DOCUMENT RESUME

ED 114 447 UD 015 560

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TITLE An Investigation Into the Social Roots of Competence. Final Report.
INSTITUTION Florida Univ., Gainesville. Inst. for Development of Human Resources.
SPONS AGENCY National Inst. of Mental Health (DHEW), Rockville, Md.
PUB DATE Oct 74
NOTE 127p.

EDRS PRICE MF-$0.76 HC-$6.97 Plus Postage
DESCRIPTORS Classroom Observation Techniques; Cognitive Development; Individual Development; Individual Differences; Infancy; *Infant Behavior; *Interaction Process Analysis; Low Income; *Mothers; *Parent Child Relationship; Parent Role; *Performance Factors; Psychological Studies; Success Factors

ABSTRACT

The focus of the study reported here is on two issues: whether the two most elaborate systems of natural observation; that is, those developed by Escalona and Watts could be applied to mother-child interaction recorded in a teaching situation; and whether there are relationships between maternal-child behavior so observed, and a more extended definition of competence than those originally applied by the various independent investigators. This study, therefore, is considered to have used elements of the natural observation measures and applied them to the videotape from the Instructional Strategies in Infant Stimulation (ISIS) project to further examine the social roots of competency. The sample consisted of 53 families with 22 boys and 31 girls who participated in the ISIS project. They were low income families residing in or near Gainesville, Florida. It is held that, generally, the project demonstrated that the use of observation systems developed originally for naturalistic observation in the home is functional for the analysis of videotapes of structured teaching situations. Further, it is asserted that the mix of theoretical orientations contributes to the richness of this understanding of the meaning of the social transactions between babies and mothers. The project is seen as having demonstrated that within a social class there are variances in maternal-baby behavior which influence infant performance. (Author/JM)

AN INVESTIGATION INTO THE SOCIAL ROOTS OF COMPETENCE

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October 1974

Final Report

to

National Institute of Mental Health
Department of Health, Education, and Welfare

Grant No. 1 R01 MH22724-01

Acknowledgement

I wish to acknowledge the help and support of Sybille Escalona and Jean Carew Watts for their original presentations of their materials in conjunction with the Studies in Socio-emotional Development conference at the University of Florida in December, 1971, which led to this project. Further, I thank them, and Itty Chan and Bernice Shapiro of Harvard for their help to Ronald Fannin in modifying and applying elements of their systems to our data. Robert S. Soar helped in the statistical process, and was gracious enough to read a draft of this report. Ronald Fannin bore the brunt of the work on observing and coding; Pat Schlenker of computer data processing. Virginia Monroe suffered through the many editions of the tables, as well as through the many necessary chores.

A special acknowledgement is due the 53 families who participated, who allowed us to tape them, and to analyze the data.

The Institute for Development of Human Resources' office staff, headed by Virginia C. Braune, did its usual superb job of turning to, helping out in typing, proofing and all the other essential support needed. To all, thank you.

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1. Problem

Much of the recent research in both naturalistic observation of caretaker-infant relationships and infant intervention programs indicate that the competence of the child, variously defined, has as one of its roots the quality of maternal-child interaction. Each of several studies has investigated relatively small samples and utilized mostly home-grown instruments to assess both the child's competence and the antecedent maternal-child conditions. There exists, therefore, as pointed out in the report of the Ad Hoc Committee on Child Mental Health (1971), a need to replicate and verify the findings, to use multivariate designs, and to reuse data based upon useful communication with a variety of investigators which would lead to the increased use of standard procedures. This direction is also stressed in the Sparling and Gallagher (1971) report to various agencies of the Department of Health, Education and Welfare, in which they indicate the need for collaborative studies, instrument development, and theory development especially concerning the first two years of life.

This study, therefore, was designed to deal with these needs. Several observation schedules developed by investigators from differing theoretical orientations were selected. These schedules had each been previously used in only one location, on small samples. Since we possessed a video-taped set of mother-infant interaction data on fifty-three families who had been in our Instructional Strategies in

Infant Stimulation (ISIS) project, we applied these schedules to the common data. The purposes were to test the utility of these schedules on this type of data and to increase our knowledge of the relationships between mother-infant transactional patterns and the competence of the infant.

Related Research

There are two basic approaches to the study of caretaking between child and adult. First is the natural observation approach. The relevant studies for this project are the Harvard Preschool Project (White, 1972; Watts & Barnett, 1971); the Escalona Project, (1971); Wachs, Uzgiris & Hunt, (1971); and Yarrow, et al., (1971). In each of these, a set of environmental variables were identified which were found to be related to infant performance in the first year of life. Watts and Barnett (1971) developed a human interaction schedule which was used by observers who followed families through the course of the days' activities; approximately 40 families were involved. In the same project, White (1972) described the mother whose child demonstrated competence as one who provided an environment which encouraged exploration, and who reacted to the child's overtures with short interchanges.

Wachs, Uzgiris, and Hunt's observers recorded a set of both ecological variables such as size and crowdedness conditions and neighborhood factors, as well as specific parent activities. They found relationships between a set of these and especially designed Piaget-based measures utilized at, among other ages, 11 months.

Wachs et al. (1971) indicated that such parental behaviors as spontaneously vocalizing, direct teaching, and providing objects were precursors of competence. Yarrow et al. (1971) reported that positive affect and the level of response, contingent responses and variety of responses were related to child competence performance such as goal orientation and the Bayley Mental Development Index.

Using a natural observation framework, Escalona (1971) intensively studied a whole range of demographic and interactional variables in the life of two children. While no direct quantitative analyses were made on the relationships between these variables and a measure of infant performance, she indicated that the sustained reciprocal interaction between mother and infant seemed to be a most significant variable in child competence.

There appeared to be similarities between the Harvard (White, Watts), Wachs, Yarrow and Escalona findings and our ISIS data from the analysis of structured teaching episodes (Gordon and Jester, 1972). We used a formal teaching situation in which parent educator, mother, and infant interactions were observed and video-taped at six-week intervals beginning at three months of age, and terminating at 49 weeks. The video-tape was made in an apartment off-campus. In the ISIS project, a home visit was made each week by a parent educator, who demonstrated to a mother ways she might engage her baby in activities. As a part of the research design, every six weeks the home visit was actually at the apartment and video-taped. The focus of the taped session was on the parent educator-mother-baby interaction in relation to the activity. We found that, on

the Reciprocal Category System (RCS) developed for the project (Appendix 1), the frequency with which the mother and baby engaged in a transactional pattern of behavior in which the mother elicited, initiated, or directed the child to act, followed by the child acting, followed by further maternal-initiating, eliciting, and directing, was predictive of child performance on the Bayley Mental Scale at 52 weeks of age. The above study, Instructional Strategies in Infant Stimulation (ISIS), was the latest in the Institute for Development of Human Resources, University of Florida series of investigations into a parent education approach to infant stimulation, several of which demonstrated relationships between parent and family variables and child performance (Bradshaw, 1969; Jester & Bailey, 1969; Gordon, 1969, 1971; Herman, 1970; Etheridge, 1971). However, only in the ISIS project was it possible to not only observe the actual mother-child teaching pattern systematically, but also, through the videotapes, to record the data in reusable fashion.

Yarrow et al. (1971) and Gordon and Jester (1972) defined competence by performance on Bayley Mental Index items. Wachs et al. (1971) defined it by performance on the Uzgiris-Hunt (1966) scales which are based upon Piaget. (See Appendix 2 for items used in this Social Roots study.) Bell (1970) used object permanence, measured by items comparable to those used by Wachs, to measure the relationship between mother-infant interaction and infant competence. She and Ainsworth (Ainsworth and Bell, 1974), however, did not feel this was a satisfactory definition of competence. They indicated that competence included the ability of the child to elicit responses

from the mother. White and Kaban's (1971) definition as reflected in the Social Abilities Scale (Appendix 3) developed for this current study, includes this type of behavior.

Yarrow et al., White and Watts, and Gordon and Jester all found sex differences in the relationship between maternal behavior and child competence, even though they measured these two dimensions in different fashions. Thus, we have these small studies, as well as others, pointing up the importance of the area and showing some overlap, but no clear replication of results or use of common methods.

Problem

Since each set of investigators operated independently, the emergence of a common set of findings of relationships between maternal-child interactions, observed in either the natural setting or in a teaching situation, and various measures of competence pointed to the need for combining these measures in a single study. The focus was on two issues: Could the two most elaborate systems of natural observation, that is, those developed by Escalona and Watts, be applied to mother-child interaction recorded in a teaching situation? Are there relationships between maternal-child behavior so observed, and a more extended definition of competence than those originally applied by the various independent investigators? This study, therefore, used elements of the natural observation measures and applied them to the video-tape from the ISIS project to further examine the social roots of competency.

Objectives

The specific aims were to test the following hypotheses:

1. Observed mother-infant behaviors from Watts, Escalona, and ISIS-RCS systems will form factors which will cross the systems.

2. Standing on the pattern of mother-child interaction (factors) will be established early and will be consistent over time. That is, scores achieved by 19 weeks will correlate with later scores.

3. The measures of competence derived from White, the Bayley Mental Scales' items, and those Wachs' items which resemble performance tasks used in the ISIS project will yield several factors of competence.

4. There will be positive relationships between observed maternal-infant behavior at 13, 19, 25, 31, 37, 43 and 49 weeks of age (objective 2), and measures of infant competence at 52 weeks of age (objective 3).

5. There will be significant differences in the pattern of mother-infant interaction by sex of infant.

6. There will be significant differences in the relationship between maternal variables and child competence by sex of chi d.

2. Procedures

Sample

The sample consisted of 53 families with 22 boys and 31 girls who participated in the ISIS project. They were low income families (OEO guidelines) residing in or near Gainesville, Florida. All parents gave written consent for the video-tapes to be used for educational purposes.

Data Available

The material for analysis consists of seven instructional setting tapes for each family, on each of which a parent educator, parent, and the baby are interacting. The tapes average 20 minutes in length. For each family there was also an exit tape made when the baby was 52 weeks of age, in which the mother presented a standard object permanence task to the child (Appendix 4). For each child there were scores on the Bayley Mental Development Index and a 20-item set of tasks, many of which were activities previously demonstrated.

Instrumentation

In preparation for the project, the Watts Schedule of Human Interaction and the Escalona Schedules of Social Input, Social Output and Social Interaction were analyzed to yield a possible set of items based upon our knowledge of what was contained on the video-tapes. Items from these schedules were then logically compared with items on the Reciprocal Category System (See Appendix 5).

Instrumentation consisted of three steps: clarification of schedules and training of project directors, training of observers, and coding and transformation of data into scorable form.

Clarification of schedules. The project director, Ronald Fannin, worked at Cambridge with the Harvard group to review their schedules and our tapes. On the basis of this review, items from the White instrument which measured social competence and from the Watts Home Scale which measured mother-infant interaction were selected and

re-ordered so that they were usable in this project. This modification led to the scales in Appendices 3 and 6. The training of the project director in the use of these scales took the general form of explaining items, viewing our video-tapes, identifying definitions of particular items, and isolating examples of the behaviors represented by the items from the tapes. A major concern was our need for a time sampling system although the original Watts schedule had not been of this sort. We needed a suitable time frame which would be easy enough to learn and still sensitive enough to highlight changes in any of the different areas of the scale. The time frame arrived at was one of 15 seconds duration. It was felt that our three second time interval for the Reciprocal Category System would be too short for the Home Scale. After the time frame had been agreed upon by the Harvard group and us, the Harvard group worked out protocols to be used in the actual viewing of the video-tapes. These protocols are presented in Appendix 6 as the Home Scale and Appendix 3 as the Social Abilities Scale.

A similar procedure was followed at Yeshiva University with Dr. Escalona. The items on the Escalona Scale from social input, social output, and social interaction did not need modification. There was no way to convert this into a time sample so the major training problem for the project director and the Escalona group was clarification of the definitions of terms and reaching agreement between the project director and the Escalona group on scoring. The Escalona Scale is presented in Appendix 7.

Training of observers. There were three new schedules to be used on the tapes: the Social Abilities Scale on the tape at baby's age 52 weeks for a measure of competence, the Watts Scale and the Escalona Scale to be scored on each mother-infant dyad for seven observation episodes between 13 weeks and 49 weeks. Since the Social Abilities Scale was a dependent variable, and it might be possible for observers to become very familiar with the mother-infant dyads, it was decided to train first on it and to complete scoring this measure before any training of observers on the mother-infant observation schedules. Observers were trained by studying the items, practicing on tapes not part of the sample, and discussion of differences until the two coders had achieved a percentage of agreement of 84%. This was arrived at by taking each 15 second time interval and recording agreement or disagreement. The percentage was on the observation of a tape consisting of approximately 40 to 50 segments. Once this reliability had been reached consistently the coders then coded all of the 53 tapes on the Social Abilities Scale.

Training then was undertaken on the Home Scale. Due to the rather complex nature of the scale it took approximately 100 hours of training to arrive at a desirable level of reliability. The reliability between the two coders, using a percentage of agreement for items each 15 seconds, was 79%. These were the same coders who had used the Social Abilities Scale.

To avoid contamination between the Escalona and the Watts scales because of the familiarity with the tapes, two new coders were recruited and trained on the Escalona Scale. Although there are many items

on the scale, it was easier to train because the system required a simple frequency count without time sampling. Approximately 50 hours was required to reach a reliability of 80%.

Transformation of raw data. The tapes were of differing visit lengths (not all tapes were 20 minutes long). The parent educators were present along with the mother and engaged in interaction with both mother and baby. We, therefore, faced the problem of refining the measures so that they would reflect only those times in which the mother was engaged in transaction with the baby and so that differential amounts of time for different mothers could be controlled. The observers had kept track on the Home Scale of the amount of Parent Educator time and on the Escalona Scale they marked off the Parent Educator interaction with the baby. It was then possible to deduct this time from total time. The RCS already allowed for this since the data represent percent of total interaction.

Since the Escalona Scale was a simple frequency of occurrence measure, we used the number of occurrences as the raw data. To arrive at a total score across visits, the number of occurrences for each visit was added and this total was divided by the number of visits. This average was necessary because not all 53 families in the sample had been observed at each time period.

Transformation of the Home Scale involved a more difficult procedure. The data were transformed by adding up the number of occurrences for each item, then this was divided by the total number of 15 second intervals. This gave a proportional measure for the individual item and took care of the differing lengths of time and

visits. For across visit totals, we added up all the occurrences per item over the number of visits made and divided by the grand total (overall visits) of 15 seconds time intervals. This gave two proportional measures of occurrence of particular items, one by age and one across age.

The Reciprocal Category System had a computer program already in existence which computed the number of occurrences of a pair of items divided by the total number of occurrences possible. Thus, for the per visit data we had each mother-child dyad's proportional score for the items needed and for the total we also had a proportional score. The time frame for a pair of items on the Reciprocal Category System was 6 seconds.

Selection of items for factor analysis and multiple regression. The frequencies for all items on all three observation scales were examined and a cutoff point selected so that items with virtually no frequency were eliminated. This left us with seven items from the Escalona Scale (Table 1), 17 items from the Home Scale (Table 2), and the 11 items from the RCS Scale (Table 3). These are called key items.

The development of the competence schedule proceeded in somewhat the same fashion. The items from the White Social Ability Scale which possessed some reasonable frequency of occurrence were entered into the factor analysis along with the Bayley items and the series items which had previously been scored for the ISIS project.

