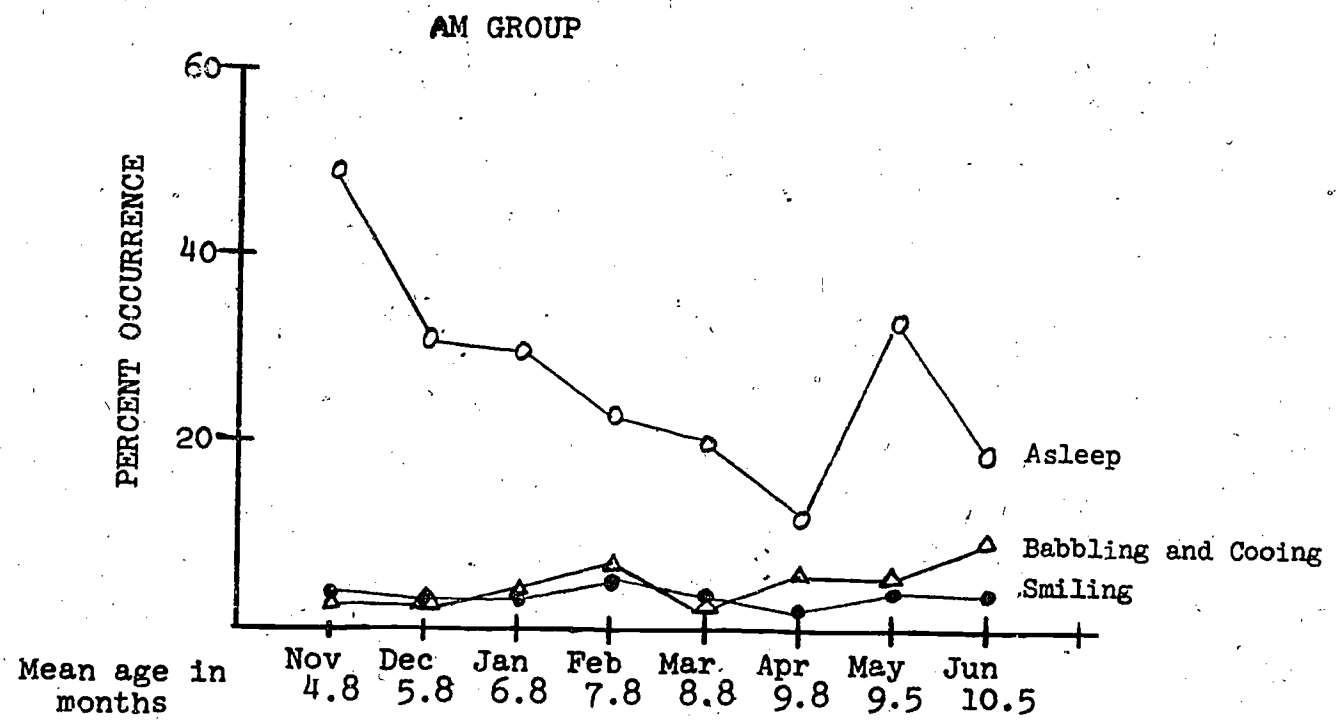


Fig. 3 PERCENT OCCURRENCE OF ASLEEP, SMILING, AND BABBLING - COOING (TOTAL TIME)



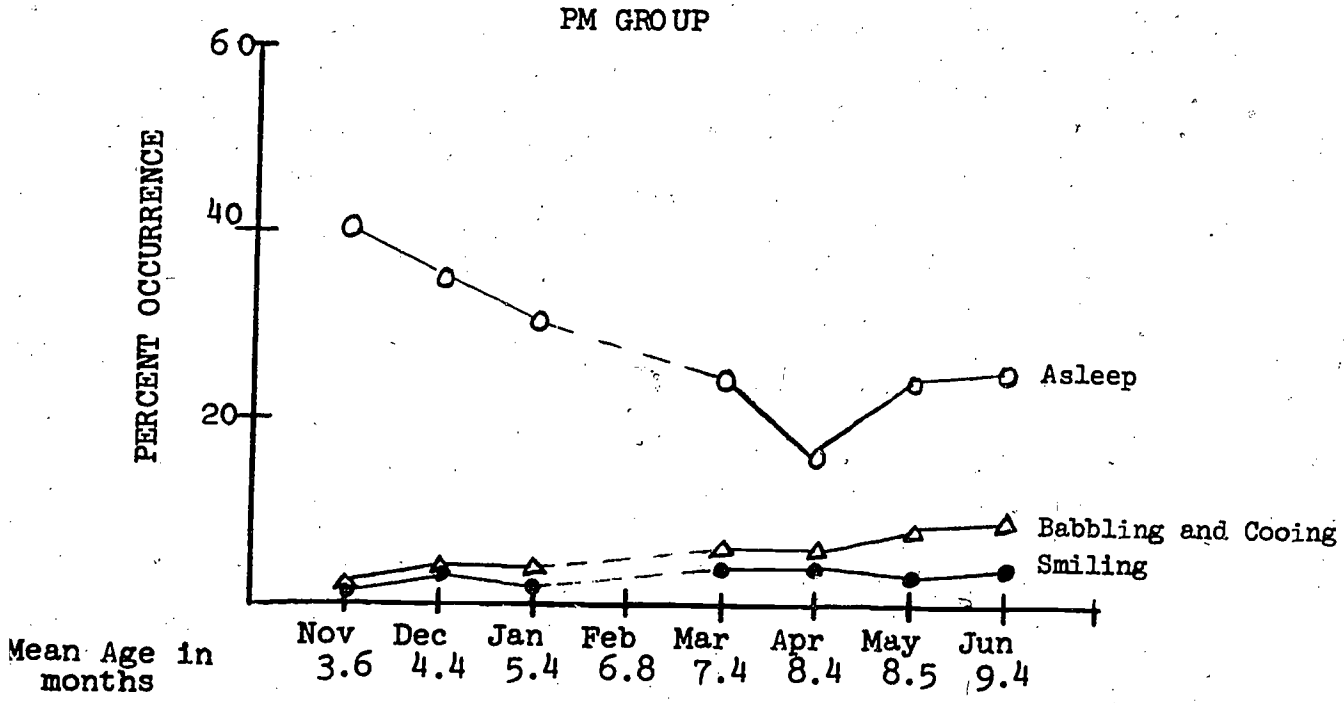
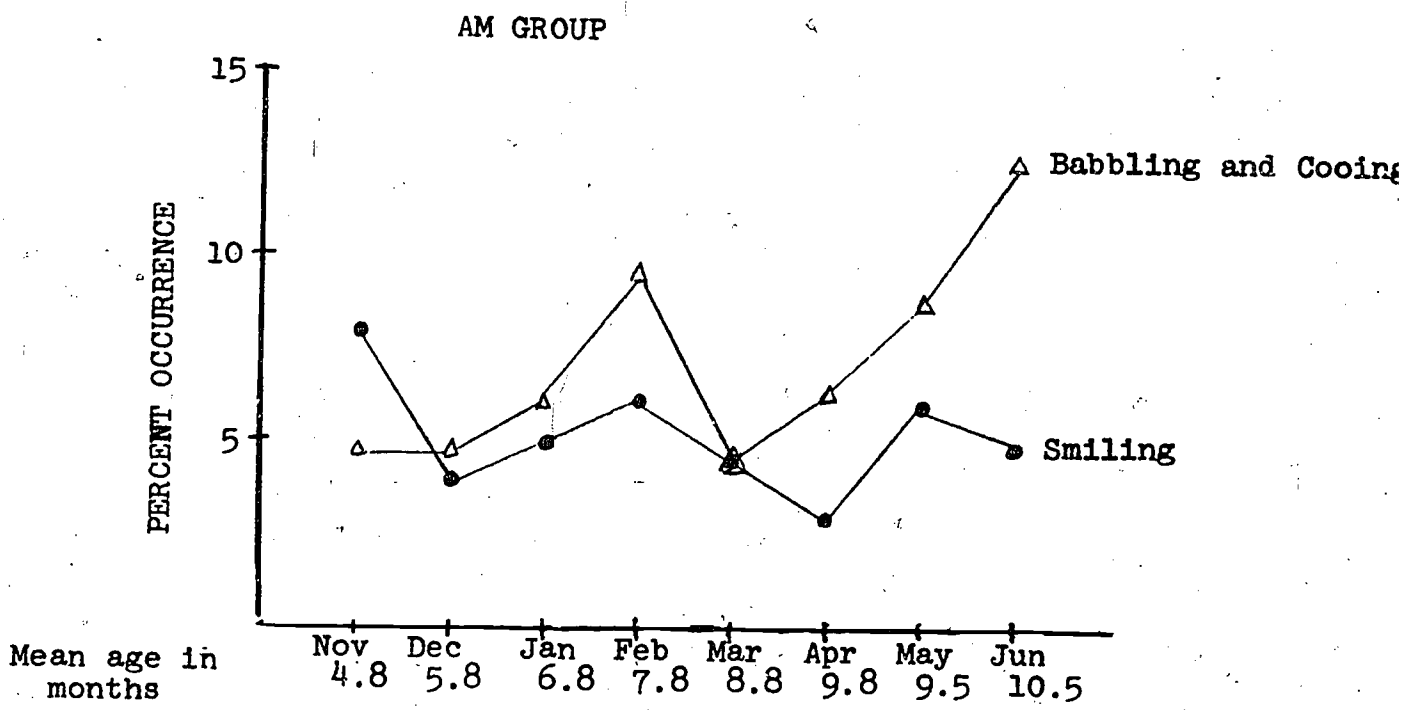


Fig. 3.A PERCENT OCCURRENCE OF SMILING, AND BABBLING - COOING (AWAKE ONLY)