Table 1

Key Observation Items from the Escalona Scale

Item No.	Item
1	Non-specific social control - input
2	First step in patterned reciprocal activity
3	Being shown something or having attention called to it
4	Mutual gazing - brief
5	Mutual gazing - prolonged
6	Non-specific social conduct - output
7	Shows affection or gives praise and admiration

Table 2

Key Observation Items from the Home Scale

Item No.	Item
8	Verbal and symbolic learning
9	Perceptual, spatial and fine motor learning
10	Visual pursuit
11	Object permanence
12	Differentiation of means and ends
13	Labeling, reading
14	Demonstration explanation, expansion
15	Actively engaging child
16	Observing
17	Focusing on task
18	Encourages
19	Discourages
20	Mastery
21	Exploration
22	Observe
23	Blank stare
24	Seeks emotional comfort

Table 3

Key Observation Items from the RCS

Item No.	Item
25	Mother-baby total interaction (8)
26	Baby behaves - mother warms, accepts amplifies
27	Mother initiates, child responds
28	Mother elicits, child responds
29	Mother directs, child responds
30	Child elicits, mother responds
31	Child directs, mother responds
32	Baby warms, baby cools
33	Baby warms, mother warms
34	Baby warms, mother accepts
35	Baby warms, mother amplifies

The 35 mother-infant observation items were submitted to principal factors extraction and varimax rotation, and incomplete factor scores were derived which were the algebraic sums of items loading above a minimum cut-off.

3. Results

Hypothesis 1

The first hypothesis was that observed mother-infant behaviors from the Watts, Escalona, and ISIS systems would form factors which would include items from all three systems. Five factors were rotated from the 35 items shown on tables 1 through 3. The five factors are shown on tables 4 through 8. Inspection of the factors indicates that they are fairly specific to the observation schedules. Factors one and three are predominantly Home Scale factors with only one item from the Escalona Scale present on factor one. Factors two and four are completely Reciprocal Category System factors. Only factor five cuts across all three scales. We named observation factor one Performance orientation because it contains maternal technique (items 13, 14, 16, 19) in conjunction with intellectual activities (items 8, 10, 12) and child mastery behavior (item 20). The child's non-specific social behavior (Escalona, item 6) loads negatively on this factor.

Factor three was named Maternal push because it seems to represent task orientation on the part of the mother. She is technique oriented (items 15, 16, 17, 18) and not responsive to child's seeking emotional comfort (item 24). The child is actively involved in completing the task (item 20).

Table 4

Factor Structure, Observation Factor 1, Performance Orientation

Item No.	Item Name	Item Scale	Loading
19	Discourages	Home Scale	.92
14	Demonstration, explanation, expansion	Home Scale	.81
20	Mastery	Home Scale	.72
21	Exploration	Home Scale	.69
16	Observing	Home Scale	-.65
8	Verbal and symbolic learning	Home Scale	.58
13	Labeling, reading	Home Scale	.56
10	Visual pursuit	Home Scale	.54
12	Differentiation of means and ends	Home Scale	.48
23	Blank stare	Home Scale	.41
6	Non-specific social - output	Escalona	-.41

Eigenvalue = 4.87.

Table 5

Factor Structure, Observation Factor 2, Baby-Mother Affectional Transaction

Item No.	Item Name	Item Scale	Loading
32	Baby warms, baby cools	RCS	.97
35	Baby warms, mother amplifies	RCS	.97
34	Baby warms, mother accepts	RCS	.95
33	Baby warms, mother warms	RCS	.94

Eigenvalue = 4.22.

Table 6

Factor Structure, Observation Factor 3, Maternal Push

Item No.	Item Name	Item Scale	Loading
17	Focusing on task	Home Scale	.89
18	Encourages	Home Scale	.82
24	Seeks emotional comfort	Home Scale	.80
22	Observe	Home Scale	.72
15	Actively engaging child	Home Scale	.68
20	Mastery	Home Scale	.64
16	Observing	Home Scale	.51
9	Perceptual, spatial and fine motor learning	Home Scale	.42

Eigenvalue = 4.27.

Table 7

Factor Structure, Observation Factor 4, Mother-Baby Teaching Transaction

Item No.	Item Name	Item Scale	Loading
25	Total mother-baby interaction	RCS	.92
27	Mother initiates, child responds	RCS	.87
28	Mother elicits, child responds	RCS	.77
26	Baby behaves - mother warms, accepts amplifies	RCS	.49
29	Mother directs, child responds	RCS	.46

Eigenvalue = 3.28.

Table 8

Factor Structure, Observation Factor 5, Non-Specific Social Transaction

Item No.	Item Name	Item Scale	Loading
23	Blank stare	Home Scale	.67
12	Differentiation of means and ends	Home Scale	.49
6	Non-specific social - output	Escalona	.45
31	Child directs, mother responds	RCS	.44
1	Non-specific social - input	Escalona	.42
9	Perceptual, spatial and fine motor learning	Home Scale	-.52

Eigenvalue = 2.64.

Factor two was obviously affective and four obviously teaching. Factor five was named Non-specific social transaction because of the blank stare (Home Scale item 23) and the two Escalona items of Non-specific social input and output. Hypothesis 1 was not confirmed.

Hypothesis 2

The hypothesis was that the pattern of mother-child interaction will be established early and will be consistent over time; scores achieved by 19 weeks will correlate with later scores. We hypothesized that the factors, which were derived from total scores across all time periods, would stablize early, and that there would be a consistent pattern of interaction between a mother and her baby.

Tables 9-14 present the data. To avoid clutter, only reliable correlation coefficients are displayed on Tables 10-14. Analysis of the tables indicates that the hypothesis is upheld for factors three and four, but rejected for factors one, two and five. The hypothesis was upheld for factor four because a basic pattern is established of Mother-baby teaching transaction from the RCS by at least 25 weeks of age and becomes increasingly strong with time. Out of 15 possible relationships, 12 are reliable. There is also a relationship between scores at 19 weeks and two later times.

Although factor three, Maternal push, on the Home Scale shows only four reliable coefficients out of 15 from 19 weeks on, the pattern is consistent in that some of the variances at the last two ages is predictable from the immediately preceeding age. That is, score at 37 weeks predicts 43 weeks, score at 43 weeks predicts 49 weeks, and the

Table 9

Means and Standard Deviations, Observation Factors by Age and Sex

Age and Sex		Performance Orientation		Baby-Mother Affectional Transaction		Maternal Push		Mother-Baby Teaching Transaction		Non-specific Social Transaction	
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
13	Total (49)	.515	.560	.003	.008	.824	.596	.207	.157	.722	.784
	Girls (30)	.550	.549	.005	.010	.836	.723	.225	.180	.717	.715
	Boys (19)	.460	.587	.001	.002	.804	.319	.178	.111	.729	.901
19	Total (46)	.195	.784	.004	.006	.891	.484	.252	.152	1.27	1.41
	Girls (29)	.319	.686	.005	.007	.830	.479	.257	.154	.980	1.20
	Boys (17)	-.015[1]	.910	.002	.004	.994	.489	.245	.152	1.78	1.61
25	Total (46)	-.043	1.41	.003	.004	.730	.491	.256	.155	1.22	1.75
	Girls (29)	.130	1.01	.003	.004	.821	.420	.286	.156	1.27	1.93
	Boys (17)	-.339	1.18	.003	.004	.573	.380	.204	.143	1.13	1.44
31	Total (47)	.119	.861	.002	.003	.739	.358	.280	.166	1.32	1.30
	Girls (26)	.173	.911	.003	.004	.821	.306	.318	.158	1.49	1.23
	Boys (21)	.054	.813	.002	.003	.637	.397	.233	.167	1.11	1.39
37	Total (49)	-.457	1.35	.003	.006	.772	.414	.354	.238	1.79	1.81
	Girls (28)	-.623	1.35	.003	.006	.769	.432	.371	.257	2.19	1.98
	Boys (21)	-.236	1.36	.003	.006	.775	.400	.330	.214	1.27	1.43
43	Total (47)	.078	.729	.003	.006	.778	.358	.330	.185	1.23	1.25
	Girls (26)	-.142	.803	.003	.004	.736	.336	.322	.183	1.34	1.31
	Boys (21)	.350	.527	.004	.008	.829	.373	.340	.190	1.10	1.19
49	Total (46)	.123	.670	.003	.005	.802	.448	.331	.145	.934	1.11
	Girls (28)	.115	.686	.004	.006	.820	.462	.350	.144	1.03	1.13
	Boys (18)	.137	.663	.001	.001	.776	.436	.301	.143	.780	1.09

[1]Score is negative because of high frequency of item 6, which loads negatively.

Table 10

Relationships Over Time, Observation Factor 1, Performance Orientation, by Age and Sex, (N=53)

Age and Sex		Child's Age in Weeks					
		13	19	25	31	37	43
19	Total						
	Boys						
	Girls						
25	Total	-.29					
	Boys						
	Girls	-.39					
31	Total						
	Boys						
	Girls						
37	Total				.27		
	Boys	.44	.40	.47			
	Girls				.41		
43	Total						
	Boys						
	Girls						
49	Total						
	Boys						
	Girls						

r=.27, p=.05, N=53.
r=.42, p=.05, N=22.
r=.35, p=.05, N=31.

Table 11

Relationships Over Time, Observation Factor 2, Baby-Mother Affectional Transaction, by Age and Sex, (N=53)

Age and Sex		Child's Age in Weeks					
		13	19	25	31	37	43
19	Total						
	Boys						
	Girls						
25	Total						
	Boys						
	Girls						
31	Total						
	Boys		.43				
	Girls						
37	Total	.42					
	Boys						
	Girls	.57					
43	Total			.39			
	Boys			.71			
	Girls	.71				.35	
49	Total						
	Boys						
	Girls						

r=.27, p=.05, N=53.
r=.42, p=.05, N=22.
r=.35, p=.05, N=31.

Table 12

Relationships Over Time, Observation Factor 3, Maternal Push, by Age and Sex, (N=53)

Age and Sex		Child's Age in Weeks					
		13	19	25	31	37	43
19	Total						
	Boys						
	Girls						
25	Total	.29					
	Boys						
	Girls						
31	Total						
	Boys			.50			
	Girls						
37	Total	.37					
	Boys		.46				
	Girls				.38		
43	Total		.36		.36	.29	
	Boys	.45					
	Girls						
49	Total						.33
	Boys			.42			
	Girls						.35

r=.27, p=.05, N=53.
r=.42, p=.05, N=22.
r=.35, p=.05, N=31.

Table 13

Relationships Over Time, Observation Factor 4, Mother-Baby Teaching Transaction, by Age and Sex, (N=53)

Age and Sex		Child's Age in Weeks					
		13	19	25	31	37	43
19	Total						
	Boys						
	Girls						
25	Total						
	Boys						
	Girls						
31	Total		.39	.40			
	Boys		.56				
	Girls						
37	Total	.33	.55	.27	.47		
	Boys		.46				
	Girls						
43	Total			.33	.66	.65	
	Boys				.63		
	Girls			.38	.50		
49	Total	.27		.40	.40	.50	.66
	Boys						
	Girls			.36			.40

r=.27, p=.05, N=53.
r=.42, p=.05, N=22.
r=.35, p=.05, N=31.

Table 14

Relationships Over Time, Observation Factor 5, Non-Specific Social Transaction, by Age and Sex, (N=53)

Age and Sex		Child's Age in Weeks 13	19	25	31	37	43
19	Total						
	Boys						
	Girls						
25	Total						
	Boys						
	Girls						
31	Total						
	Boys						
	Girls						
37	Total				.29		
	Boys						
	Girls						
43	Total		-.32			.42	
	Boys						
	Girls						
49	Total						
	Boys						.63
	Girls						

r=.27, p=.05, N=53.
r=.42, p=.05, N=22.
r=.35, p=.05, N=31.

variance at age 43 weeks is related to five other ages. Note that there is also a reliable relationship between 13 week scores and 25 and 37 week scores.

Factor one (Table 10), Performance orientation, shows no consistent stability for the total population, but does show stability for the boys alone from 13 to 37 weeks. Factor two, Affectional transaction, shows no consistent pattern over age, although there are scattered early relationships. Factor five, Non-specific social transaction, shows no stability. Hypothesis 2 is not sustained except for factors three and four.

Hypothesis 3

Hypothesis 3 was that the measures for competence derived from the Social Abilities Scale, the Bayley Mental Scale, and the Series would yield several factors. Here, we were not expecting the scales to relate highly to each other. An underlying notion which led to the project was that they might very well be measuring different things. Four competence factors emerged (Tables 15-18). Factor one consists of 11 items from the Bayley Scale and one item from the Social Abilities measure taken from the 52 week video-tape. Inspection of Table 15 shows that this last item, Non-compliance, is loaded negatively on this factor which we have labeled Bayley Compliance. This factor was so named because the items loading on it demonstrate that the child follows verbal directions on motor coordination activities and also imitates, on command, adult behavior.

Table 15

Factor Structure, Competence Factor 1, Compliance

Bayley Scale Item No.	Item Description	Scale	Loading
96	Unwraps cube	Bayley	.76
105	Dangles ring by string	Bayley	.73
107	Puts bead in cup	Bayley	.68
100	Puts 3/more cubes in cup	Bayley	.57
99	Pushes car along	Bayley	.54
115	Closes round box	Bayley	.50
95	Attempts to imitate scribble	Bayley	.49
86	Uncovers toys	Bayley	.44
90	Puts cube in cup on command	Bayley	.44
104	Pats whistle doll, in imitation	Bayley	.42
92	Stirs with spoon - imitation	Bayley	.40
	Non-compliance	White	-.42

Table 16

Factor Structure, Competence Factor 2, Series

Bayley or Series Item No.	Item Description	Scale	Related Scale	Loading
4	His part in "Pop Goes..."	Series	White-Social	.80
15	Child makes sound of thing named	Series		.72
11	Answers questions	Series		.71
16	Imitates paper folding	Series		.70
3	Unwraps toy	Series	Wachs A	.62
90	Cube in cup, on command	Bayley		.49
12	Points to person named	Series	Wachs D	.48
5	Buttons into slit	Series	Wachs L&F	.46
14	Points to thing named	Series	Wachs D	-.45

Table 17

Factor Structure, Competence Factor 3, Language

Bayley Item No.	Item Description	Scale	Loading
85	Says "Da-Da"	Bayley	.85
113	Says 2 words	Bayley	.85
106	Imitates words	Bayley	.83
89	Responds to verbal request	Bayley	.61
94	Inhibits on command	Bayley	.52
84	Listens selectively	Bayley	.50

Table 18

Factor Structure, Competence Factor 4, Responsiveness

Bayley or Series Item No.	Item Description	Scale	Loading
108	Places 1 peg repeatedly	Bayley	.53
14	Points to thing named	Series	.52
109	Removes pellet from bottle	Bayley	.49
94	Inhibits on command	Bayley	.46
102	Uncovers blue box	Bayley	.45
97	Repeats performance laughed at	Bayley	.44

The second competence factor (Table 16) consists, except for one item from the Bayley, of items from the 20 tasks presented as the Series measure. A few of these activities may have been taught to the child during the ISIS project. They all carry the same flavor as items taught, but most were not presented because of the child's age (too young) or individual circumstances. The Series items had been constructed in an earlier project for children up through age two and the test items are drawn from the appropriate age range. They all represented a particular orientation toward specific activity with a Piagetian flavor. Four of the eight items are similar to the items used by Wachs et al. in their measure of cognitive competence (items 3, 5, 12, 14). One item (4) relates to the White Social Abilities measure of cooperation, but was taken, in this case, from the testing rather than from the 52 week baby performance on the baby-mother tape.

Factor three is confined completely to the Bayley Scale and consists of three expressive and three receptive language items. Factor four is primarily a Bayley factor with one item from the Series. No items dominate the factor (load very high). Examination does not yield any simple label for this factor, except it may reflect receptive language mixed with some object permanence type activities. For shorthand purposes, the label assigned is Responsiveness. The hypothesis is confirmed.

Hypothesis 4

Hypothesis 4 was that there would be positive relationships between observed maternal-infant behavior at 13, 19, 25, 31, 37, 43

and 49 weeks of age and measures of infant competence at 52 weeks of age. We used four approaches to test this hypothesis: One, an item by item examination of the 35 items used in the observation factor matrix. Items were correlated at each age with each of the competence measures. Two, a factor by factor analysis in which factors at each age were correlated with competence factors. Three, a multiple regression analysis in which factors at each age entered into a multiple regression equation to predict each competence factor. Four, in addition to age related procedures, scores on items were pooled across ages to arrive at total scores for each of the subjects and these were correlated with each of the competence factors. This was also done for each factor. The total factor scores were also used in a multiple regression equation. All of these analyses were done for the total group and by sex. This procedure allowed for the testing of hypothesis 6. The following sets of tables present the results in relation to both hypotheses 4 and 6 (sex difference).

Item by Age Examination

Table 19 presents the means and standard deviations for the competence factors. Table 20 presents the means and standard deviations for the key items by age which relate to the competence factors. Tables 21-24 presents the relationships between these observation items and the competence measures. Only the significant relationships are displayed.

An analysis of Table 21 in which competence factor one, Compliance is the dependent variable, reveals few significant relationships between independent observation items at each age and child performance

Table 19

Means and Standard Deviations, Competence Factors

Factors	Girls (N=31)		Boys (N=22)		Total (N=53)	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Compliance	6.35	3.50	6.36	2.85	6.36	3.22
Series	5.09	2.60	4.91	2.76	5.02	2.64
Language	2.16	2.07	1.00	1.45	1.68	1.91
Responsiveness	2.06	1.71	1.55	1.18	1.85	1.52

Table 20

Means and Standard Deviations for Observation Items Reliably Related to Competence Factors, by Age and Sex

Scale	Item No.	Item	Child's Age in Weeks													
			13		19		25		31		37		43		49	
			$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Escalona	1	Non-specific social control - input														
		Total					.59	1.33								
		Boys													.39	.78
		Girls	.37	.56											.46	.88
	2	First step in patterned reciprocal activity														
		Total					.11	.31								
		Girls					.10	.31							.25	.70
	3	Being shown something or having attention called to it														
		Total									.16	.47				
		Boys					.24	.66								
		Girls							.27	.60					.04	.19
	4	Mutual gazing - brief														
		Total	.04	.20	.17	.44	.17	.44								
		Boys	.11	.32	.24	.56	.12	.33								
		Girls					.21	.46								
	5	Mutual gazing - prolonged														
		Total					.09	.28	.30	.80						
		Boys							.38	.97						
		Girls					.07	.26								

			13		19		25		31		37		43		49	
			X	SD	X	SD	X	SD	X	SD	X	SD	X	SD	X	SD
Escalona	6	Non-specific social conduct - output														
		Total			.35	.71										
		Boys	.16	.50	.59	.87										
		Girls	.17	.38												
	7	Shows affection or gives praise and admiration														
		Total											.02	.15		
		Boys											.05	.22		
Home Scale	9	Perceptual, spatial and fine motor learning														
		Total	.14	.12	.20	.18	.22	.11							.21	.18
		Boys			.24	.19										
		Girls					.12	.13							.19	.18
	10	Visual pursuit														
		Total							.003	.02	.004	.02				
		Boys							.008	.03						
		Girls	.17	.09												
	11	Object permanence														
		Total			.006	.02	.04	.08	.06	.09					.07	.11
		Boys													.07	.13
		Girls			.01	.03	.04	.10	.05	.08						
	12	Differentiation of means and ends														
		Total											.04	.10		
		Boys									.03	.05	.05	.13		
		Girls					.02	.05								

			13		19		25		31		37		43		49	
			X	SD	X	SD	X	SD	X	SD	X	SD	X	SD	X	SD
Home Scale	13	Labeling, reading														
		Total					.05	.11								
		Boys					.08	.16					.001	.005		
		Girls					.04	.06								
	14	Demonstration explanation, expansion														
		Total			.09	.09	.18	.14			.09	.11				
		Boys	.20	.14			.09	.09	.15	.14	.15	.12	.19	.12		
		Girls							.21	.15			.20	.12		
	15	Actively engaging child														
		Total													.08	.07
		Boys	.11	.10									.11	.10		
		Girls											.08	.06		
	17	Focusing on task														
		Total									.01	.02	.27	.02		
		Girls					.002	.008					.02	.02		
	18	Encourages														
		Total					.25	.19			.22	.19				
		Boys	.21	.11	.28	.17	.19	.21			.21	.21	.24	.15		
	19	Discourages														
		Total	.007	.05			.002	.01								
		Girls	.01	.07												
	20	Mastery														
		Total							.13	.11						
		Boys			.23	.16	.16	.21	.08	.09			.11	.09		

			13		19		25		31		37		43		49	
			$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Home Scale	21	Exploration Total					.04	.05								
	22	Observe Boys									.15	.10				
	23	Blank stare Boys			.009	.02										
	24	Seeks emotional comfort Total											.003	.01		
RCS	25	Mother-baby total interaction (8) Total							.23	.13	.29	.19			.28	.12
		Boys													.27	.13
		Girls							.27	.13			.27	.15	.29	.12
	26	Baby behaves - mother warms, accepts amplifies Total													.003	.001
		Boys							.002	.003					.0001	.0001
	27	Mother initiates, child responds Total			.02	.02					.03	.03	.02	.01	.02	.01
		Girls			.02	.02					.02	.02			.02	.01
	28	Mother elicits, child responds Total									.02	.02			.01	.01
		Boys							.01	.01			.01	.01	.01	.01
		Girls	.009	.01	.009	.009					.13	.09				

			13		19		25		31		37		43		49	
			$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
RCS	29	Mother directs, child responds														
		Total					.01	.01	.02	.02			.03	.02		
		Boys					.007	.01					.03	.02		
		Girls									.06	.07	.02	.02	.03	.02
	30	Child elicits, mother responds														
		Total											.0003	.001		
		Boys											.0004	.002		
	31	Child directs, mother responds														
		Total													.001	.002
	32	Baby warms, baby cools														
		Total									.001	.001			.0001	.0007
		Girls													.0002	.0009
	33	Baby warms, mother warms														
		Total					.001	.002	.0006	.001						
		Boys							.0009	.002			.002	.006	.0003	.0008
		Girls											.0008	.001		
	34	Baby warms, mother accepts														
		Total			.001	.003										
	35	Baby warms, mother amplifies														
		Total							.001	.002						
		Boys			.0006	.001			.0004	.001			.001	.002		
		Girls			.002	.006										

Table 21

Relationships Between Observed Behavior Items and Competence Factor 1, Compliance, by Age and Sex

Scale	Item No.	Observation Items	Child's Age in Weeks						
			13	19	25	31	37	43	49
calona	1	Non-specific social control - input							
		Boys							-.62
		Girls	-.50						
	3	Being shown something or having attention called to it							
		Total.					.35		
		Boys			-.63				
		Girls				.41			
	4	Mutual gazing - brief							
		Total	-.35						
		Boys	-.49						
	5	Mutual gazing - prolonged							
		Boys	.43						
me	10	Visual pursuit							
ale		Total					-.29		
	12	Differentiation of means and ends							
		Total						-.37	
		Boys						-.45	
	13	Labeling, reading							
		Total			-.38				
		Boys			-.60				
	14	Demonstration explanation, expansion							
		Boys	.69		-.51	-.44	-.46	-.70	
	15	Actively engaging child							
		Boys	.46			.46	.44		
	17	Focusing on task							
		Total					.28		
	18	Encourages							
		Total			-.29				
		Boys	-.63		-.67		-.52	-.60	

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			13	19	25	31	37	43	49
me	20	Mastery							
ale		Boys			-.53			-.49	
	22	Observe							
		Boys					-.45		
S	25	Mother-baby total interaction (8)							
		Boys				.47			
		Girls		.47					
	26	Baby behaves - mother warms, accepts amplifies							
		Girls	.38	.43				.44	
	27	Mother initiates, child responds							
		Total		.30			.36	.28	.30
		Boys				.46			
		Girls		.63					
	28	Mother elicits, child responds							
		Total					.29		
		Boys				.44		-.49	
		Girls	.40	.37					
	29	Mother directs, child responds							
		Boys						-.48	
		Girls				.37			
	33	Baby warms, mother warms							
		Total			.31				
	35	Baby warms, mother amplifies							
		Boys						-.55	
		Girls		.37					

Table 22

Relationships Between Observed Behavior Items and Competence Factor 2, Series, by Age and Sex

Scale	Item No.	Observation Items	Child's Age in Weeks 13	19	25	31	37	43	49
scalona	1	Non-specific social control - input							
		Total			-.34				
	4	Mutual gazing - brief							
		Total			-.30				
	5	Mutual gazing - prolonged							
		Total			-.38	.34			
		Boys				.47			
		Girls			-.42				
ome cale	9	Perceptual, spatial and fine motor learning							
		Total	.29		.34				
		Boys		.49					
		Girls			.47				
	10	Visual pursuit							
		Girls	-.36						
	11	Object permanence							
		Total			-.31				-.30
		Girls			-.45				
	14	Demonstration explanation, expansion							
		Total					.31		
		Boys		.65			.59		
		Girls						.45	
	15	Actively engaging child							
		Boys				-.42			
		Girls						.39	
	18	Encourages							
		Total					.29		
		Boys		.69					
	20	Mastery							
		Total				-.30			
		Boys		.58		-.54			

ble 22 continued, page 2

			13	19	25	31	37	43	49
me ale	21	Exploration Total			.30				
	22	Observe Boys							-.55
	23	Blank stare Boys		.50					
S	25	Mother-baby total interaction (8) Total				.36	.32		
		Girls				.52		.41	.44
	27	Mother initiates, child responds Total		.34					
	28	Mother elicits, child responds Boys							-.57
	29	Mother directs, child responds Total			.31	.34		.31	
		Boys			.48				
		Girls						.48	.51
	31	Child directs, mother responds Total							-.39
	35	Baby warms, mother amplifies Girls		.38					

Table 23

Relationships Between Observed Behavior Items and Competence Factor 3, Language, by Age and Sex

Scale	Item No.	Observation Items	Child's Age in Weeks						
			13	19	25	31	37	43	49
Escalona	2	First step in patterned reciprocal activity							
		Total			.38				
		Girls			.62				
	3	Being shown something or having attention called to it							
		Boys							
	4	Mutual gazing - brief							
		Boys		.47					
	6	Non-specific social conduct - output							
		Total		.34					
		Girls	.43						
	7	Shows affection or gives praise and admiration							
		Total						.31	
		Boys						.60	
Time Scale	9	Perceptual, spatial and fine motor learning							
		Total		.33					-.38
		Girls							-.44
	10	Visual pursuit							
		Total				.38			
		Boys				.76			
	11	Object permanence							
		Total				-.36			.30
		Boys							.64
		Girls				-.40			
	12	Differentiation of means and ends							
		Boys					.70		
	13	Labeling, reading							
		Boys						.60	
		Girls			-.41				

ble 23 continued, page 2

		13	19	25	31	37	43	49
14	Demonstration explanation, expansion							
	Total			.33				
	Boys		.36		.44			
	Girls				.44			
19	Discourages							
	Total	.33						
	Girls	.36						
20	Mastery							
	Total				.32			
	Boys				.64			
24	Seeks emotional comfort							
	Total						.32	
25	Mother-baby total interaction (8)							
	Boys							.50
26	Baby behaves - mother warms, accepts, amplifies							
	Total							.35
	Boys				.46			
27	Mother initiates, child responds							
	Girls		.50					
28	Mother elicits, child responds							
	Total							.29
	Boys							.56
30	Child elicits, mother responds							
	Total						.32	
	Boys						.60	
32	Baby warms, baby cools							
	Total							.47
	Girls							.53
33	Baby warms, mother warms							
	Total				.32			
	Boys				.47			.66

ble 23 continued, page 3

			13	19	25	31	37	43	49
S	34	Baby warms, mother accepts							
		Total							.29
	35	Baby warms, mother amplifies							
		Boys			.52		.52		

Table 24

Relationships Between Observed Behavior Items and Competence Factor 4, Responsiveness, by Age and Sex

Scale	Item No.	Observation Item	Child's Age in Weeks						
			13	19	25	31	37	43	49
scalona	1	Non-specific social control - input							
		Total			.29				
		Girls							.42
	2	First step in patterned reciprocal activity							
		Boys							.61
	4	Mutual gazing - brief							
		Total		.29	.48				
		Boys		.51	.64				
		Girls			.43				
	6	Non-specific social conduct - output							
		Boys	-.43						
	7	Shows affection or gives praise and admiration							
		Boys			.55				
ome cale	11	Object permanence							
		Total		.47					.29
		Girls		.53					
	12	Differentiation of means and ends							
		Girls			.47				
	15	Actively engaging child							
		Total							.47
	17	Focusing on task							
		Girls			.47			.42	
	18	Encourages							
		Total						.29	
	19	Discourages							
		Total			.29				
	21	Exploration							
		Total				-.31			
	22	Observe							
		Girls		.37					

ble 24 continued, page 2

			13	19	25	31	37	43	49
CS	25	Mother-baby total interaction (8)							
		Total							.39
		Girls					.40		.38
	26	Baby behaves - mother warms, accepts amplifies							
		Boys							.48
	27	Mother initiates, child responds							
		Total					.31		
		Girls					.37		.37
	28	Mother elicits, child responds							
		Total							.33
		Boys							.52
		Girls					.48		
	32	Baby warms, baby cools							
		Total					-.30		
	33	Baby warms, mother warms							
		Total			.33				
		Boys				.46		.45	.51
		Girls						-.39	
	34	Baby warms, mother accepts							
		Total		-.34					
	35	Baby warms, mother amplifies							
		Total				-.29			
		Boys			.49				

at 52 weeks. Here, we are concerned only with total population rather than by sex. Item 27 from the Reciprocal Category System (mother initiates, child responds) shows a consistent pattern beginning as early as 37 weeks with a reliable coefficient also present at 19 weeks. The item perhaps catches a phase of learning to comply. This may be why it is stable in its relationship to this factor.

Table 22 shows that the Escalona and Home Scales have items which relate at 25 weeks to performance on the Series at 52 weeks. The Reciprocal Category System items seem to come into play later and only item 29 (mother directs, child responds) shows some consistent relationship across age with the competence measure. This relationship begins at 25 weeks and is still present at 43 weeks.

The affective items seem to come into play in relation to language performance in the last weeks before testing; item 24 is related at 43 weeks and items 26, 32 and 34 are related at 49 weeks. Other relationships are scattered (Table 23). There is little relationship between independent observation items and competence factor four, Responsiveness (Table 24).

Inspection of the table of means (Table 20) shows that only two items (8, 16) are totally unrelated to competence for any group (total, boys or girls); seven items (7, 21, 22, 23, 24, 30, 31) are related at only one age. All other items show more relationship. Seven items (4, 9, 11, 14, 25, 27, 29) are related to some competence measure at three ages or more for the total group.