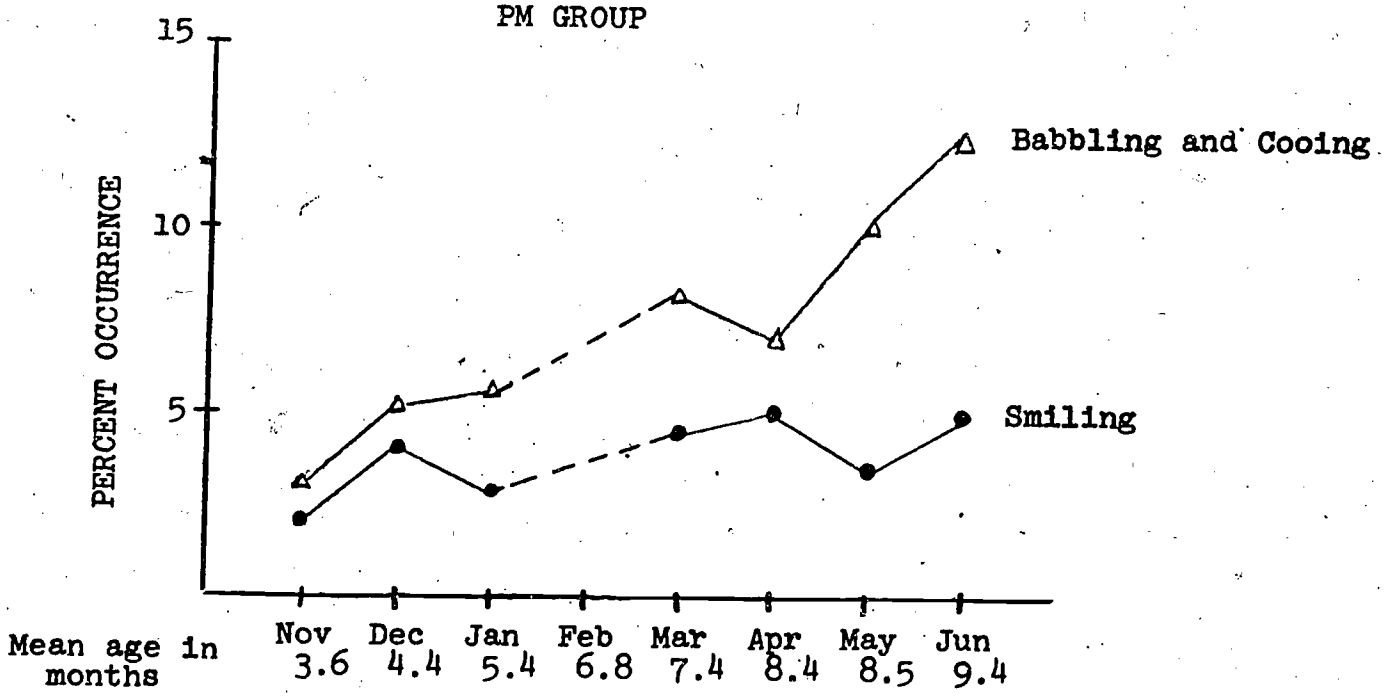
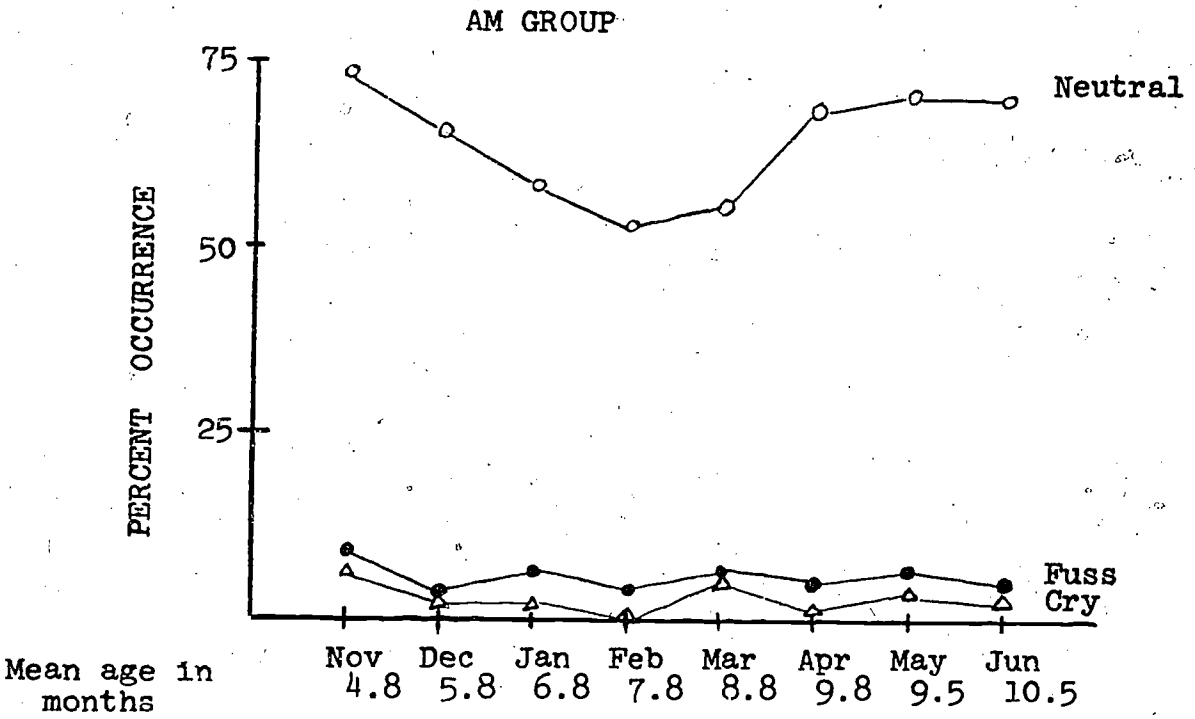
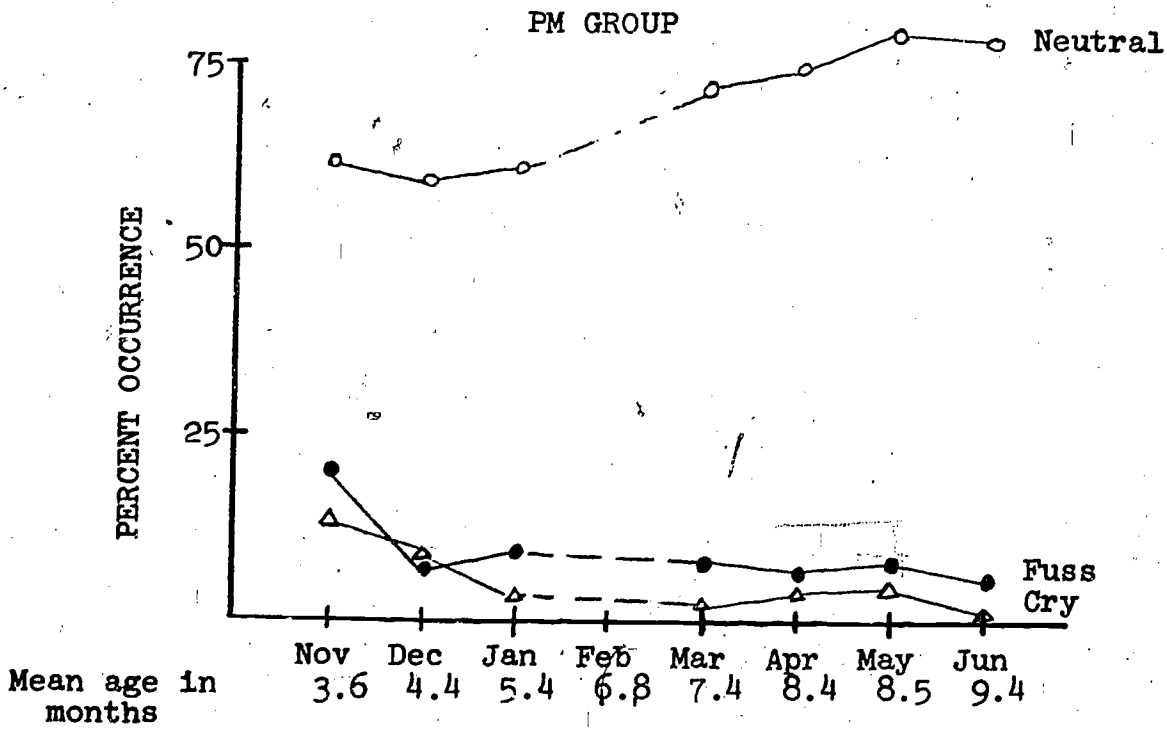


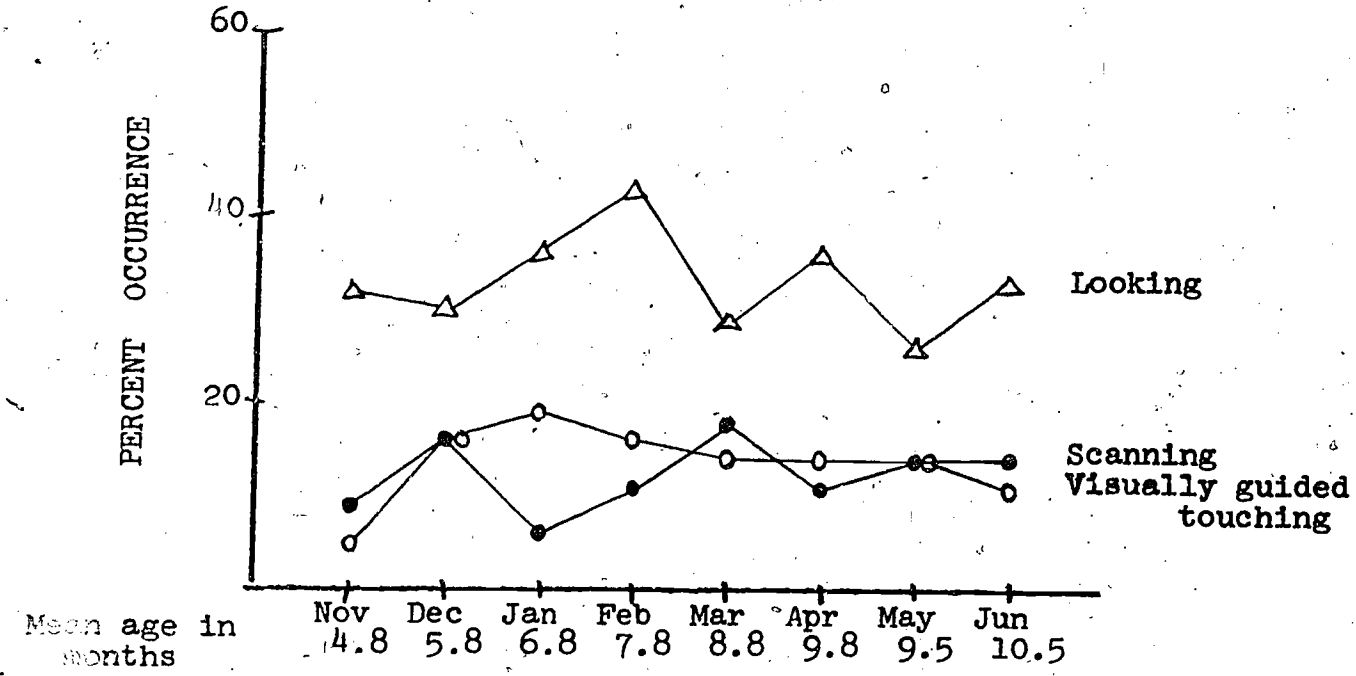
Fig. 4 PERCENT OCCURRENCE OF NEUTRAL AFFECT, FUSSING AND CRYING (AWAKE ONLY)





3. 5 PERCENT OCCURRENCE OF SELECTED VISUAL ACTIVITIES (AWAKE ONLY)

AM GROUP



PM GROUP

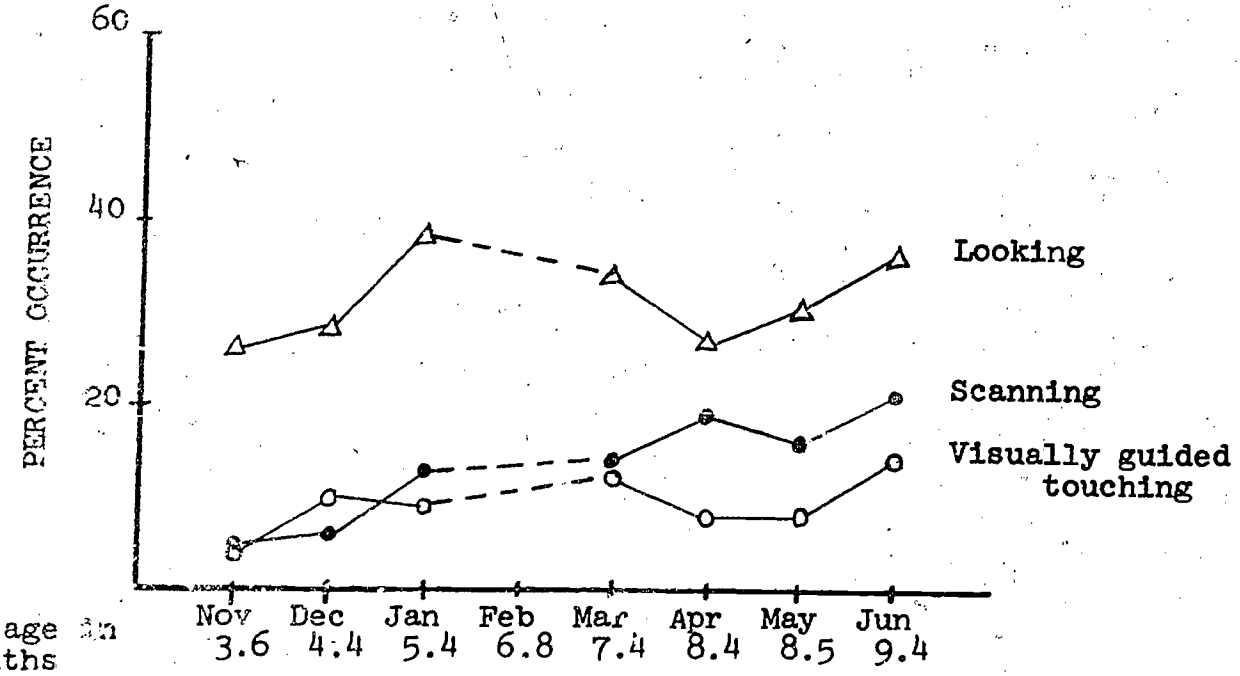
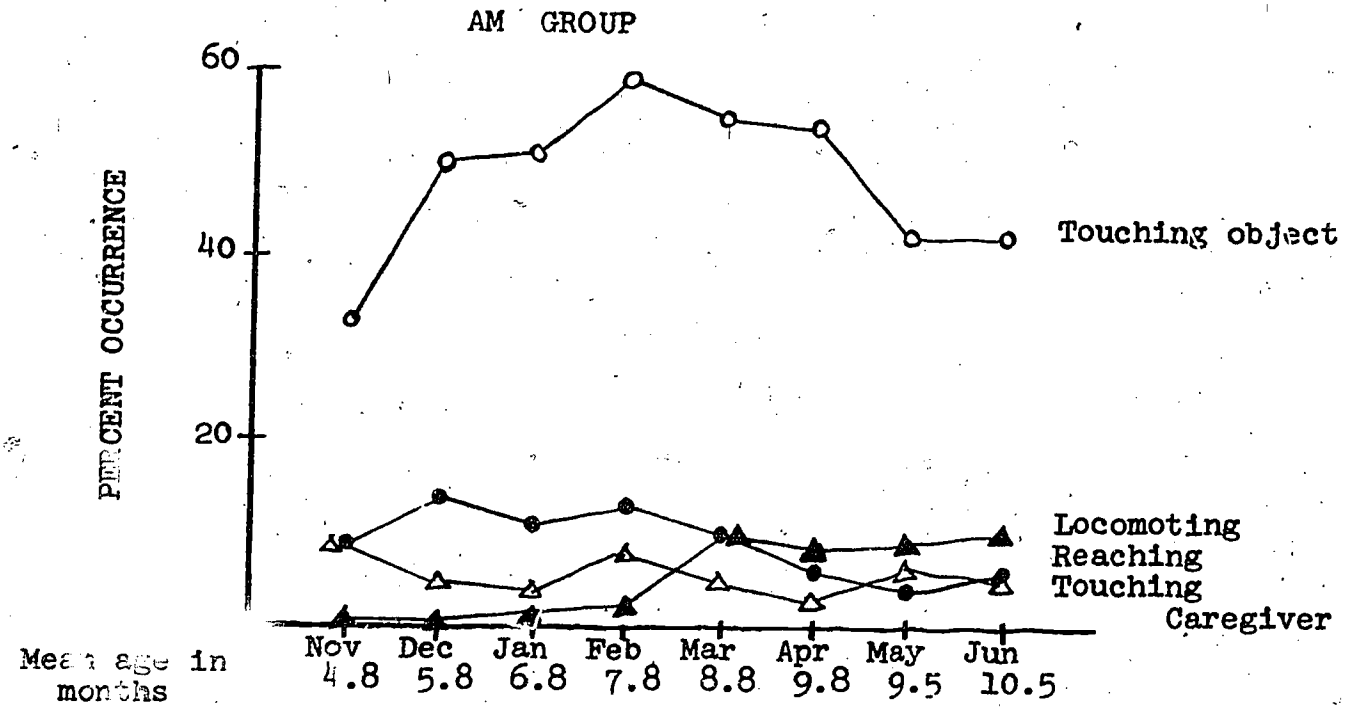


Fig. 6 PERCENT OCCURRENCE OF SELECTED MANIPULATIVE AND MOTOR ACTIVITIES (AWAKE ONLY)



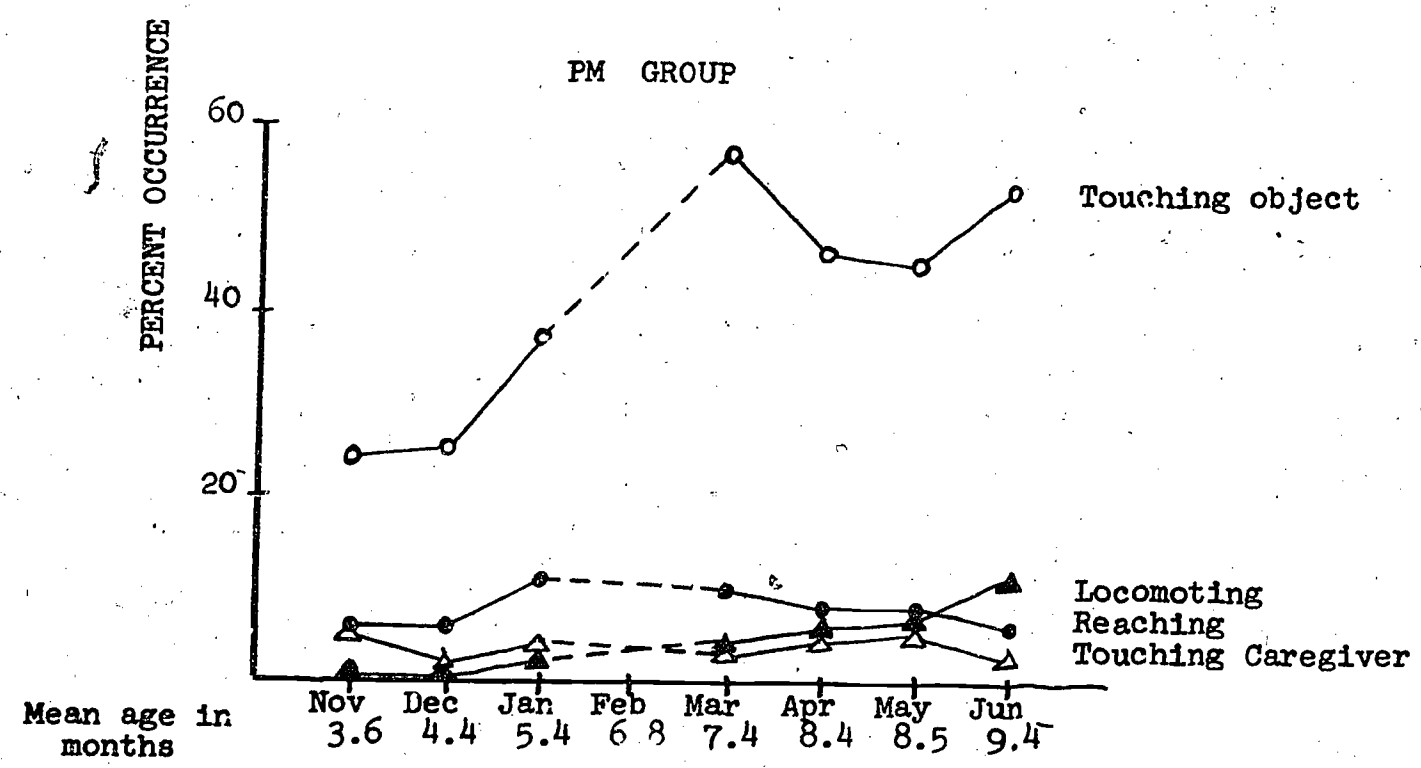
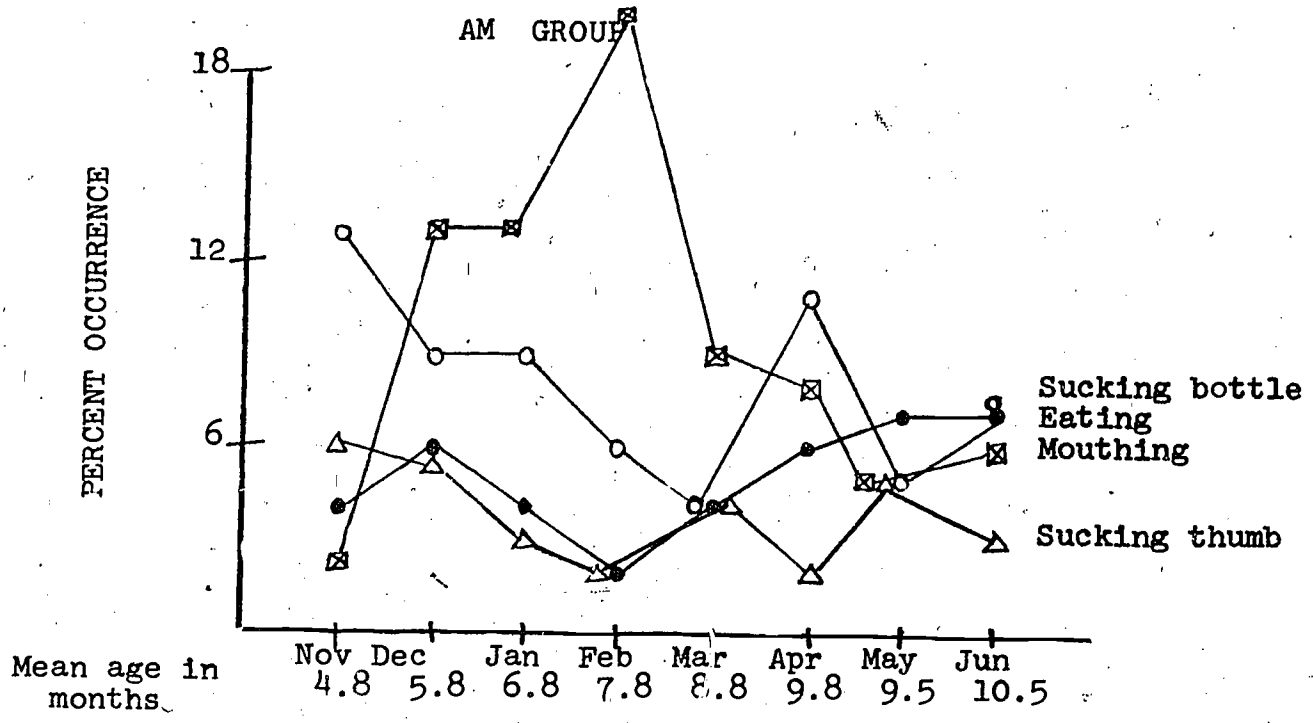