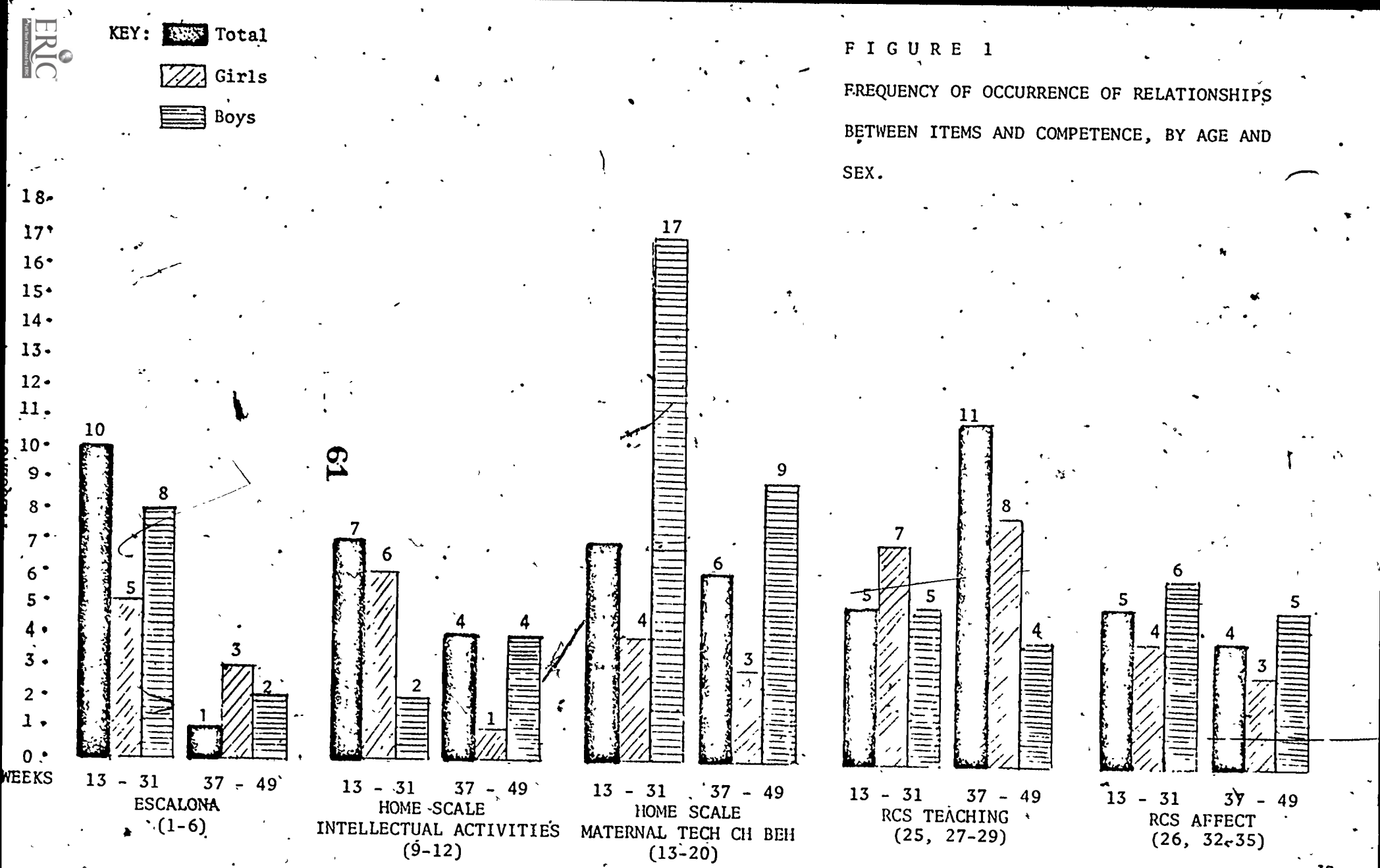
Analysis of the patterns of relationships between items and competence factors reveals their emergence as a function of time and sex. We will analyze the sex differences in relation to Hypothesis 6, but the data are presented here. If 31 weeks is viewed as a midpoint, then we can examine items whose scores including that time relate to competence versus items whose scores after that point show such a relationship. For the total group scores on item 4, Brief mutual gazing, at 13, 19 and 25 weeks relate to competence scores at 52 weeks. Prolonged mutual gazing (item 5) at 25 and 31 weeks relates to competence. Other items in which scores up to and including 31 weeks relate to competence center around intellectual activities items 9, Perceptual, spatial, and fine motor learning, and 11, Object permanence.

Examination of patterns which emerge late, that is, in which scores at 37, 43 and 49 weeks of age are related to competence, reveals the emergence of the Reciprocal Category System as the major observation scale. Items 25, 27 and 29, Mother-baby total interaction, Mother initiates-child responds, Mother directs-child responds, are all related for the total population.

Another way we can see these data is shown on Figure 1. Here, the items have been grouped by scale or section of scale. The frequencies are of relationships to any of the four competence factors for an age range. That is, the score of 10 on the Escalona Scale for the 13 to 31 week period for the total, means that there were 10 significant relationships for the total group to competence measures during this

FIGURE 1

FREQUENCY OF OCCURRENCE OF RELATIONSHIPS BETWEEN ITEMS AND COMPETENCE, BY AGE AND SEX.



time. Out of 96 possible relationships, 10 are twice chance expectation. The Escalona Scale is one in which occurrences of behavior early in the mother-baby transactions is predictive of competence as we measured it. This is not true for the period from 37 weeks on.

For the population as a whole, time is not a critical factor on the Home Scale items, although there is a slight tendency for the frequency of intellectual activities to be a earlier rather than a later predictor. Seven items out of a possible 64 relationships exceeds chance expectation, as does the four out of 48 for the 37-49 week period.

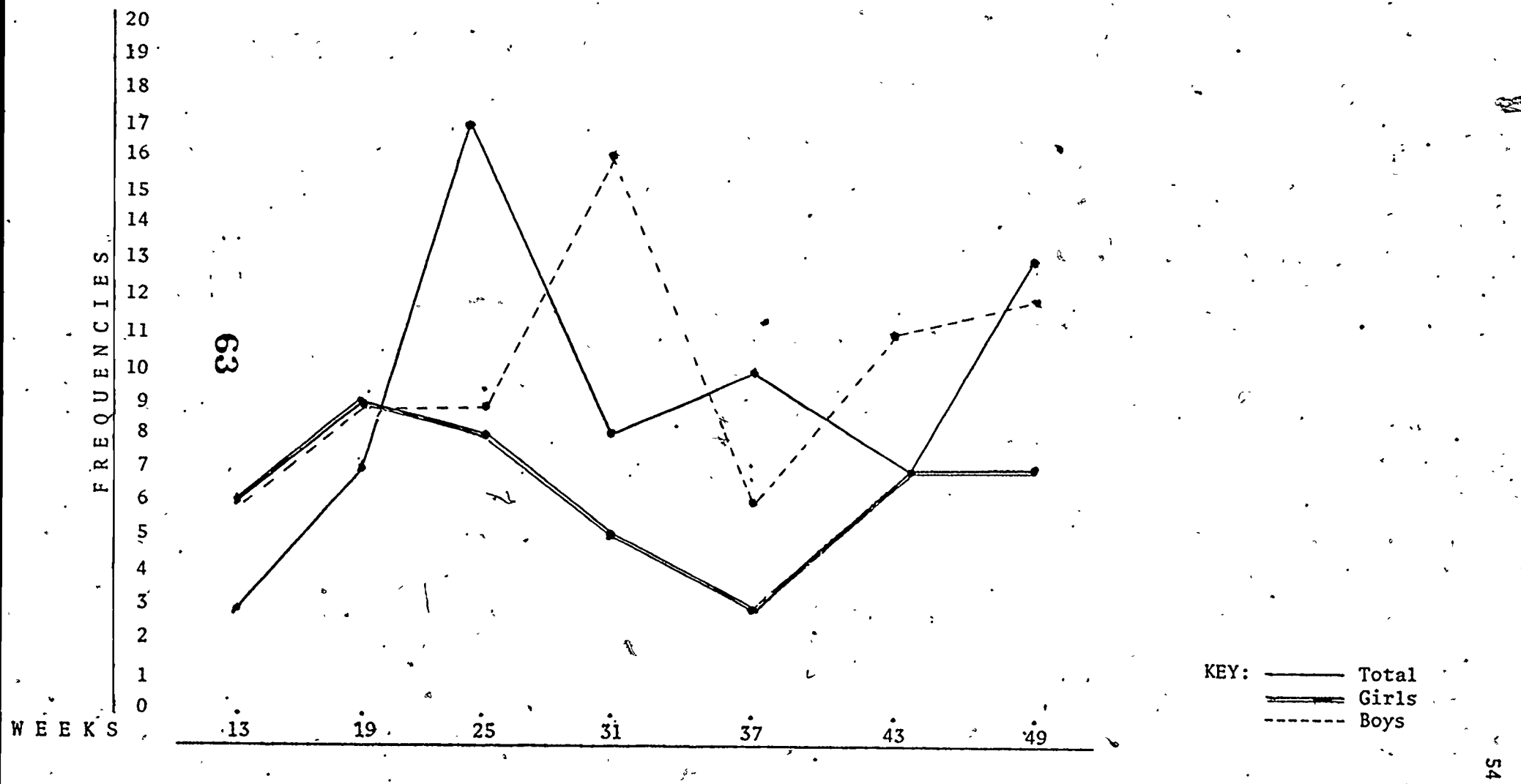
The Reciprocal Category System items can be logically grouped into two categories, teaching and affect. When examined this way, teaching makes more impact later than earlier, although both times exceed chance (five out of 64, 11 out of 48 times). Affect is more even in effect; both early and late better than chance (five out of 80 early, four out of 48 late).

Figure 2 shows the pattern by age and sex for all items. Age 25 weeks is the peak for both groups. That is, there were more items occurring at that time which were reliably related to any competence measure than at any other one observation episode. Seven items related to the Series factor, five to Responsiveness.

Although there may be a tendency, because of the skewed distributions (Table 20) for correlations to be inflated, the above data provide modest support for the hypothesis. Items, both singly and in logical scale groups, predict competence. Escalona Scale

FIGURE 2

NUMBER OF SIGNIFICANT CORRELATIONS, OBSERVATION ITEMS TO ALL COMPETENCE FACTORS, BY AGE AND SEX.



items predict early; the Home Scale and RCS items function throughout the 13-49 week period. Generally, the period from 25 weeks on (Figure 2) is more predictive, at each age, than earlier. The peak is 25 weeks. The most predictive items are: 4, 9, 11, 14, 25, 27 and 29. Each of the competence factors is about equally predictable overall with Series and Language a little better (18 each) than Responsiveness (15) and Compliance (13) out of a possible 245 for each. This exceeds chance, but is not strong support for the hypothesis. The items which relate are different for different factors, supporting the factor analytic approach to competence.

Factor by Age Analysis

Tables 25-28 present the relationships between the observation factors and each of the competence factors at each age. An examination of Table 25 indicates that what is observed on the factors is non-predictive of performance on the Compliance measure.

Examinations of the relationships of observational factors to the Series factor (Table 26), indicate that mother-baby teaching transaction is predictive of series performance. This emerges as early as 25 weeks. While the amount of variance accounted for is not particularly high, there is a reliable and persistent relationship between the teaching transaction and this factor. In addition, Maternal push is related at 19 weeks and Non-specific social transaction at 25 weeks.

Language competence (Table 27) is independent of observation factors for the total population. Baby-mother affectional transaction at 49 weeks is the only one significant out of the possible 35. This can be due to chance.

Table 25

Relationship of Observed Factors to Competence Factor 1, Compliance, by Age and Sex

Observation Factors	Child's Age in Weeks						
	13	19	25	31	37	43	49
Performance Orientation							
Total	-.04	-.07	.06	.04	-.08	.17	-.17
Boys	.02	-.08	-.15	-.03	.12	.02	-.42
Girls	-.07	-.06	.14	.08	-.19	.24	-.04
Baby-mother affectional transaction							
Total	.00	-.07	.15	-.09	-.12	.05	.07
Boys	-.17	.36	.01	-.37	-.08	.19	.07
Girls	.03	.01	.21	.05	-.14	-.10	.08
Maternal push							
Total	.04	.07	-.09	.00	.04	.20	.00
Boys	-.12	.05	-.52*	-.28	.05	-.02	-.15
Girls	.07	.09	.03	.24	.03	.35	.07
Mother-baby teaching transaction							
Total	.14	.22	-.09	.05	.18	.23	.14
Boys	.13	.09	-.23	-.07	.02	.15	-.32
Girls	.16	.28	-.07	.14	.28	.29	.40*
Non-specific social transaction							
Total	.14	.14	-.09	-.20	.08	-.09	.25
Boys	-.03	.10	-.15	-.48*	-.14	-.28	.04
Girls	.25	.17	-.07	.00	.17	.02	.37

Table 26

Relationships Between Observed Factors and Competence Factor 2, Series, by Age and Sex

Observation Factors	Child's Age in Weeks						
	13	19	25	31	37	43	49
Performance orientation							
Total	-.12	.21	.23	-.19	.19	.01	.26
Boys	-.20	.09	.30	-.32	.45*	-.18	.27
Girls	-.09	.26	.15	-.09	.01	-.19	.26
Baby-mother affectional transaction							
Total	-.08	-.17	-.10	.09	-.10	-.21	.22
Boys	.16	.17	-.02	.18	.00	-.17	-.07
Girls	-.14	-.33	-.15	.02	-.18	-.30	.26
Maternal push							
Total	.16	.31*	.17	.00	.18	.13	-.06
Boys	.22	.71*	-.08	-.15	.35	.12	-.37
Girls	.15	.14	.25	.27	.06	.19	.12
Mother-baby teaching transaction							
Total	.01	.18	.27*	.37*	.30*	.25	.28*
Boys	-.05	.41	.39	.25	.37	.08	-.07
Girls	.02	.06	.18	.49*	.26	.41*	.48*
Non-specific social transaction							
Total	.21	-.17	-.37*	-.20	-.01	.05	.05
Boys	.47*	.05	-.34	.15	.27	-.10	-.18
Girls	.02	-.26	-.40*	.03	.11	.13	.18

*p = .05.

Table 27

Relationships Between Observed Factors and Competence Factor 3, Language, by Age and Sex.

Observation Factors	Child's Age in Weeks						
	13	19	25	31	37	43	49
Performance orientation							
Total	-.11	.28	.06	.12	-.09	-.07	-.06
Boys	.25	.12	-.20	.03	.10	.30	.29
Girls	-.33	.28	.10	.15	-.15	-.11	-.22
Baby-mother affectional transaction							
Total	.07	.15	.08	.08	.10	.06	.33*
Boys	-.19	.06	.18	.46*	.04	.14	.14
Girls	.04	.09	.02	-.13	.12	.05	.30
Maternal push							
Total	-.22	.10	.19	.14	-.16	.08	-.21
Boys	.00	.06	.17	.45*	-.21	.44*	-.04
Girls	-.28	.23	.10	-.24	-.14	-.13	-.33
Mother-baby teaching transaction							
Total	-.10	.12	.10	.01	-.07	.03	.03
Boys	-.08	-.28	.35	.21	-.30	.30	.03
Girls	-.17	.24	-.10	-.25	.01	-.15	-.05
Non-specific social transaction							
Total	.20	-.16	.21	.15	-.04	.09	-.01
Boys	.10	-.28	.40	.29	-.16	.14	-.35
Girls	.28	.02	.14	.00	-.09	.02	.11

*p = .05.

Table 28

Relationships Between Observed Factors and Competence Factor 4, Responsiveness, by Age and Sex

Observation Factors	Child's Age in Weeks						
	13	19	25	31	37	43	49
Performance orientation							
Total	.25	.04	-.01	.10	.03	.26	-.01
Boys	.34	.00	.03	.01	-.12	.31	.22
Girls	.20	.00	.10	.12	.16	.35	-.11
Baby-mother affectional transaction							
Total	.20	-.15	.23	-.16	.11	.12	.04
Boys	-.07	-.13	.30	-.11	.25	.36	.40
Girls	.24	-.22	.20	-.30	.02	-.10	-.05
Maternal push							
Total	.00	-.12	.05	.23	.10	.39*	.19
Boys	-.00	-.15	.11	.27	-.19	.35	-.01
Girls	-.01	-.07	-.06	.13	.24	.48*	.27
Mother-baby teaching transaction							
Total	.15	-.09	.10	-.08	.24	.20	.38*
Boys	-.14	-.36	.44	-.08	-.25	.22	.18
Girls	.24	-.01	-.10	-.18	.44*	.21	.46*
Non-specific social transaction							
Total	-.06	-.04	.25	.18	.04	-.19	.24
Boys	-.29	-.37	.17	.32	.15	.21	-.23
Girls	.10	.23	.27	.06	-.08	-.43*	.43*

*p = .05.

The last competence factor (Table 28), Responsiveness, shows relationships to Maternal push at 43 weeks and Mother-baby teaching transaction at 49 weeks. These, too, may be chance.

When each factor is examined by age for the total population against the four competence measures, the relationship is present only between Mother-baby teaching transaction and Series performance.

When we examine factors to any competence measure, RCS affect predicts Language at 49 weeks. Factor three, Maternal push, predicts factor two at 19 weeks, factor four at 43 weeks. RCS teaching (factor four) predicts competence factor two, Series, at 25, 31, 37, 49 weeks and Responsiveness at 49 weeks. Factor five, Non-specific social transaction, predicts competence on the Series at 25 weeks.

Multiple regression analysis by age. The data on Table 29 indicate there is no relationship between Compliance and observation when boys and girls are combined. The sex differences will be presented in relation to hypothesis 6. Series performance (Table 30) is predictable from the observations as early as 19 weeks of age, and the multiple regression at that early point accounts for 23 percent of the variance (multiple r of .48), going up at the 49 week time to 29 percent of the variance. At 19 and 31 weeks four out of five of the observation factors enter into the equation. At 25 and 49 weeks all five factors contribute to the multiple correlation. At 37 and 43 weeks the relationships are due to the

Table 29

Multiple Regression, Competence Factor 1, Compliance, by Age and Sex

Observation Factor	Step	Mult r	F ratio	Direction of Correlation
		Boys, 25 Weeks		
Maternal push	1	.51	5.41*	-
		Boys, 31 Weeks		
Non-specific social transaction	1	.48	5.75*	-
Baby-mother affectional transaction	2	.64	6.09**	-
Performance orientation	3	.73	6.46**	-
Mother-baby teaching transaction	4	.75	5.05**	-
Maternal push	5	.75	3.86*	-
		Girls, 49 Weeks		
Mother-baby teaching transaction	1	.39	4.77*	+
Non-specific social transaction	2	.47	3.61*	+

*p = .05.
**p = .01.

Table 30

Multiple Regression, Competence Factor 2, Series, by Age and Sex

Observation Factor	Step	Mult r	F ratio	Direction of Correlation
		Total, 19 Weeks		
Maternal push	1	.31	4.74*	+
Non-specific social transaction	2	.39	3.76*	+
Baby-mother affectional transaction	3	.45	3.54*	-
Mother-baby teaching transaction	4	.48	3.07*	+
		Boys, 19 Weeks		
Maternal push	1	.71	15.67**	+
Baby-mother affectional transaction	2	.78	10.79**	+
Mother-baby teaching transaction	3	.88	10.03**	+
Non-specific social transaction	4	.90	9.46**	+
		Girls, 19 Weeks		
Baby-mother affectional transaction	1	.33	3.29	-
Performance orientation	2	.46	3.51*	+
		Total, 25 Weeks		
Non-specific social transaction	1	.37	6.93*	+
Mother-baby teaching transaction	2	.45	5.35*	+
Baby-mother affectional transaction	3	.48	4.09*	-
Performance orientation	4	.49	3.17*	+
Maternal push	5	.49	2.49*	+
		Girls, 25 Weeks		
Non-specific social transaction	1	.40	5.09*	-

Table 30 continued, page 2

Total, 31 Weeks				
Mother-baby teaching transaction	1	.37	6.96*	+
Performance orientation	2	.46	5.75*	-
Non-specific social transaction	3	.46	3.93*	+
Baby-mother affectional transaction	4	.47	2.98*	+
Girls, 31 Weeks				
Mother-baby teaching transaction	1	.49	7.48**	+
Performance orientation	2	.51	3.96*	-
Total, 37 Weeks				
Mother-baby teaching transaction	1	.30	4.81*	+
Boys, 37 Weeks				
Performance orientation	1	.45	4.75*	+
Total, 43 Weeks				
Mother-baby teaching transaction	1	.25	3.02	+
Baby-mother affectional transaction	2	.38	3.63*	-
Boys, 43 Weeks				
Performance orientation	1	.18	.64	-
Maternal push	2	.48	2.71	+
Non-specific social transaction	3	.60	3.23*	-
Girls, 43 Weeks				
Mother-baby teaching transaction	1	.41	4.86*	+
Baby-mother affectional transaction	2	.53	4.61*	-
Maternal push	3	.56	3.30*	+
Total, 49 Weeks				
Mother-baby teaching transaction	1	.28	3.65	+
Maternal push	2	.37	3.36*	-
Performance orientation	3	.44	3.33*	+
Non-specific social transaction	4	.53	3.26*	+
Baby-mother affectional transaction	5	.54	3.26	+

Table 30, continued, page 3

		Boys, 49 Weeks		
Maternal push	1	.37	2.60	+
Performance orientation	2	.60	4.22*	+
		Girls, 49 Weeks		
Mother-baby teaching transaction	1	.48	7.85**	+
Maternal push	2	.52	4.50*	+
Performance orientation	3	.55	3.48*	+
Non-specific social transaction	4	.62	3.57*	+
Baby-mother affectional transaction	5	.63	2.87*	+

RCS factors only; at 37 weeks, Mother-baby teaching transaction alone; at 43 weeks that factor is combined with Baby-mother affectional transaction.

The Language factor is predictable from observation made at 49 weeks. Baby-mother affectional transaction contributes positively and Maternal push negatively to the total correlation (Table 31).

Competence factor four, Responsiveness (Table 32), is predictable as early as 43 weeks where three factors contribute to the regression, including Non-specific social transaction negatively. This same factor contributes in a positive direction at 49 weeks of age. Mother-baby teaching transaction is the main variable at 49 weeks and the third variable at 43 weeks.

Table 33 summarizes the multiple regression. It shows that by 49 weeks three of the competence measures are predictable from combinations of observation factors. By 43 weeks two factors are predictable. As early as 19 weeks one factor (Series) is predictable. Only the Compliance measure is not related to combinations of factors for the total population.

Pooled Item Relationships to Competence

As noted above we not only analyzed by age but also by total scores on each item. That is, we summed the frequencies across ages, divided by seven, and arrived at a mean score for each item. To distinguish this from an age mean, it is called total score. Table 34 presents the means of significant items; Table 35, the relationships. The total scores for the Escalona Scale items bear

Table 31

Multiple Regression, Competence Factor 3, Language, by Age and Sex

Observation Factor	Step	Mult. r	F Ratio	Direction of Correlation
		Boys, 31 Weeks		
Baby-mother affectional transaction	1	.46	5.16*	+
Maternal push	2	.68	7.70**	+
Non-specific social transaction	3	.71	5.70**	+
Performance orientation	4	.72	4.20*	+
		Boys, 43 Weeks		
Maternal push	1	.44	4.48*	+
		Total, 49 Weeks		
Baby-mother affectional transaction	1	.33	5.31*	+
Maternal push	2	.38	3.66*	-

Table 32

Multiple Regression, Competence Factor 4, Responsiveness, by Age and Sex

Observation Factor	Step	Mult. r	F ratio	Direction of Correlation
			Girls, 37 Weeks	
Mother-baby teaching transaction	1	.44	6.30*	+
Non-specific social transaction	2	.47	3.61*	-
			Total, 43 Weeks	
Maternal push	1	.39	8.15**	+
Non-specific social transaction	2	.42	4.58*	-
Mother-baby teaching transaction	3	.43	3.17*	+
			Girls, 43 Weeks	
Maternal push	1	.48	7.21**	+
Non-specific social transaction	2	.59	6.03**	-
Performance orientation	3	.59	3.99*	+
Baby-mother affectional transaction	4	.60	2.91*	-
			Total, 49 Weeks	
Mother-baby teaching transaction	1	.38	7.31**	+
Non-specific social transaction	2	.43	4.74*	+
Baby-mother affectional transaction	3	.44	3.43*	+
			Girls, 49 Weeks	
Mother-baby teaching transaction	1	.45	6.78*	+
Non-specific social transaction	2	.55	5.43*	+
Baby-mother affectional transaction	3	.61	4.77**	-
Maternal push	4	.62	3.62*	+
Performance orientation	5	.62	2.79*	-

*p = .01.
**p = .05.

Table 33

Summary of Significant Multiple Regression Coefficients, Observation Factors to Competence Factors.

Age and Sex		Competence Factors			
		Compliance	Series	Language	Responsiveness
19	Total		.48		
	Boys		.90		
	Girls		.46		
25	Total		.49		
	Boys	.52			
	Girls		.40		
31	Total		.47		
	Boys	.75		.72	
	Girls		.51		
37	Total		.30		
	Boys		.45		
	Girls				.47
43	Total		.38		.43
	Boys		.60	.44	
	Girls		.56		.60
49	Total		.54	.38	.44
	Boys		.60		
	Girls	.47	.63		.62

Table 34

Means and Standard Deviations of Total Scores on Key Items Which Related Reliably to Competence Factors

Item No.	Item Scale	Item Name	Total (N=53) $\bar{X}$	Total (N=53) SD	Boys (N=22) $\bar{X}$	Boys (N=22) SD	Girls (N=31 $\bar{X}$	Girls (N=31 SD
1	Escalona	Non-specific social control - input	.613	.398	.562	.368	.649	.420
3		Being shown something or having attention called to it	.188	.234	.166	.252	.204	.222
7		Shows affection or gives praise and admiration	1.608	.832	1.518	.915	1.671	.778
11	Home Scale	Object permanence	.372	.284	.296	.298	.426	.265
12		Differentiation of means and ends	.163	.177	.207	.207	.132	.148
13		Labeling, reading	.154	.175	.215	.212	.112	.132
16		Observing	6.264	.812	6.227	.869	6.290	.783
19		Discourages	1.856	.624	2.044	.661	1.723	.570
22		Observe	.365	.227	.423	.239	.324	.213
24		Seeks emotional comfort	.208	.282	.236	.298	.187	.273
25	RCS	Mother-baby total interaction (8)	.237	.106	.217	.097	.251	.112
27		Mother initiates, child responds	.018	.011	.016	.012	.019	.010
28		Mother elicits, child responds	.011	.009	.011	.009	.012	.008
29		Mother directs, child responds	.018	.013	.016	.009	.019	.015
30		Child elicits, mother responds	.0001	.0002	.0001	.0003	.0001	.0001
32		Baby warms, baby cools	.0025	.0160	.0003	.0004	.0040	.0209
33		Baby warms, mother warms	.0015	.0052	.0009	.0016	.0019	.0067
34		Baby warms, mother accepts	.0019	.0053	.0006	.0008	.0028	.0068
35		Baby warms, mother amplifies	.0045	.0239	.0008	.0010	.0072	.0312

Table 35

Relationships Between Observed Behavior Items and Competence Factors by Sex. (Boys=22, Girls=31, Total=53)

Item	Scale	Name	Competence Factors: Compliance Series 1	2	Language 3	Responsiveness 4
1	Escalona	Non-specific social control- input				
		Total				.32
		Girls				.40
3		Being shown something or having attention called to it				
		Boys	-.44			
		Girls	.47			
7		Shows affection or gives praise and admiration				
		Girls		-.36		
8	Home Scale	Verbal and symbolic learning				
		Boys	-.44			
11		Object permanence				
		Girls		.42		
12		Differentiation of means and ends				
		Total	-.39			
		Boys	-.53		.57	.55
13		Labeling, reading				
		Boys			.38	
16		Observing				
		Total		-.33		
22		Observe				
		Total			-.28	
23		Blank stare				
		Total	-.27			
		Boys	-.54			
25	RCS	Mother-baby total interaction (8)				
		Total		.34		

Table 35 continued, page 2

		Compliance	Series	Language	Responsiveness
		1	2	3	4
27	RCS Mother initiates, child responds				
	Total	.36			
	Girls	.42			
28	Mother elicits, child responds				
	Girls		.40		
29	Mother directs, child responds				
	Total		.36		
	Girls		.39		
30	Child elicits, mother responds				
	Total			.30	
	Boys			.74	
	Girls		-.44		
32	Baby warms, baby cools				
	Total				.28
33	Baby warms, mother warms				
	Total				.32
34	Baby warms, mother accepts				
	Total				.27
35	Baby warms, mother amplifies				
	Total				.31

little relationship to competence factors. Only one item, Non-specific social control-input, relates to one competence factor, Responsiveness. This can be due to chance. The discussion section will present some rationale for why pooled items from the Escalona show this lack of effect.

The Home Scale has four items of its 17 which relate to competence measures. Two relate to Compliance (items 12 and 23), one to the Series (item 16) and one to Language (item 22), all negatively. This number of relationships slightly exceeds chance (four out of 68).

Of the 10 RCS items, seven relate to various competence measures. Compliance is predictable from item 27, Series from 25 and 29, Language from 30, and Responsiveness from 32, 33, 34, 35. These last four items are all highly interrelated and load on the RCS Baby-mother affectional transaction factor.

Pooled Factor Relationships to Competence

Table 36 presents the means and standard deviations for the summed observations. Table 37 indicates the relationships between observations and competence when observations are summed across age. Two of the competence factors, Series and Responsiveness, are predictable from observation factors. The Series is related positively to Mother-baby teaching transaction and negatively to Maternal push. Responsiveness is positively related to both Baby-mother affectional transaction and to Non-specific social transaction. The Language and Compliance factors are unrelated to pooled scores.

Table 36

Means and Standard Deviations, Summed Observation Factors

Observation Factors	Total (N=53)		Girls (N=31)		Boys (N=22)	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Performance orientation	14.41	3.27	14.06	2.87	14.89	3.79
Baby-mother affectional transaction	.01	.05	.02	.07	.003	.002
Maternal push	11.93	2.61	11.91	2.27	11.96	3.08
Mother-baby teaching transaction	.29	.13	.31	.14	.26	.12
Non-specific social transaction	3.06	.78	3.05	.71	3.07	.89

Table 37

Relationships Between Observed Behavior Factors and Competence Factors

Observation Factors	Competence Factors: Compliance	Series	Language	Responsiveness
Performance orientation				
Total (53)	-.08	-.20	.12	.12
Boys (22)	-.14	-.23	.05	.12
Girls (31)	-.04	-.17	-.19	.18
Baby-mother affectional transaction				
Total	.03	.01	.18	.30*
Boys	-.11	.02	.04	.29
Girls	.04	-.02	.17	.32
Maternal push				
Total	-.10	-.27*	-.19	.14
Boys	-.12	-.37	.18	.03
Girls	-.10	-.17	-.22	.24
Mother-baby teaching transaction				
Total	.17	.35*	-.10	.07
Boys	.00	.27	.13	.07
Girls	.26	.40*	-.29	.03
Non-specific social transaction				
Total	-.18	-.13	.07	.27*
Boys	-.59*	-.10	.18	.19
Girls	.11	-.16	.02	.34

* N=53, r=.27, p=.05.
N=22, r=.42, p=.05.
N=31, r=.35, p=.05.