FIG. 7 PERCENT OCCURRENCE OF SELECTED ORAL ACTIVITIES (AWAKE ONLY)



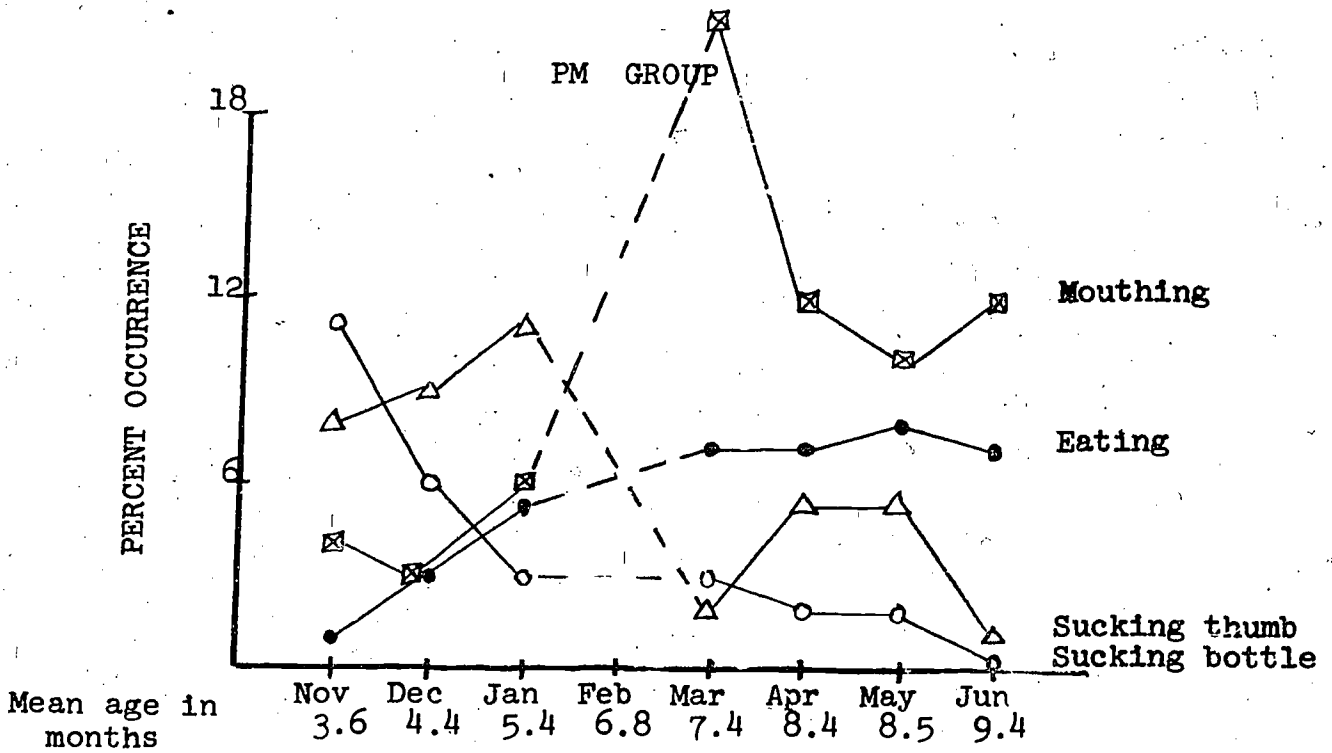
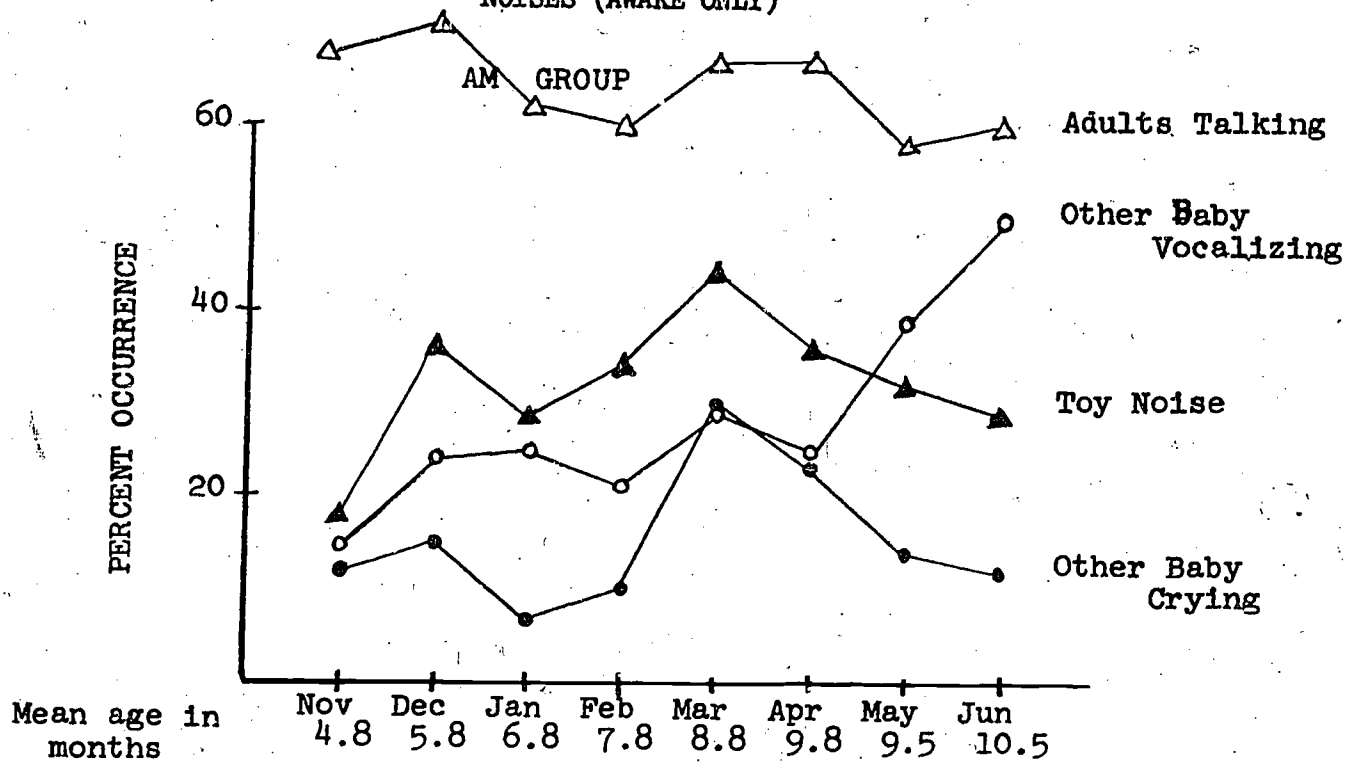


Fig. 8 PERCENT OCCURRENCE OF SPECIFIC NOISES (AWAKE ONLY)



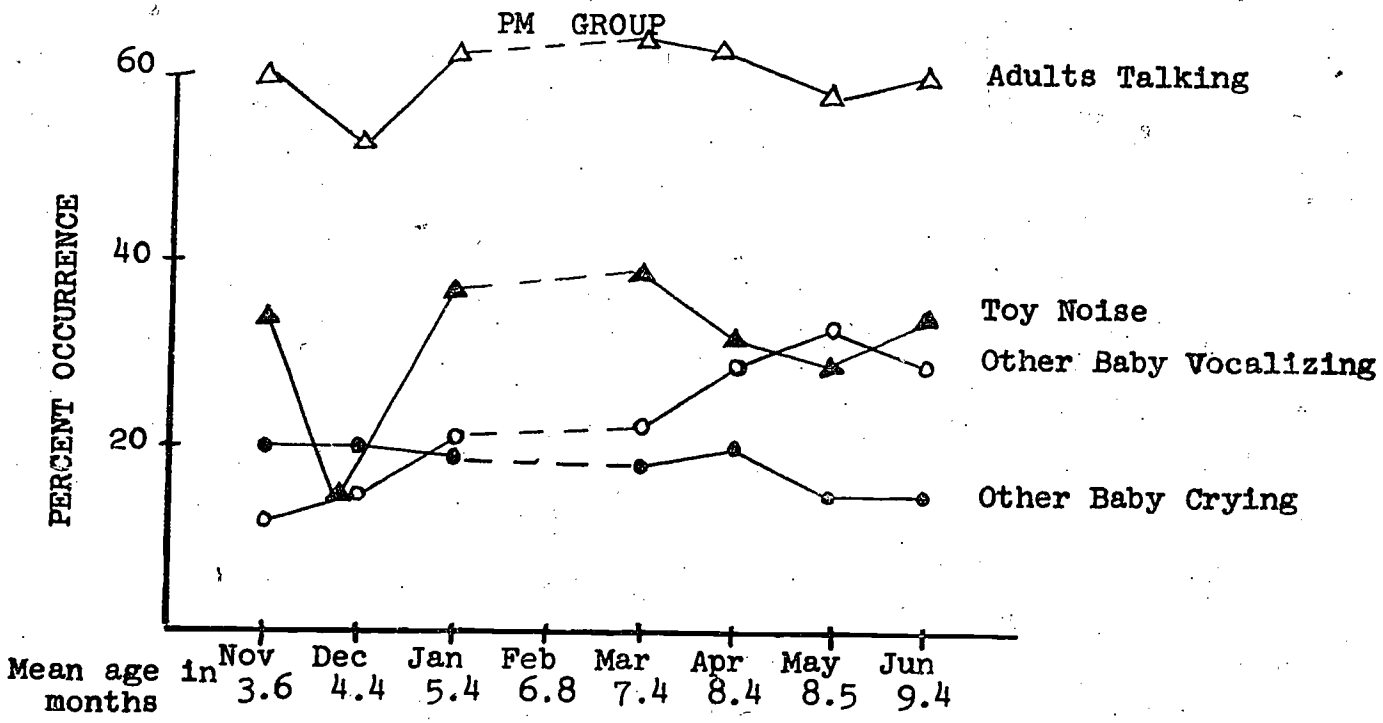
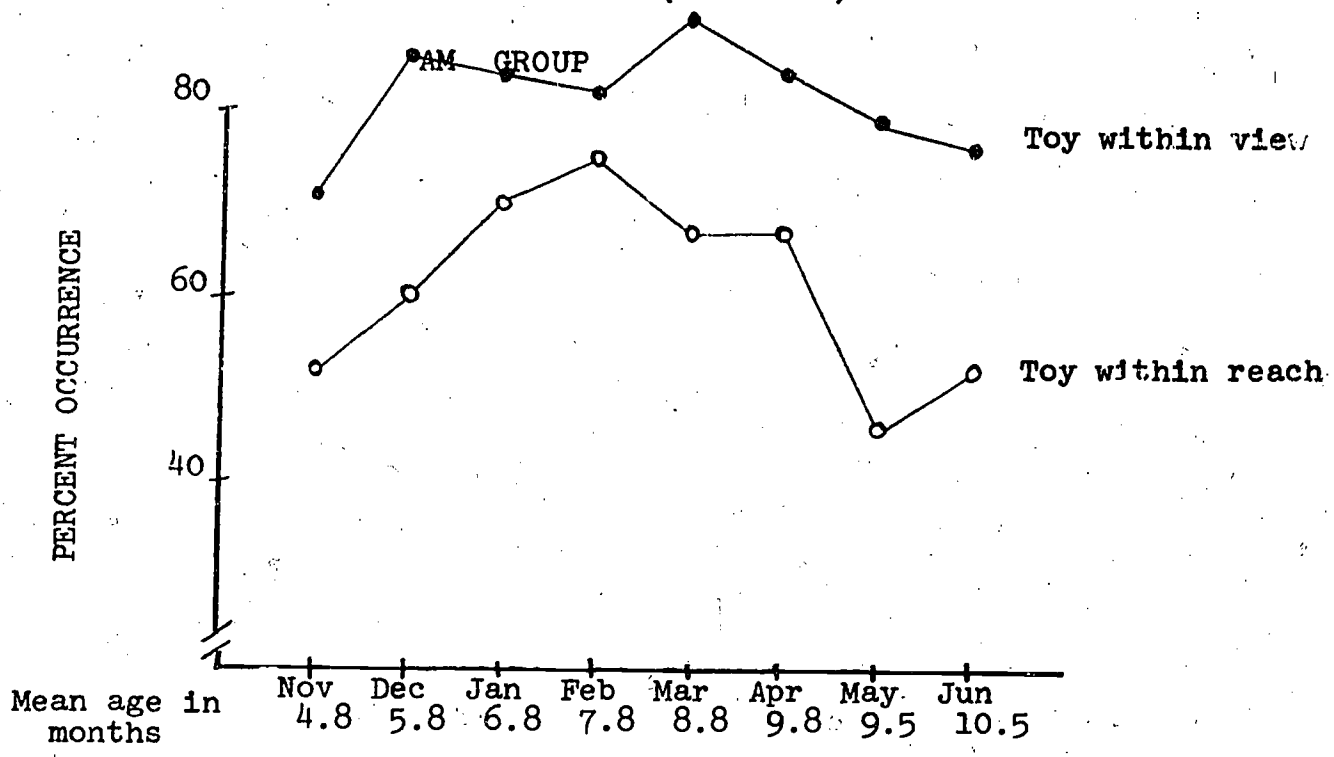


Fig. 9 PERCENT OCCURRENCE OF TOYS IN NEAR ENVIRONMENT (AWAKE ONLY)



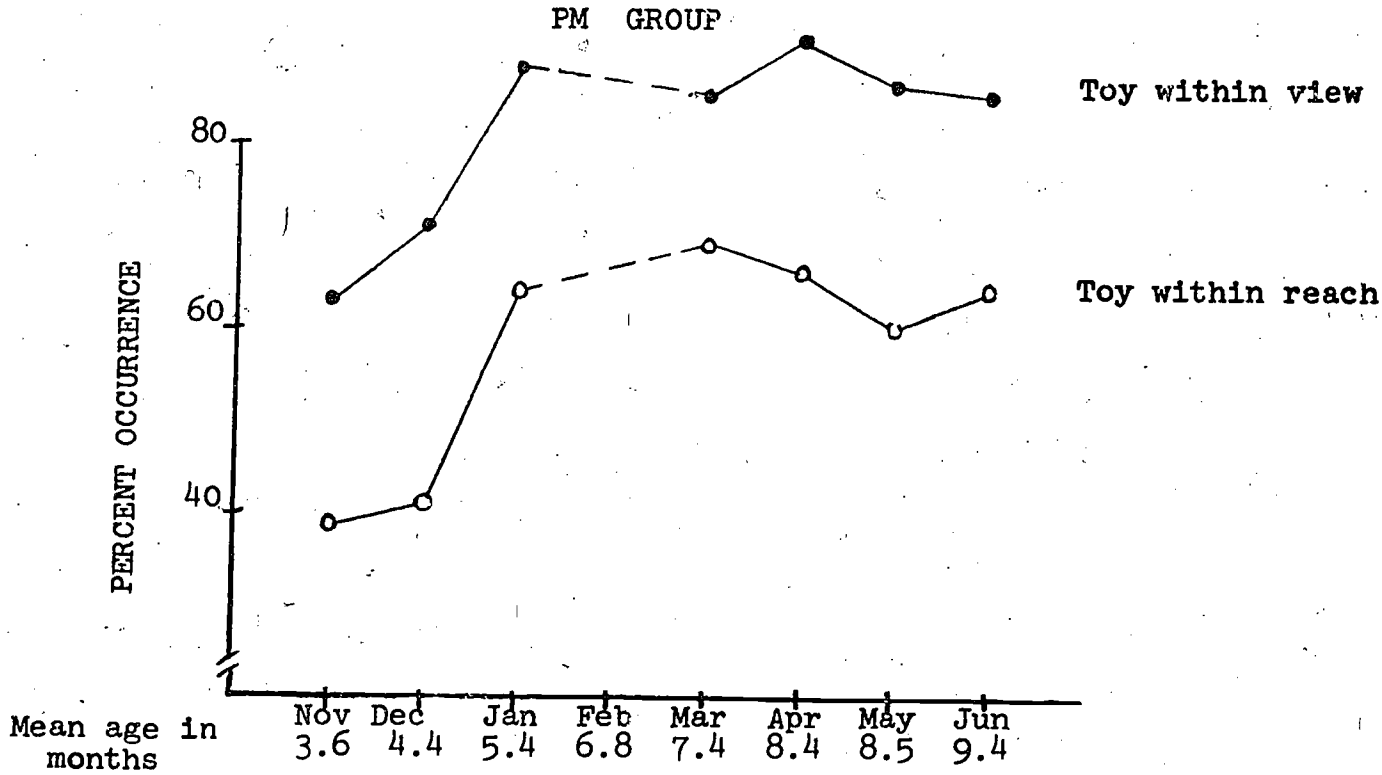
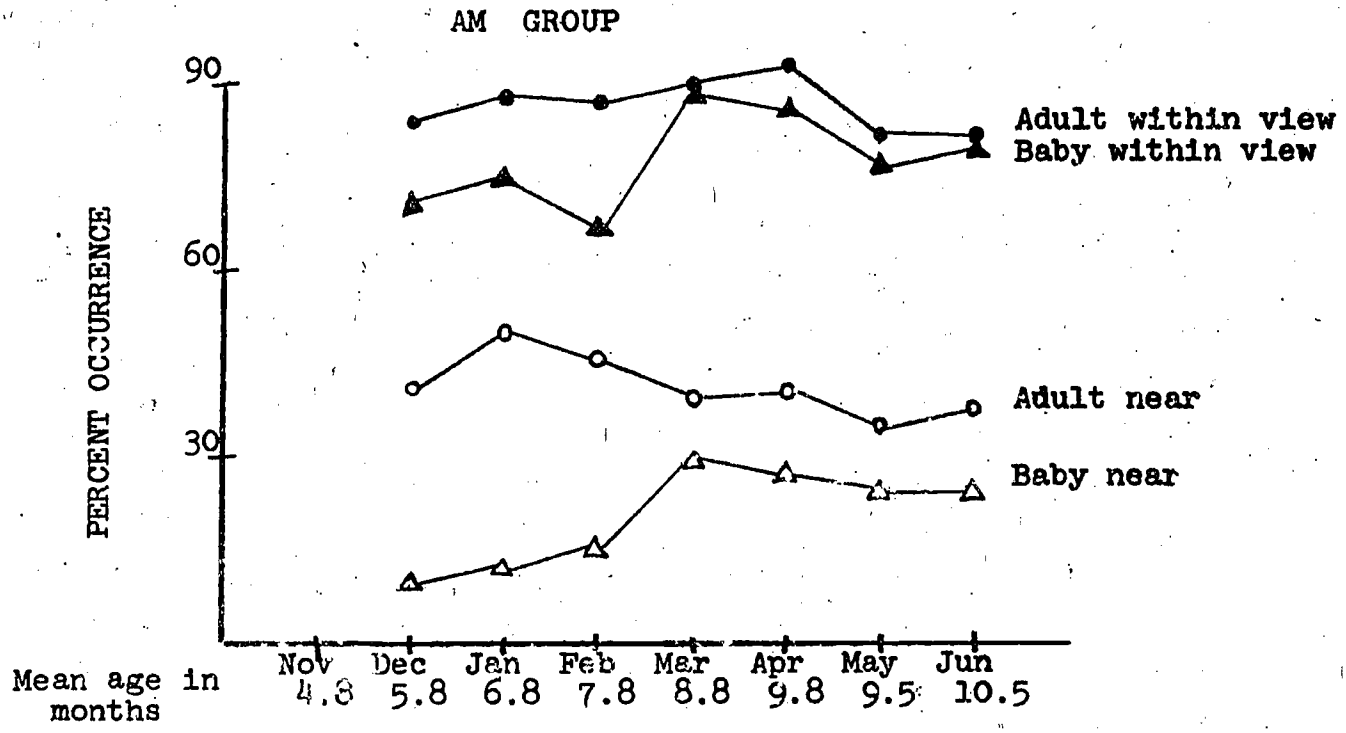