Table 38 presents the multiple regression of observation factors to competence. Competence factors two (Series) and four (Responsiveness) are predictable from observation across time. The first two observation factors, in each case, account for almost all the explainable variance. The effect of affect is clear on both competence measures, but predominantly so on Responsiveness.

Summary of Hypothesis 4

Hypothesis 4, tested in a variety of ways, is moderately sustained. There are significant relationships between observed maternal-infant behavior over time and when pooled and various measures of infant competence at age one. Series performance is best predicted. Mother-baby teaching transaction is the best predictor at different ages for different factors.

Responsiveness is the second best predicted factor. Both items and observation factors which relate to it are, in addition to teaching, affective in nature. This is particularly true for pooled relations, although it also holds for the age-relationships as well. Language is predicted only at 49 weeks and is predictable by affective rather than teaching transactions. Only one factor, Compliance, is essentially unpredictable from either items or factors at different ages or across age. Only one observation factor, Performance orientation, is unrelated to competence except in multiple regression. Two cautions must be stated: first, the skewed distributions may be inflating correlation coefficients; second, the number of correlations run means some which seem significant may be due to chance. The patterns, however, make sense and are probably reliable.

Table 38

Multiple Regression, Observed Behavior Factors and Competence Factors

Observation Factor	Step	Mult. r	F ratio	Direction of Correlation
Competence Factor 2, Series				
Mother-baby teaching transaction	1	.35	6.98*	+
Maternal push	2	.46	6.56**	-
Non-specific social transaction	3	.47	4.75**	-
Baby-mother affectional transaction	4	.49	3.72*	-
Performance orientation	5	.49	3.00*	-
Competence Factor 4, Responsiveness				
Baby-mother affectional transaction	1	.30	4.98*	+
Non-specific social transaction	2	.40	4.71*	+
Mother-baby teaching transaction	3	.41	3.25*	+

*p = .05.
**p = .01.

Hypothesis 5

Hypothesis 5 stated that there would be a significant difference in the pattern of mother-infant interaction by the sex of the infant. We examined the data in four ways: (1) by overall correlation of factors to factors (Table 39); (2) by consistency of factor over time (Tables 10-13); (3) by patterns of relations among the factors over time (Table 40); and (4) by frequency of occurrence both by age and summed (Tables 9, 20, 34 and 36).

Table 39 presents the data on overall correlation. There is one common relationship, Maternal push to Performance orientation. There is also a difference. Mother-baby teaching transaction relates in opposite directions, both reliably, to Mother-baby affectional transaction. For boys, this is positive; for girls, negative. Generally; for each sex, the factors are independent.

The other two correlational procedures were analyses by age. Tables 10-13 present the data on consistency within a factor over time in relation to hypothesis 2. They also contain the data by sex. Examination of Table 10 indicates that Performance orientation at 37 weeks for boys is predictable from Performance orientation at 13, 19 and 25 weeks. No such pattern emerges for the girls. Tables 11 and 12 show no significant patterns. Table 13 (Mother-baby teaching transaction) indicates that there is a tendency, beginning at 25 weeks, for a more consistent pattern for the girls than for the boys. Scores at 25 weeks for the girls relate to 43 and 49 weeks. Scores at 31 weeks relate to those at 43 weeks and scores at 43 weeks relate to 49 weeks.

Table 39

Relationships Among Observation Factors by Sex

Observation Factors	Performance Orientation	Baby-Mother Affectional Transaction	Maternal Push	Mother-Baby Teaching Transaction
Baby-mother affectional transaction				
Boys	.02			
Girls	-.10			
Maternal push				
Boys	.83**	.08		
Girls	.74**	-.04		
Mother-baby teaching transaction				
Boys	-.07	.47*	-.12	
Girls	.11	-.40*	.25	
Non-specific social transaction				
Boys	.34	.36	.38	.22
Girls	.28	.01	.33	.31

*p = .05.
**p = .01.

Table 40 presents the intercorrelations of all the observation factors by age and sex. It allows analysis of the way in which a factor relates to other factors both at the same observation episode and at other times. It also shows where a factor score is predictive of a later score on the same factor. There are very few cells in which both boys' and girls' correlations appear. The predominantly common relationship is that between factor one (Performance orientation) and factor five (Non-specific social transaction). This relationship is consistently negative and is present within the observation episode. It appears for both boys and girls at 25, 31, 37 and 49 weeks. It appears just for the girls at 19 weeks and 43 weeks.

Another common pattern is between factor three (Maternal push) and factor four (Mother-baby teaching transaction), again, within an observation episode. This occurs at 19, 37, 43 and 49 weeks for both and at 25 and 31 weeks for the girls only. The only other common occurrences are between factors four at 31 weeks and factors three and four at 37 weeks; factor three at 31 weeks and factor one at 43 weeks.

All other relationships are separate for boys and girls. There are 685 relationships possible on the table for each sex. Sixty-two are reliable for girls, 57 for boys. This exceeds chance. There are more relationships of factors one, three and four to either themselves at other times or to other factors than there are such relationships for factors two and five. Factor four has 35 such

relationships, factor three has 30, and factor one has 26 for the girls. Factor one has 33 relationships, factors three and four with 26 apiece for the boys. Thirty-four percent of all the reliable relationships for girls are within an observation, 28 percent for boys. For the girls, 19, 25 and 49 weeks show four or more such relationships; for the boys; 37 and 49 weeks.

Further, this was more likely to occur earlier for the girls and later for the boys. For example, 57 percent of all the significant relationships within cells occur for the girls up to 31 weeks of age, while only 31 percent of these relationships occur for the boys.

There is also a tendency for an age by sex interaction. Scores up to 31 weeks seem more predictive of later boy transactions; scores at or after that age are more predictive of later girl transactions. For example, scores at 19 weeks predict 13 other scores for boys and only three for girls. Scores at 25 weeks predict eight apiece. Scores at 31 weeks predict seven later ones for boys and 15 for girls. Scores at 43 weeks predict four at 49 for the girls and none for the boys.

When we examine which factors seem central, that is, which relate more frequently to other factors, factor one, Performance orientation, is most central for the boys, predicting 14 out of the 32 scores (44%) which related early to later behavior. Mother-baby teaching transaction (17 out of 41, 41%) and Maternal push (12 out of 41, 29%) are the central ones for the girls.

In order to see if there were differences in the amount of transaction on any factors which might also be relevant, we examined Tables 9, 20, 34 and 36.

Table 9 contains the means and standard deviations for observation factors by age and sex; Table 20, those items which relate reliably to competence factors by age and sex; Table 34, the items pooled across time, and Table 36 the factors pooled across time.

Examining the factors (Tables 9 and 36) would suggest that there was more Baby-mother affectional transaction overall for the girls than for the boys. Since there is a considerable deviation around the means in both cases, the chances are that any statistical test of significance would yield nothing. The means and standard deviations are very much alike for both sexes on all the other factors. There is some slight tendency, reflected in both the age table and the pooled or summed table, for mothers to engage in more teaching transaction with the girls than with the boys. The differences, again, would not be significant. Generally, an inspection of Tables 9 and 36 suggest that the frequencies of occurrence are not where the differences lie in the factor scores of boys and girls.

Examination of Tables 20 and 34 indicate again that there is somewhat higher frequency of Mother-baby affectional transaction for the girls on items 32 through 35 than for the boys, and there may be more focus on object permanence overall for the girls than for the boys. Otherwise, the frequencies overall look very much alike. The differences lie not in amount, but in organizational pattern.

Hypothesis 5, that there would be sex differences in the pattern of mother-baby transactions, is sustained.

Hypothesis 6

Hypothesis 6 stated that there would be significant differences in the relationship between maternal variables and child competence by sex of the child. The various tables presented for hypothesis four contain the data for hypothesis six. The same outline used for discussing the results section for hypothesis four is followed here, that is, item by age, factor by age, multiple regression of factor by age, pooled items and factors.

Item by Age Examination. Table 21 shows the relationship between observed behavior items and Compliance. There are more relationships between observed mother-son transaction and Compliance than there are for mother-daughter. There are 35 items which are different by sex; 25 are relationships of boys to competence factor one, 10 for girls. Moreover, items 14 and 18 show clear patterns of negative relationships between Maternal demonstration, explanation, and expansion and Encouragement to boys and performance on competence factor one. Actively engaging the child (item 15) is consistently positively related for boys and unrelated for girls. Item 26, Baby Behaves, followed by Mother warms, accepts and amplifies is a mother-daughter pattern related to performance.

The data on Table 22 shows that there is much in common on this factor. However, there are 25 items in which a single sex score is significantly related to performance. Twelve of these are for girls,

thirteen for boys. There are some consistent patterns for the girls in relationships between total Mother-baby interaction (item 25) and Mother directs/child responds (item 29) and girl performance on the Series. There is no consistent pattern of relationship for the boys beyond that which would be represented in the total relationships of combined boys and girls to performance.

Relationships between competence factor three, Language (Table 23), and observed behavior are markedly different by sex. There are twice as many (16) significant relationships for boys as there are for girls (8). In addition, at 31 weeks of age, item 14, Demonstration, explanation, expansion relates positively for boys and negatively for girls. There is, however, no consistent pattern for either sex. The reliable coefficients are scattered throughout items and time. What little pattern may be present is on two of the RCS affective items (33 and 35). Baby warms followed by Mother warms or Mother amplifies are positively related to language development for the boys.

Relationships between Receptiveness and observed behavior items show quantitively no difference (Table 24). There are 13 for girls and 11 for boys. However, the patterns, though somewhat unclear, suggest sex differences. For the boys, item 33, Baby warms/mother warms, is significant in the later ages from 31 weeks up. At 43 weeks the relationship is positive for boys and negative for girls. Item 4, Mutual gazing - brief, emerges as an early pattern for boys and is the one place on all four competence measures where both boys and girls independently show a significant relationship. This

occurs at 25 weeks. For the girls, the relationships are in the teaching domain, items 25 and 27, occurring late in the year.

Overall, the item by age analysis indicates sex differences in patterns of relationships between observational items and competence measures. However, it may be that chance relationships are significant, and real relationships not because the small sample sizes tend to introduce randomness, which would reduce agreement of data across sexes.

In order to get another perspective, the data were organized by scale and frequency of relationships to any of the competence measures. The results for the total population were presented in reference to Hypothesis 4. Figure 1, along with Tables 21-24 are here analyzed for sex differences as shown on the tables.

Scores on items four, 14, 18, 20, 28, 33 and 35 for the boys at three or more ages, and scores on items 11, 25, 27, 28 and 29 for the girls at three or more ages, show relationships to competence. Maternal technique, items 14, Demonstration, explanation and expansion, and 18, Mother encourages, shows an early pattern of negative relationship to performance for the boys. Mother directs/child responds appears beginning at 25 weeks. Those items for the girls which seem to be early predictors are item 11, Object permanence and 28, Mother elicits/child responds. Note that the early items, except for this last one, are all from the Escalona or Home Scales. Further, the items for the girls are of the teaching or intellectual activity type. The pattern for the boys seems to be more in the affective domain (such as brief mutual gazing).

An examination of Tables 21 and 22 show that one of the items most clearly negatively consistently related to performance for the boys on Compliance (item 14) is positively related for boys to performance on the Series, although the pattern is clearer for Compliance.

After 31 weeks, items 25, 27 and 29 are predictors for the girls alone, but do not predict for the boys alone. For the boys, as mentioned above, items 14 and 18 continue to be important, but in addition, item 20, Mastery behavior by the boy himself, item 28, Mother elicits/child responds, and items 33 and 35, which are affective transactions between baby and mother, are related to competence. Again, we note that the girl pattern and the total pattern of relationships between observation and competence is more in the teaching behavior, whereas the significant patterns of relationships for the boys seem to come more from the affective transactions between mother and baby.

Figure 1 indicates that the Escalona Scale is a somewhat better predictor for the boys than for the girls early, and about even late. The intellectual activity section of the Home Scale shows an age by sex reversal. The frequency of these items is more important for the girls up to and including 31 weeks, and more important for the boys later. The maternal technique (items 13 to 19) and child behavior (item 20) section of the Home Scale shows up the sex differences. Amount of Maternal technique is a far more important variable in influencing boy performance both early and late, but especially early for the boys than it is for the girls. Here, we are

not concerned with the direction of the relationship, such as the negative relationships for items 14 and 18, but simply the frequency of occurrence of a relationship.

Teaching transaction, on the other hand, is more potent for the girls than for the boys both early and late. Even though there are only four items represented, compared to eight on Home Scale maternal technique, the highest frequencies for girls are found here than on any scale or sub-scale.

The affective transaction as seen by the RCS is about equally relevant as a function of age with a slight tendency toward the earlier time. It seems to have slightly more significance for the boys.

Figure 2 shows quite different patterns for boys and girls after 19 weeks of age. Age 31 weeks is the peak for the boys; there is no such peak for girls. More items relate to competence for boys than girls. The special effects of the 31 week observation episode for the boys is shown on the Home Scale maternal technique (six occurrences), RCS Teaching (four occurrences), and RCS affect (five occurrences). This age period raises the heights of the columns on Figure I by the above amounts.

The item by age analysis tends to support Hypothesis 6. The second procedure was factor by age analysis.

Factor by age analysis. Examination of Tables 25-28 show the pattern of sex differences. Scores on Compliance are basically unrelated to observation factors. The two significant relationships are

for boys, Maternal push at 25 weeks and Non-specific social transaction at 31 weeks, both negative. The one for girls, Mother-baby teaching transaction at 49 weeks, may be due to chance.

The data on Table 26 indicate that Mother-baby teaching transaction is an important factor for girls beginning at 31 weeks of age in predicting Series competence. No such consistent pattern emerges for the boys. For boys, the significant correlations are spread over three factors (none RCS) at three times.

The data on Table 27 show relationships for the boys between Mother-baby affectional transaction at 31 weeks, Maternal push at 31 and 43 weeks, and Language performance. There are no factors for girls alone.

The relationships between observed factors and Receptiveness show an emergent pattern for girls between Non-specific social transaction at 43 and 49 weeks (one negative, one positive), for Baby-teaching transaction at 37 and 49 weeks, Maternal push at 43 weeks, and performance. No such pattern is present for the boys. There is no explanation of the shift in sign on Non-specific social transaction.