Fig. 10 PERCENT OCCURRENCE OF INFANT OR ADULT IN NEAR ENVIRONMENT (AWAKE ONLY)



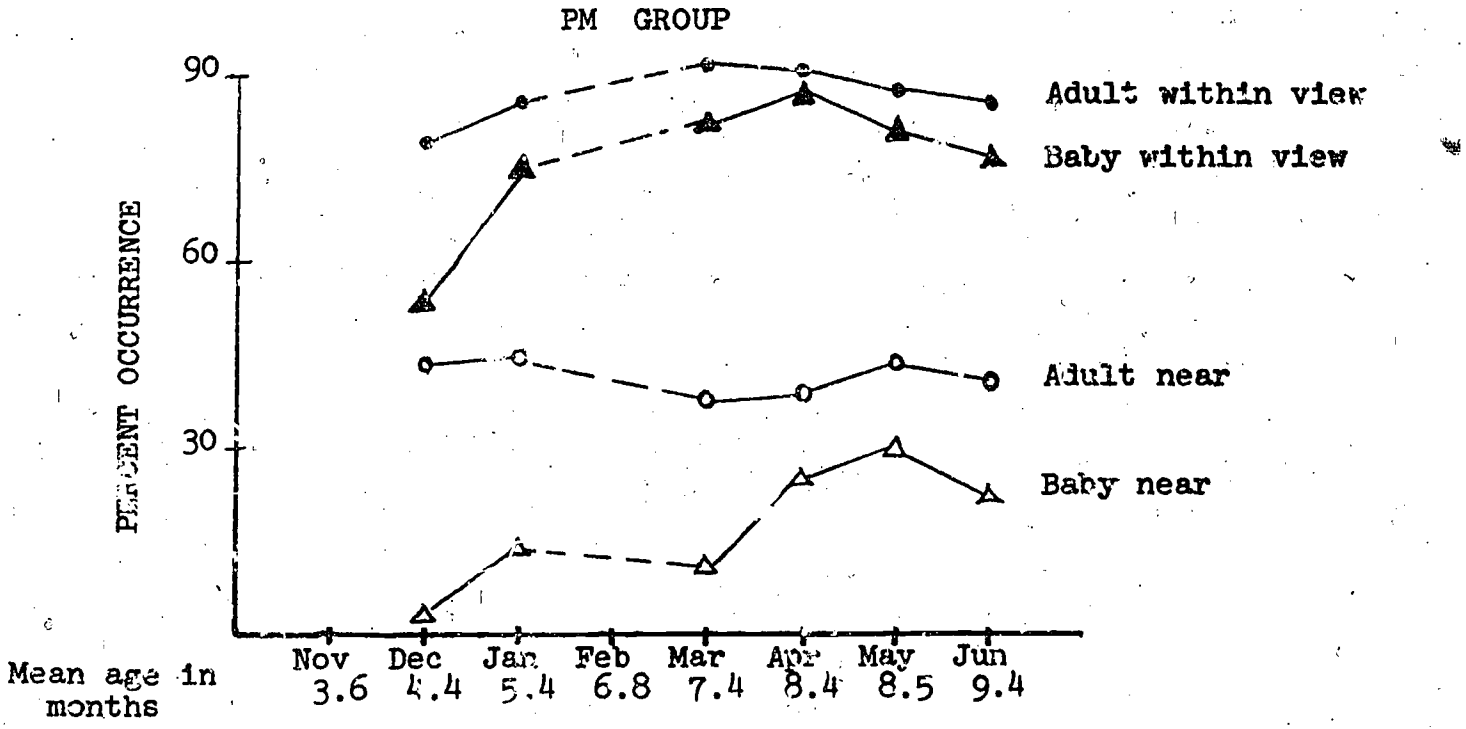
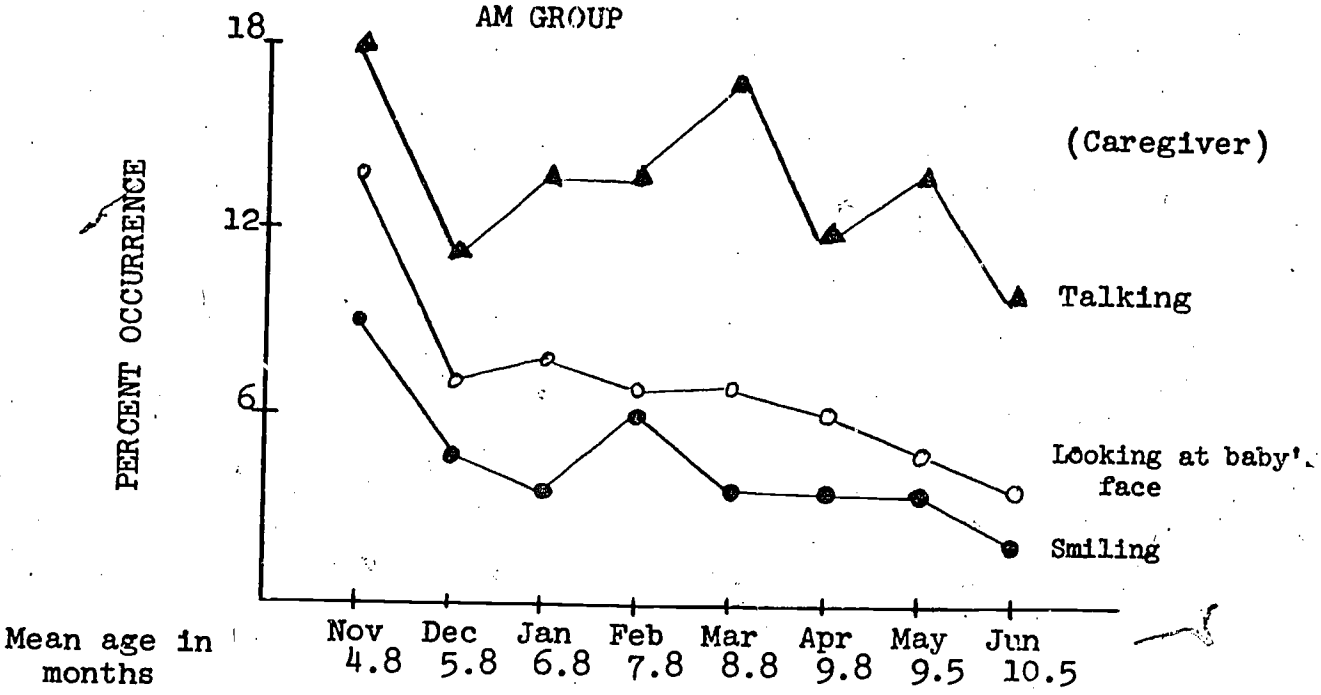


Fig. 11 PERCENT OCCURRENCE OF SELECTED CAREGIVER ACTIVITIES (AWAKE ONLY)