Inspection of Figure 3 shows the impact of the Mother-baby teaching transaction on the girls especially in the last three episodes before 52 weeks, and the early influence of Maternal push, Baby-mother affectional transaction and Non-specific social transaction on the boys. Across Figure 1 there are six times when a score on an observation factor is significantly related to a competence measure at 31 weeks of age or younger of the boys and only

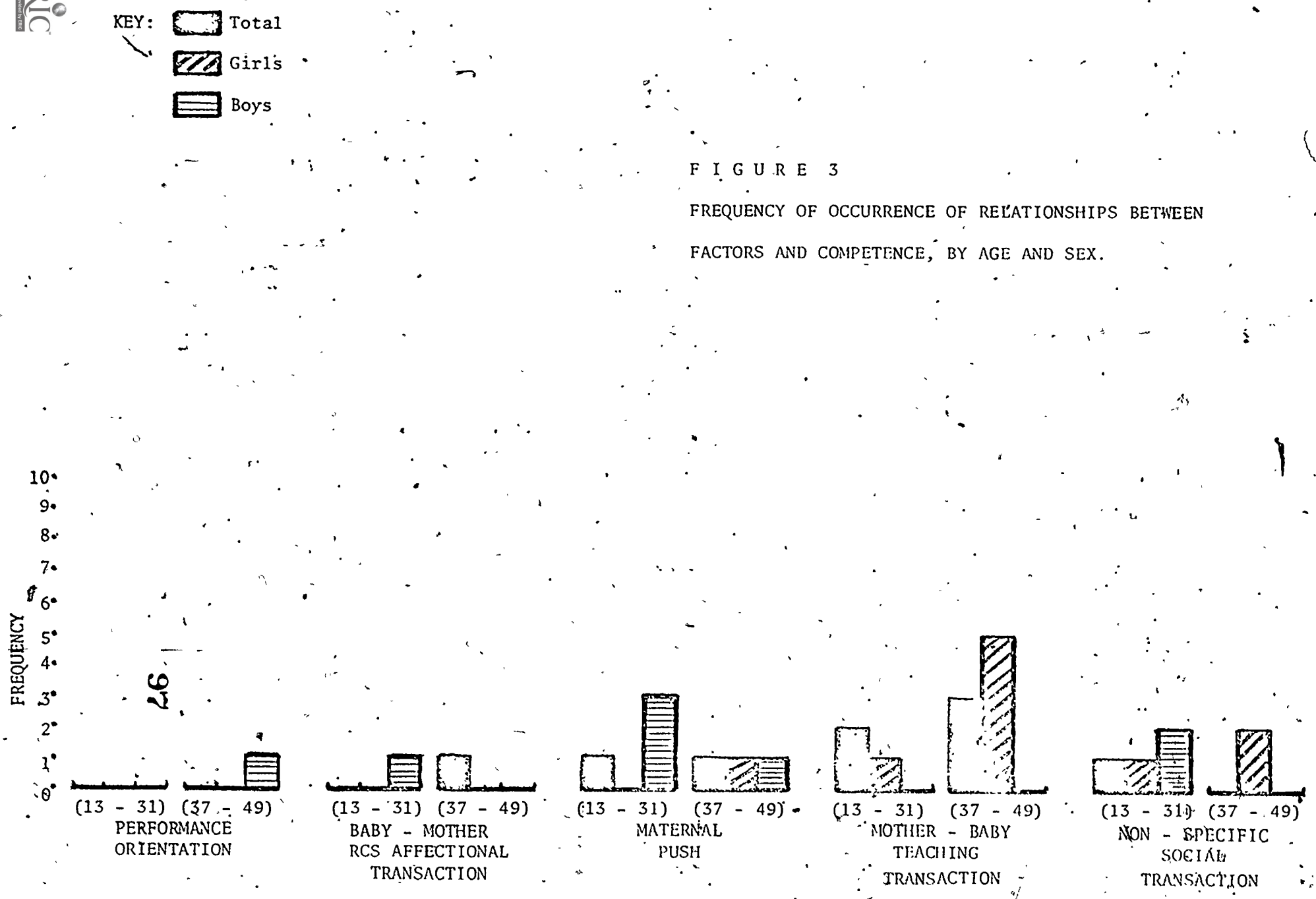


FIGURE 3

FREQUENCY OF OCCURRENCE OF RELATIONSHIPS BETWEEN FACTORS AND COMPETENCE, BY AGE AND SEX.

twice for the girls. There are eight occasions between 37 and 49 weeks for the girls and only four for the boys. Mother-baby teaching transaction is never significant for the boys alone, although it is for the total group. Performance orientation and Baby-mother affectional transaction are never significant for the girls alone, although the latter is significant for the total. Maternal push seems to be more critical for boys than for girls. Non-specific social transaction is important early for boys and late for girls.

Overall, there are sex differences when factors are examined in their relationships to competence measures by age. Mother-baby teaching transaction relates to three competence measures at 49 weeks for the girls and to one competence measure at 31, 37 and 43 weeks. In addition, Maternal push is positively related to two competence measures at 43 weeks. Non-specific social transaction is related to one competence measure negatively and the same one positively at 49 weeks. The girls' relationships all pile up in these last ages before age one. The boys' pattern is a more scattered one. Performance orientation and Baby-mother affectional transaction show scattered relationships for the boys and none for the girls. Maternal push and Non-specific social transaction seem to have influence early on the boys. The relationships for boys occur primarily early and on the affective side; for girls they occur later and seem to be more on the teaching side.

Multiple regression analysis. When we examine the multiple regression tables 29-32 we find further confirmation for hypothesis 6.

Compliance (Table 29) is related to observed behavior for boys early, for girls, late. We noted in relation to Hypothesis 4 that there were no total (combined boy-girl) relationships between observation factors either by age or pooled and Compliance. It is clear from Table 30 that the transaction which can be captured on the observation factors is a potent predictor for boys at the early ages (25 and 31 weeks) and a significant predictor for girls at 49 weeks. The variance accounted for from the observation factors for the boys at 31 weeks is 56%, a very high amount for these types of data. Note further that for the boys the correlations are all negative, whereas for the girls at 49 weeks, they are positive.

The Series factor (Table 30) is related for both sexes but the factors present in the multiple regression indicate the relative role of the affectional orientation for the boys (Maternal push, Baby-mother affectional transaction, Non-specific social transaction) and the teaching orientation for the girls. The Language factor (Table 31) is predictable only for boys, and Receptiveness (Table 32) is predictable by sex only for the girls and that only at the last three ages. Although this factor is significantly predicted for the combined sexes at 43 and 49 weeks, the relationships for boys alone are not reliable. Table 33, which is a summary of the coefficients, presents the pattern in yet another way.

Pooled relationships to competence. In addition to the age related measures, pooled scores on each item and then on each factor

were examined. Table 35 presents the item distribution. Analysis of Table 35 shows that Compliance is more predictable for boys than girls from the pooled scores of separate items. Item 3, from the Escalona and items 8, 12 and 23 from the Home Scales are all negatively related to boys' performance. On the other hand, items 3 and 27 are positively related for the girls. The Series measure is primarily predictable for girls with items 7 and 30 negatively related, items 11, 28 and 29 positively related. The Language measure is predictable for the boys on three items and not for the girls except as reflected in the total score on items 23 and 30. For the boys, Differentiation of means and ends, Labeling and reading, and Child elicits mother responds are positively related to Language performance. The fourth competence measure shows little relationship by sex alone.

When items are examined, item 12, Differentiation of means and ends, is related to three competence measures for the boys (Language and Receptiveness positively and Compliance negatively). There is no comparable item having this effect for the girls.

The relationship between observation factors and competence is shown on Table 37. Mother-baby teaching transaction is significantly related to Series performance for the girls, while Non-specific social transaction is negatively related to Compliance for the boys.

Hypothesis 6 is confirmed. There are many differences, by item, by factor, by age, in the pattern of relationships between observed behavior in the mother-baby transactional situation and child performance on the competence measures.

Summary of Results

All of the six hypotheses were stated in a directional fashion so that sustaining of a hypothesis means rejection of the null hypothesis. Hypothesis 1, that factors would be formed across the three observation systems, was not confirmed. Basically, each factor was somewhat system specific. The Escalona Scale items, however, spread across two of the five factors.

Hypothesis 2, that the pattern of mother-child interaction would be established early and would be consistent over time, was only partially sustained. The pattern is most true in the case of Mother-baby teaching transaction, moderately true for factor three, Maternal push, which became predictable beginning approximately at 37 weeks.

Hypothesis 3, that the measures for competence derived from observations made of Mother-baby transaction at 52 weeks on a set task, Bayley Mental Scales and Series performance items would yield several factors, was sustained. However, the contribution of the Social Abilities Scale to the competence factors is limited to only one item on factor one. Generally, the test measures formed the competence measures.

Hypothesis 4 was that there would be a significant relationship between observed mother-infant transaction and measures of infant competence. This hypothesis is sustained. There are various patterns by item, factor and age. Overall, many consistent and logical relationships appear between observed behavior and child performance.

Hypotheses 5 and 6 concern sex differences. Hypothesis 5 was that there would be differences in the transactional pattern and 6, that there would be differences in the relationships between transactional pattern and child performance. Both hypotheses are sustained.

Overall, of the six hypotheses, only one, that items from observational systems would relate well to each other, is clearly rejected. However, the derivation of factors from the observation systems and the use of the items themselves permitted testing of all additional hypotheses. The strongest findings are of sex differences and of the differing role of affect and teaching transaction to different measures of competence. The next chapter will elaborate on these findings.

4. Discussion and Implications

Because of the mass of data, and the number of hypotheses, this chapter will match the results chapter, in that it will deal first with each hypothesis. This will be followed by an attempt to integrate the findings.

Hypothesis 1

Our expectation was that there would be relationships across the different observation schedules. Since all dealt with mother-infant transaction, why so little overlap so that the factors are virtually system specific?

The Escalona Scale differs in two important ways from the other measures. (1) It was designed from the theoretical viewpoint of modern psychoanalysis. (2) Scoring an item, even of mother behavior, requires a response on the part of the child. This means that if a mother sought to elicit a response which might show up on either the Home Scale as item 14, Demonstration, explanation, or on the RCS as Mother elicits, it is not recorded on the Escalona Scale unless the baby responds. The baby's behavior, therefore, is more central on the Escalona Scale than on the other two. It is puzzling, however, why Escalona item 2, First step in patterned reciprocal activity, did not load on the RCS teaching factor where child response is so basic to this factor.

Factor five, Non-specific social transaction (Table 8), is the only mixed (across systems) factor. Here, the blank stare (Home Scale 23) and the child initiation (RCS 31) can be seen as similar to Non-specific social-output of the baby (Escalona 6).

Generally, the separation of the Watts' Home Scale into two factors, Performance orientation (Table 4) and Maternal push (Table 6), follows logically from the scale's construction: There is nothing on either the RCS or Escalona that corresponds with identification of the focus of the mother-baby transaction resembling the Home Scale's intellectual activities. What is interesting here is that this factor emerged, because it indicates that one of the central thrusts of the ISIS project, that is, providing the baby with a variety of intellectual experiences with the environment, was accomplished. The ISIS project activities, since they

were to some extent emergent from Piagetian views of intellectual development in the sensori-motor period, included a number of object permanence type experiences. Object permanence is on the Home Scale (Table 2, number 11) but it is not significantly related to other activities. As seen in the Results section, it is related, as an independent item, to several competence factors at several ages, especially at 49 weeks. Why object permanence is different from such items as visual pursuit is not clear.

The lack of relationship of Maternal push items to RCS teaching may lie in the fact that the latter is a transactional system. That is, while the RCS observer records the occurrence of mother encourages (Home Scale item 18), it would not enter into the teaching transaction factor unless followed by baby response. The Maternal push items represent the behaviors of one person (mother-15, 16, 17, 18; baby-20, 22, 24) while the items from the RCS which were used here are all transactional. Further, Maternal push, as a factor, is highly related to Performance orientation which is composed primarily of Home Scale items. Both reflect a task-orientation by the mother.

The division of the RCS key items into two factors, teaching and affect, reveals what many other observers and conceptualizers of mother-child and teacher-pupil transaction have noted. That is, these two fundamental types of relationships are only moderately related. Indeed, as indicated on Table 39, the relationships between them are in the opposite directions for boys and girls.

While these somewhat post hoc explanations may be true, it is only as we examine the patterns of relationships below that we can see that there is considerable value in the fact that different systems captured different parts of the action. This increases the potency of use of several observation measures simultaneously on the same scene.

Hypothesis 2

The ISIS project in which these tapes were made focused heavily on the mother-baby teaching transaction and thus it is not surprising that of all of the factors this one should have become the most stable. It does mean, however, that the pattern established earlier was only partly influenced by additional parental experience. To some degree those who already were high on the amount of teaching transaction remained so. Those who were already comparatively lower have remained in that position from 25 weeks up to 49 weeks of the baby's age. However, even though the pattern stablized early, a large amount of variance is still unaccounted for from age to age. At the highest, the relationship between 31 weeks and 42 weeks still accounted for less than half of the variance. When we note further that this pattern is most highly related to performance on the series competence measure which also was central to the ISIS project, we may say that mothers who establish a teaching transaction around particular materials not only become somewhat stable in their relative position in using such a pattern but that this is clearly related to the performance of the child on the materials.

Maternal push also showed a pattern of reliable relationships, although not as distinct as that for the teaching transaction. If a mother were high on pushing at even the first observation (13 weeks), this was related to her pushing at 25 and 37 weeks. In turn, her behavior at 19, 31 and 37 weeks was also related to 43 weeks which, in turn, was somewhat predictable of her pushing at 49 weeks. While these stretch out in a thin chain, the pattern suggests that this type of behavior is somewhat consistent across time regardless of the other requirements of the situation and the age of the baby. The correlation coefficients are not very high, so that most of the variation at any later age is not predictable from the early age. Nevertheless, pushiness seems to be a somewhat stable characteristic of maternal behavior in this first year of life under these conditions.

Although for the total group there was no stability on Performance orientation, the pattern seems fairly clear for boys. Mothers of boys who might be said to be somewhat task-oriented, that is, who spend a higher proportion of their time focusing the child on the task, regardless of the intellectual activity, seem to be mor consistent in this pattern than mothers of girls. Further, this is an early pattern in which relationships jump from 13, 19 or 25 weeks of age to 37 weeks of age. The pattern is not a chained one as in the case of Maternal push, but rather there seems to be something occurring at 37 weeks which relates back to each of the previous observation times, but these observation frequencies are not related to each other. As to what this means, we would be engaging in pure speculation.

Since these data were gathered in a project designed to influence mother behavior over time, particularly in the area of teaching, it is interesting to note that Mother-baby teaching transaction turns out to be the most stable factor. While other data from the ISIS project (Gordon and Jester, 1972) indicate that the objective of increasing Mother-baby teaching transaction over time was achieved. These data suggest that the old adage that the rich get richer may also be true. The overall means grow (Table 9) from 20% of the time at 13 weeks being spent in Mother-baby teaching transaction to about one-third of the time in the last three episodes, but the correlation data indicate the tendency for those who were high to remain high in relation to their peers.

One of the problems with the Reciprocal Categories System and its use in this project is that maternal behavior must be verbal to be recorded. This seriously affects the second factor, Baby-mother affectional transaction. When one examines the video-tapes, it is clear that warmth is shown in the behavioral and facial expressions of the mother. The RCS does not code this. One should not, therefore, assume that the low scores on this factor mean that relationships were cold, but rather that the RCS was not designed to capture the non-verbal transaction. What is probably required is a modification of the system or of one of the other systems to fully catch the warm behavior of a parent which is non-verbal. This is especially critical in the infant period. Nevertheless, when we look at Hypotheses 4 and 6, even with the confinement to the verbal warmth of the mother, it is interesting to know that there is a relationship still present between this small amount of detectable

behavior and competence. The verbal requirements may contribute here to the lack of consistency across time on this factor.

Hypothesis 3

The third hypothesis was that there would be factors derivable from the mix of Social Ability, Bayley Mental Scale and Series scores. The Social Ability Scale was a measure of child performance from observation of behavior in a structured teaching situation at 52 weeks. The Bayley and Series scores were from testing situations. The four factors that emerged break generally into three Bayley factors and a Series factor. Only one item from the Social Ability Scale, Non-compliance, ended up on any of the factors. This was indeed a disappointment. Although we did not expect that the Social Ability Scale items would load across factors, we did hope that we would have a measure of social competence distinct from test competence. Why this did not occur we do not know. It may very well be that a scale such as the Social Ability Scale, developed for use in naturalistic observation of mother-baby interaction in the home over a period of time, just did not lend itself to the type of situation in which we used it, that is a structured teaching situation with a specific task. Social competence is an important concept. Further, the ability of the baby to elicit responses from the mother is an important element of this concept. The failure in this project to detect this as an outcome measure is of concern. By no means, however, should our inability to find in our data relationships of items to other items, or a factor labeled "social competence," be seen as rejecting the concept. The difficulties

lie more in the logistics and the measurement. We would certainly urge further attempts to measure social competence and to seek its roots in the analysis of family transactions in the first year of life. It should be noted that the RCS has an observational transaction, child elicits/mother responds. That transaction for boys, was related to Language competence (Table 35).