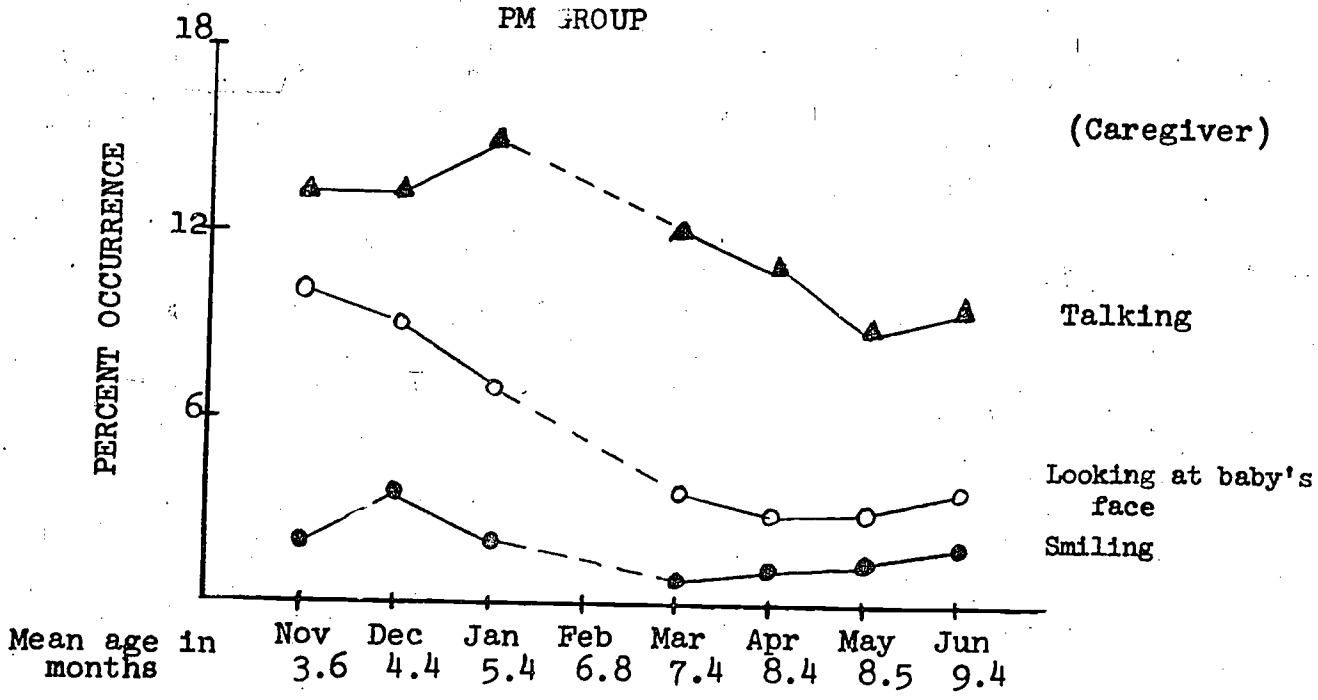
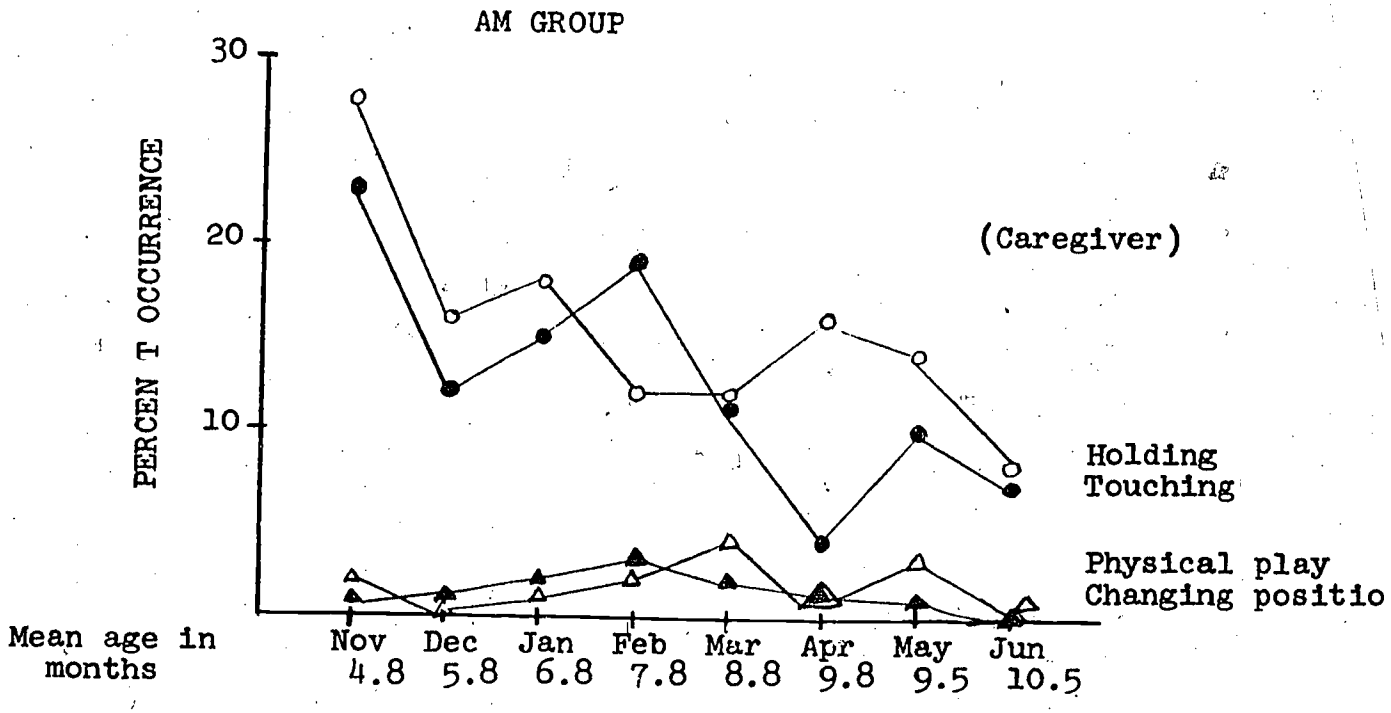


Fig. 12 PERCENT OCCURRENCE OF SELECTED CAREGIVER ACTIVITIES (AWAKE ONLY)



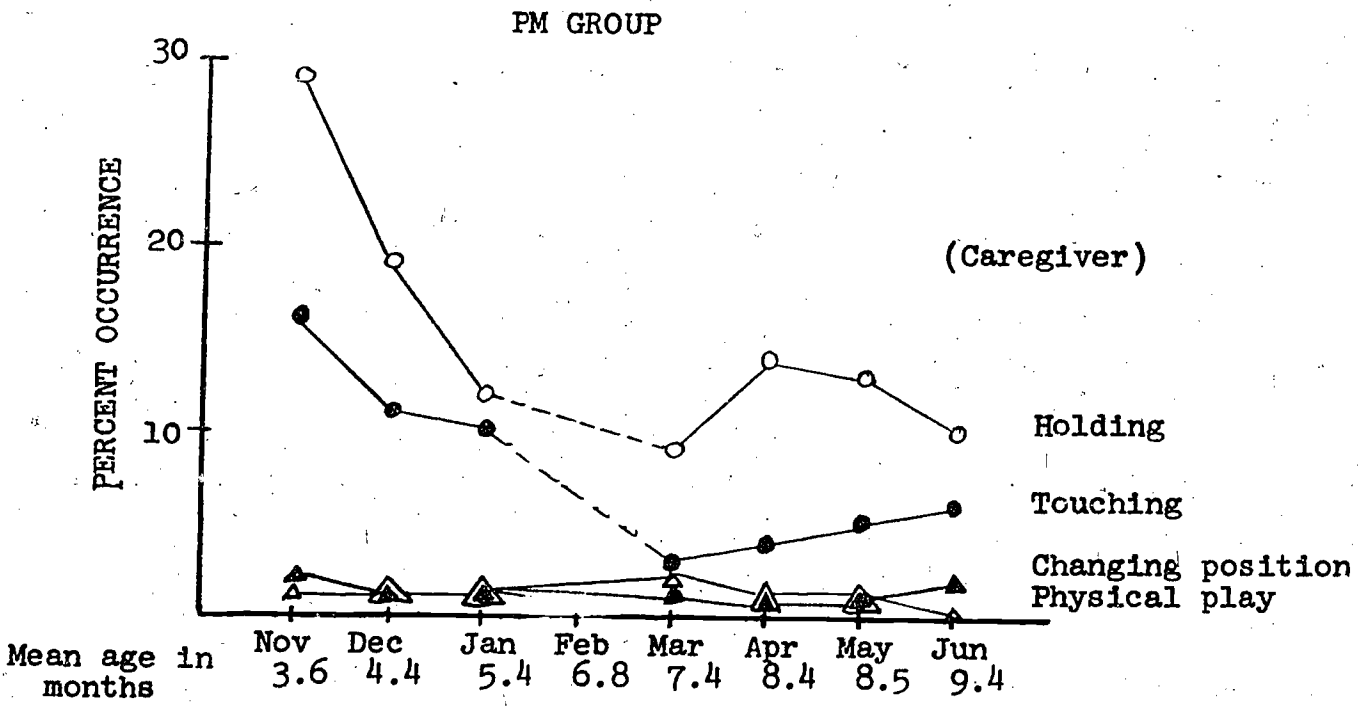
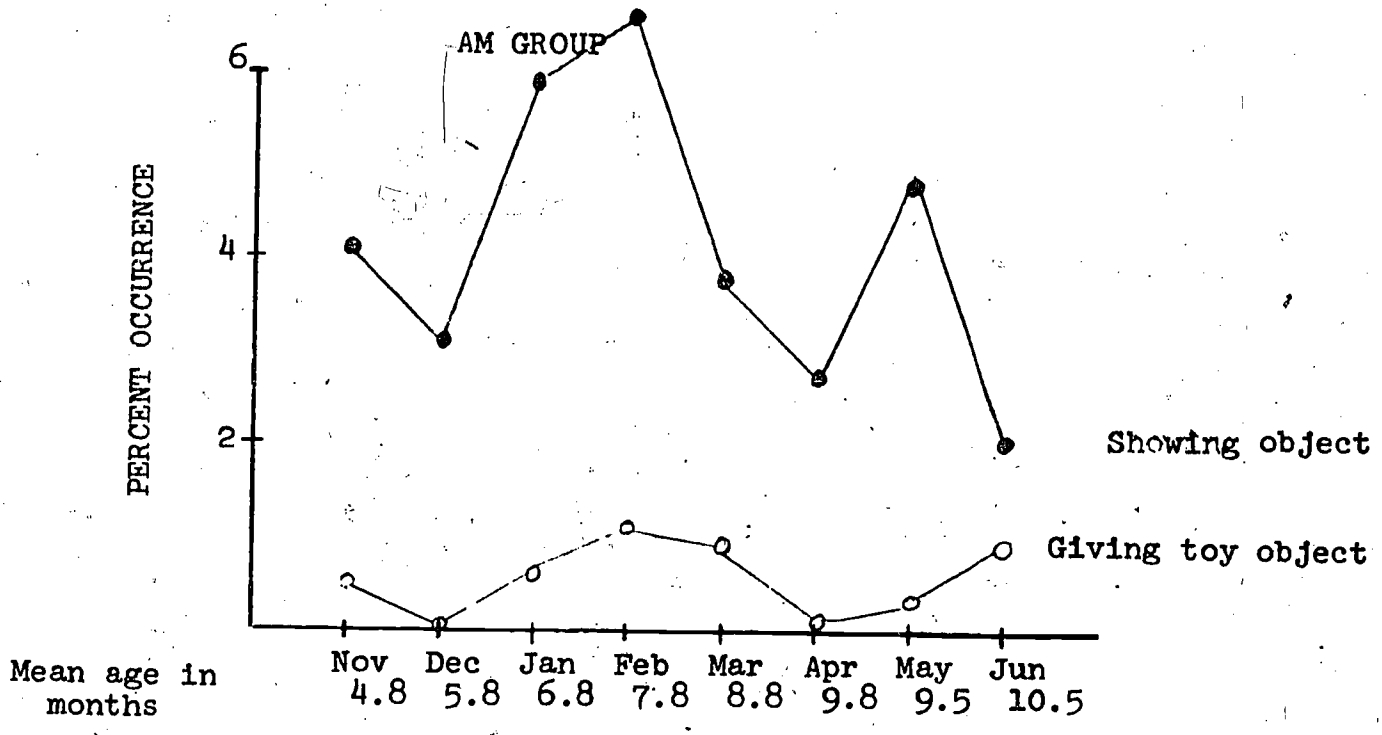


Fig. 13 PERCENT OCCURRENCE OF SELECTED CAREGIVER ACTIVITIES (AWAKE ONLY)



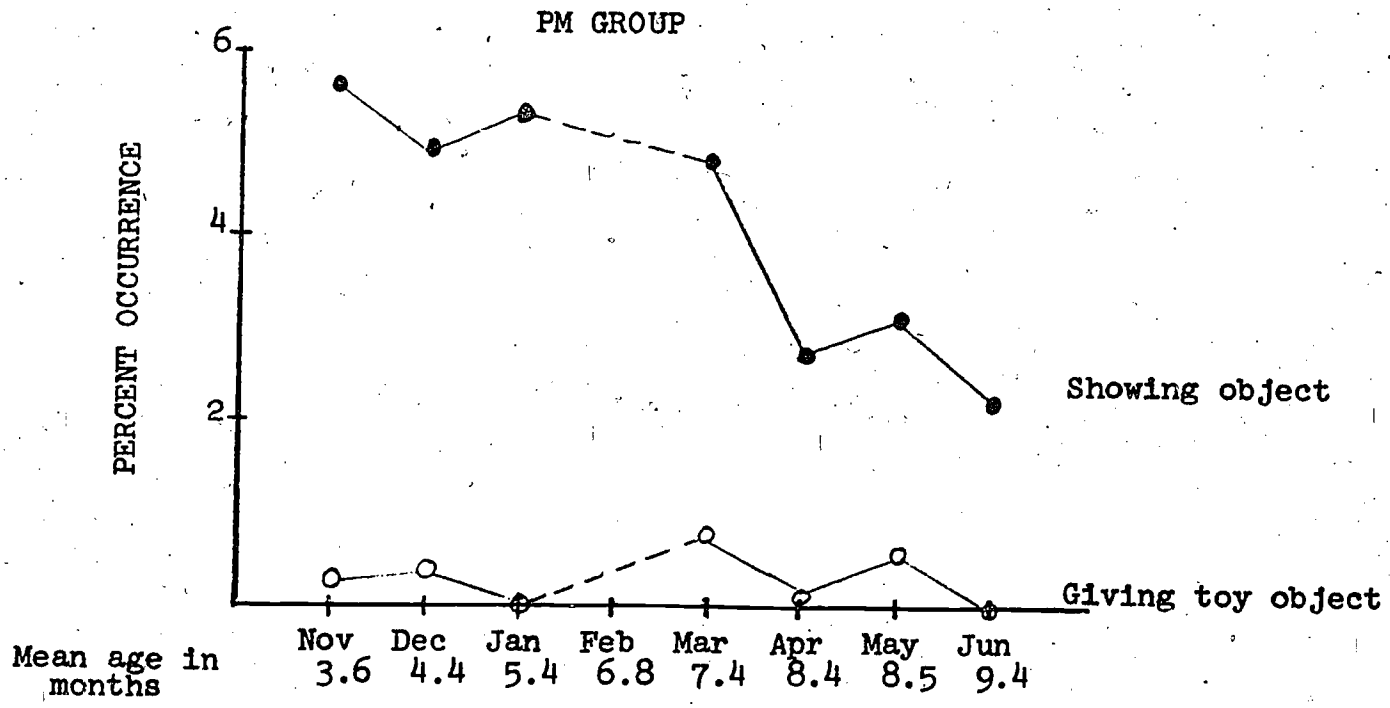
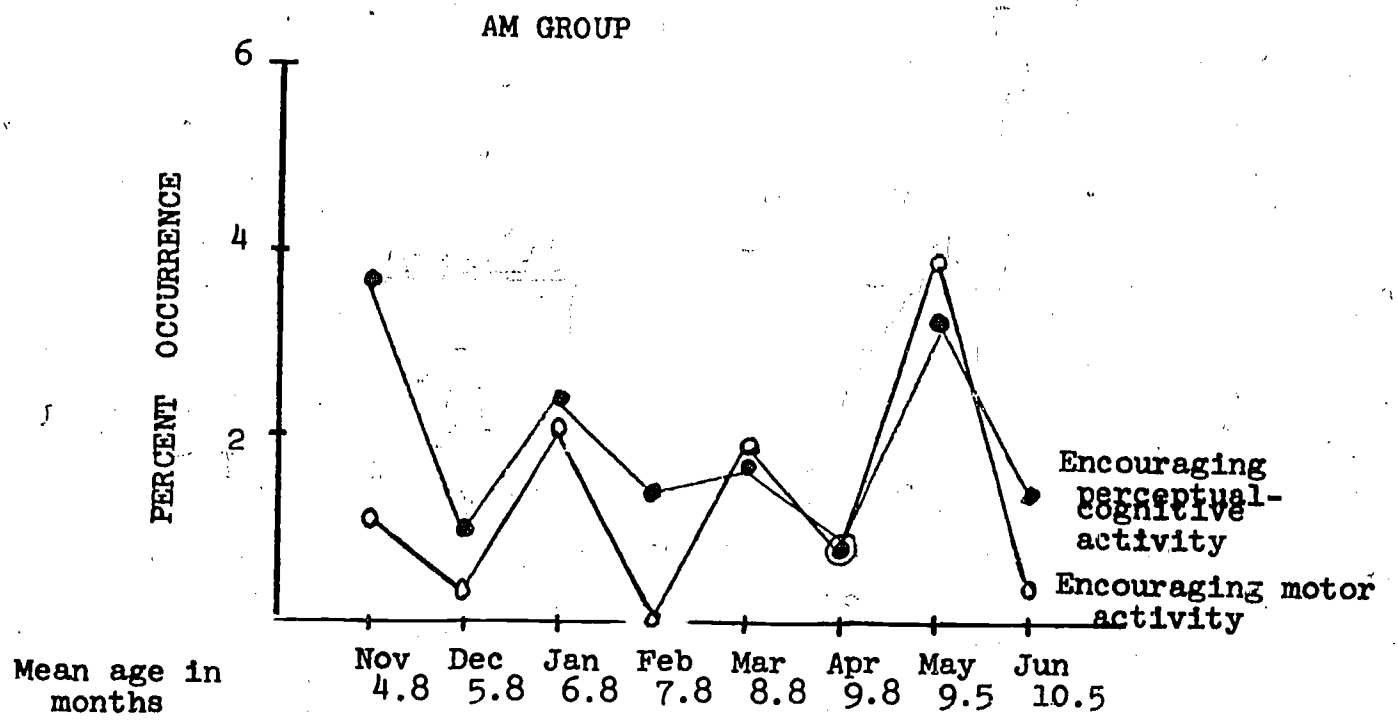


Fig. 14 PERCENT OCCURRENCE OF SELECTED CAREGIVER ACTIVITIES (AWAKE ONLY)



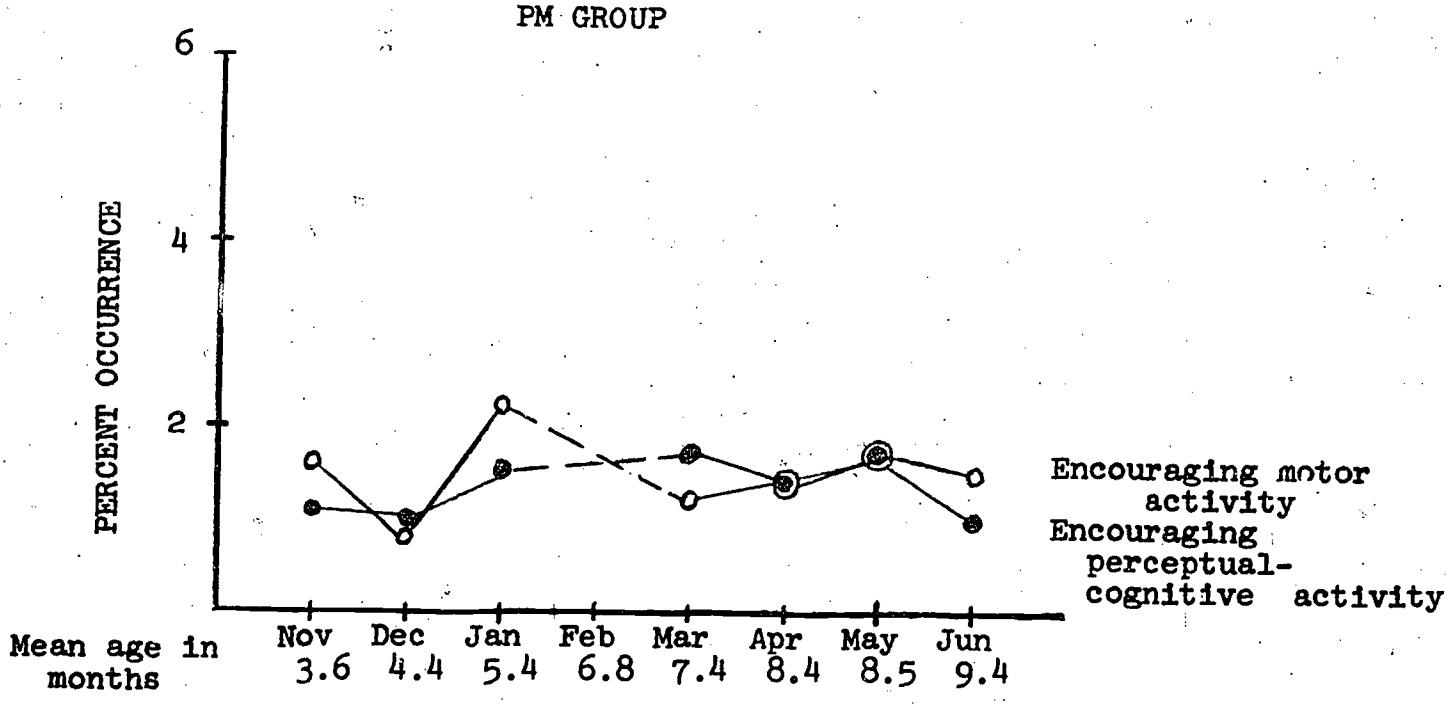


Fig. 15 PERCENT OCCURRENCE OF SELECTED CAREGIVER ACTIVITIES (AWAKE ONLY)