The factors that did emerge are understandable and have some internal logical consistency. Factor one has compliance primarily as its main theme. It is on this factor that Non-compliance from the Social Ability Scale loads negatively as we would expect. Factor two is performance on activities similar to those taught in the project. The items composing factor three clearly represent receptive and expressive language. The items on factor four seem to represent a response to instruction or encouragement.

Although the hypothesis was confirmed and as one would expect, factors emerged, the factors are predominantly in the perceptual motor domain related to intellectual performance. They do not include the personal-social domain except as compliance and receptivity to instruction can be seen as personal-social. Although we have used the term competence, it should be clear that we are still dealing with a narrow band of all that might be considered infant competence. These factors allow us to be a little more specific about that band, but do not encompass many aspects of infant behavior that can be labeled competence or that may be highly predictive of later competence behavior in the personal, social and affective domains.

Hypotheses 4 and 6

Rather than discussing these two hypotheses separately it seems to make sense to view them together, since they both deal with the relationships between observation and competence.

As indicated in the Results chapter, we analyzed the data in relation to these hypotheses in a variety of ways. For consistency, the discussion will follow that pattern of analysis within limits.

First, we analyzed the data by the relationship between items and the various competence factors (Tables 20-24, Figures 1 and 2). It is clear that, for the total population, Series is the best predicted competence dimension, and Mother-baby teaching transaction is the best single predictor. Receptiveness is next, and is best predicted by affective items and factors. Individual items also had consistent predictive power, such as item four (Escalona - brief mutual gazing), 9, 11, and 14 from the Home Scale and 25, 27 and 29 from the RCS.

The Escalona Scale items show their predictive power primarily up through age 31 weeks (Figure 1). We developed Figure 1 because we felt there might be a tendency for the factors to hide the relationships of some of the items which do not load on factors, and particularly to conceal the relationships that the Escalona Scale alone has with competence. The fact that Escalona items, when examined this way, show early and not late relations, may be because some of the items measured on the scale, such as mutual gazing, are more likely to occur early. That type of activity is precluded when the

focus later in the year shifts more to manipulation of objects. Later in the year, both mother and baby are dealing with each other through an object rather than dealing directly. It is this kind of consideration that makes items an important way to look at the data, especially for the Escalona Scale. Moreover, the age analysis is especially valuable because items such as mutual gazing do not show up when mother-baby behavior is summed across ages. The significance present on an item early is lost in the lack of significance later due to the shift in focus.

It is also evident that affect, whether measured by individual items or by factors, plays a significant role in competence. It may be because one cannot really separate affect and intellect in the baby. Even the labels given to so-called intellectual factors show this. Compliance and Responsiveness are affect laden terms. Further, Language (for the boys) and Responsiveness are the factors which seem to relate more to affect. Indeed, Language is not readily predictable from any other observation behaviors in this study.

It is not surprising that the Series factor is best predicted from teaching items. It is evidence of the impact of the particular stimulation program which focused on both these dimensions. It is important to reiterate that the relationships are more pronounced for the girls.

One important sex difference may be that Compliance is so much more predictable for boys than girls. This is especially true for Escalona and Home Scale items.

Factors

When factors are analyzed (Tables 25-28 and Figure 3), it is clear that Performance orientation is reliable at only one time (37 weeks) and just for boys. Mother-baby affectional transaction is significant only twice, once for the boys at 31 weeks and once for the total at 49 weeks. Maternal push is primarily vital for the boys, being reliably related to competence at 19, 25, 31 and 43 weeks. It is reliable for the total group at 19 and 43 weeks, and for the girls only at 43 weeks. In contrast, Baby-mother teaching transactions in addition to being significant for both, (25, 31, 37 and 49 weeks) is predominantly a contributor to girls' competence at 31, 37, 43 and 49 weeks. Non-specific social transactions are significant early for the boys (13 weeks and 31 weeks), later for the girls (25, 43 and 49 weeks) and only at 25 weeks for the total group.

It may be concluded that teaching transaction not only is the most consistent predictor for both sexes, but is especially powerful for the girls. The more personal-social-affective factors seem to be more influenced by time-sex interactions. Maternal push, which includes mother task-oriented technique, seems more predictive for boys early, and evenly for all groups late. Non-specific social transaction shifts from boys early, to girls late. Demand for performance tends to have a negative effect on the boys, except on Series, and positive affect has a positive effect. For the girls, positive affect is a mixed blessing.

When we examine the picture from the perspective of the competence factors (Tables 27 and 31), the relationships between observed behavior and Language are primarily present for the boys. The factors which relate to Language are Maternal push and Baby-mother affectional transaction. Even when there is a relationship for the total groups it is these affective observation patterns which demonstrate the relationship. We normally assume from the literature the relationship between language development and maternal activity and maternal vocalization for girls. This is not present in our data.

Further, it seems clear that whatever is being measured by the competence factor one, Compliance, is virtually independent of the observation factors. There are 105 possible correlations -- only three are reliable. Five would be expected by chance. The three are scattered. But, we noted earlier the relationship between items and this factor for boys. While there are only four relationships for Language, their placement indicates the possibility that these are not purely chance. Three of the four are for boys, all are in the affective domain. Two of the four are at 31 weeks of age, which we have indicated as an important time for the boys.

Generally, when viewed observation factor by observation factor and competence factor by competence factor, by sex and by age, the competence factors which are best predicted are Series and Responsiveness; those least predicted are Language and Compliance. The observation factors which best predict are Mother-baby teaching transaction and Maternal push. The observation factor least related

to competence is Performance orientation although the Home Scale items which load on that factor possess predictive power on their own. In addition, the Escalona Scale items which are somewhat diffused across factors demonstrate predictive power, especially early. The relationship of Non-specific social transaction to the Series at 25 weeks may be another indicator of the early role of the Escalona measures. The factor consists of six items, two of which are Escalona Non-specific social input and output.

Multiple Regression

An analysis of the multiple regression tables (29-33) reinforces what has been said above. However, it is interesting to note that Baby-mother affectional transaction, which independently shows little relationship and which, as we have indicated, is probably underestimated because of the way we observed it, nevertheless, contributes to the multiple regression for competence factor two, Series, at all ages except 37 weeks. It is the major factor in the relationship between observation and Language for the total group at 49 weeks, and for the boys at 31 weeks. It is also present in the equation predicting the Responsiveness for the girls at 43 and 49 weeks and for the total group at 49 weeks. Note that it contributes negatively to girls at these two times but positively to the total group. Although quantitatively the amount observed was small, qualitatively a little bit goes a long way.

We noted in the Results chapter that generally there were no differences in the frequencies of behavior by sex. Where there was a possible difference, although the standard deviations are large, it

was on the amount of RCS affective transaction. What we may infer is that it is not that mothers do different things with daughters than mothers do with sons, but that whatever they do has different meanings for sons and daughters. For example, if it is true that the mothers do engage in more RCS affective relationship with daughters than with sons, we still have the phenomenon that scores on those items and on that factor are more predictable for boys to competence than for girls. Further, there is a negative relationship for the girls between this affective behavior and competence, which doesn't seem to be present for the boys. Conceptually, then, what is of importance is not the amount, but how that amount is imbedded in the total self of the child and the meaning the behavior takes on in the child's performance. This has important implications for both child-rearing and education, where we tend to focus on frequency and ignore both sex-differences and meaning. The good parent or good teacher is not necessarily one who has learned to emit a certain rate of behavior but who matches the various rates to the child. We cannot from this study say what it is a mother should do, but it is clear that the relationships are by no means simple and by no means simply a matter of the frequency of occurrence.

Performance orientation, which by itself is virtually a non-predictor except for boys at 49 weeks, enters into the multiple regression equations for Compliance for the boys at 31 weeks, Series for the total group at 25, 31 and 49 weeks and for the boys at 37, 43 and 49 weeks. It also enters the equation for Language for the boys at 31 weeks and Persistence for the girls at 43 and 49 weeks. While

its contribution is small and clearly not independent, it contributes to the prediction of competence for each sex and the total group in relation to several of the competence factors.

The lack of relationships between Performance orientation and the competence measures may also be a function of the project design. The tapes we analyzed were from the ISIS project which had these activities as central subject matter. It may be that, in naturalistic, non-teaching-structured situations, such as those in which the Home Scale had been originally used, more differences exist. The laboratory may not match the real world on this dimension.

The above discussion relates to results by age. What emerges are several interesting patterns--all of which need replication. First, age is a significant factor in the relationships of observed behavior and infant competence at age one. Related to this, some forms of observation seem to be better able to capture the significance at different ages than others. The Escalona Scale, for example, when used as we used it, seems most effective up through 31 weeks of age, whereas the Reciprocal Category System seems most effective from 25 weeks up through 49 weeks of age. The factors derived from the items on the Escalona and Home Scales also seem more effective up through 31 weeks of age, than those derived from the Reciprocal Category System after that time. As tables 35 and 37 indicate, grouping the data over time hides a number of the significant relationships discussed above. For example, those items which appear on the Home Scale which we have labeled maternal-child (13-20) or which are loaded on the Maternal push factor reveal a number of relationships especially early and especially for boys. Table 37

indicates that when all the data of Maternal push across ages are pooled, this observation factor is negatively related to Series performance, but only for the total group. Table 35 indicates only item 16 survives as a single item and this one, again, is negatively related to Series performance. Most of the Escalona items completely wash out when they are pooled; only three items, one, three and seven survive. When examined by age, the importance of the Escalona items between 13 and 31 weeks is clear. Examination of the observed behavior factors pooled across age (Tables 37 and 38) indicates that only two competence measures are predictable from observation for the total population. It is the Reciprocal Category System which provides the independent predictable factors, for example, Baby-mother affectional transaction to factor four, Mother-baby teaching transaction to factor two, although Maternal push is also significantly related to competence factor two. For the total group as well as by sex, the Language factor is not predictable from pooled data, but as indicated in the item by age analysis, the factor by age analysis and the multiple regression analysis by age, the Language factor is predictable. The time period of 31 weeks of age seems potent particularly for the boys.

Second, sex is a significant factor. The original parent education projects, of which the ISIS was the last in the series, also revealed differences by sex that may reflect the same phenomenon as that found in our data. That is, teaching behavior of the mothers seemed more influential in predicting performance of girls, whereas the affective relationship seemed more predictive for boys.

Lally's (1968) dissertation showed that the effects of the original parent education program as measured by the Griffiths Scale at age one were more pronounced for girls than for boys. Herman's (1970) and Etheridge's (1971) studies showed that maternal self-concept and locus of control and attitudes toward the project were more influential within the experimental group in predicting boys' performance on Bayley's scales at age two than girls'. The data here tend to add to that in an even more powerful way. None of the above studies analyzed the process of transaction by sex. Here, there are many clues that the teaching transaction, whether viewed in an item fashion or a factor fashion, is more predictive of competence performance for the girls than for the boys. While we did not measure parental attitude in this project, the measure of actual transaction over time clearly suggests the importance of the affective relationship as measured in the Escalona, the Home Scale, and in the RCS affectional transaction area for the boys more than the girls. Because of this, the Escalona and the Home Scales, and to a lesser extent, that portion of the RCS which measures affect, seem to be more useful for the analysis of mother-son behavior whereas the RCS teaching transaction factor seems to be a more potent observation procedure for analysis of mother-daughter interaction. However, it must be noted that Mother-baby teaching transaction was predictive when sexes were combined, so that it is important for the boys. It is a matter of relative not absolute importance. Obviously, further research to examine this conceptualization of teaching for girls, affect for boys, needs to be done. We need a better measure of nonverbal affective transaction which was missing from this study.

Hypothesis 5

Hypothesis 5 related to the sex differences in the pattern of mother-baby transaction. We have indicated above the variety of sex differences present when we examine the relationships between mother-baby transaction and competence. Here, we are simply looking at the pattern of observed behavior by itself. As in the case of hypothesis 6, this hypothesis was sustained. There are differences in the pattern of relationships of mothers to their boy babies compared to other mothers to their girl babies. All sex differences need to be understood as reflective of the fact that these are different mother-baby dyads. That is, we did not examine a mother relating to her boy baby between three and 12 months of age and the same mother relating to her girl baby between three and 12 months of age. We, therefore, have no way of handling what may be not sex-related behavior on the part of these mothers. By some odd chance, and we think it would be an odd chance, there may be something very distinctly different about the 31 mothers with girls compared to the 22 mothers with boys. A more careful study, but one with almost impossible logistical demands, would be to conduct a short-term longitudinal investigation of the same mothers and their behavior toward two different children in the same family. However, since we all subscribe to the notion that no two children are alike, we would still be faced with the problem of the effects that the child was having on the parent, which also may be non-sex related. Given the real world, we are assuming here that the

differences we find are real but need replication. First, except perhaps for RCS affect and the object permanence item on the Home Scale, there are no differences in the frequency of behavior on an item or observation factor by sex. As indicated earlier, the differences are not in this realm, but in the relationships.

Tables 10 and 13 presented the relationships within a factor over time. Table 40 indicated the relationships among factors across time. They show that Performance orientation is a more predictive factor for boys. Mother-baby teaching transaction and Maternal push is more predictive for girls.

When we place those findings from hypothesis 5 together with the relationships between observation factors and competence discussed above (Hypothesis 6) we see that Mother-baby teaching transaction is not only a more stable element within the observations for the girls, but also more predictive of competence for them than it is for the boys. Conversely, Performance orientation is not only a more stable element within observations for the boys, but also more predictive of competence for them than it is for the girls. Performance orientation (Table 4) includes items that cut across the Home Scale items of intellectual activities, maternal techniques and child behaviors and includes, with negative loading, Non-specific social output from the Escalona Scale. Home Scale items and the Escalona items, when analyzed by scale seem to be more important for the boys than for the girls. This pattern on Performance orientation is another way of indicating this relationship. Personal-social affective transactions seem to be more

central in the mother-baby relationship and predictive of competence for boys.

The central thrust of teaching transaction for the girls is present not only in the internal consistency patterns of this factor to itself across ages but also in the patterns of relationship between this factor and other factors, both within the same observation and across observations (Tables 26, 28, 41 and 43). Teaching transactions are central in the mother-baby relationship and predictive of competence for the girls.

Summary

The results confirm most of our hypotheses. Competence, as measured by Bayley Mental Scale and Series performance can be dimensionalized into empirically and logically understood factors. These factors, in turn, are systematically predictable from the observation of maternal-baby transactions in a structured setting over time, from ages 13 to 49 weeks. In addition to relationships for the total population, there are significant differences in the meaning to boys and girls of the transactions which take place in a teaching situation between them and their mothers. The division of competence into four measures showed that behaviors at different ages related in differential fashion for boys and girls to different measures of competence. Further, overall, the more neutral teaching behaviors seem more influential and central in both the transactions between mother and baby and in their predictions of competence for the girls while the more personal-social items reflected from the Escalona and Home

Scales, as well as from the RCS affective domain, seem more influential for the boys. Language development for boys was more predictable than for girls and the prediction came from the affective domain. Boys' Compliance was also more influenced by maternal behavior.

There are common elements. Performance on the Series, that is on those activities similar to the ones taught, was the most easily predictable from observation. Language and Compliance activities were least predictable. This may be because measures of both receptive and expressive language at age one are fairly early in the game. Although girls' scores on Language exceeded the boys, prediction from observation to Language occurred only for the boys.

The power of using several systems for the analysis of the same observation data has been reconfirmed in this project. None of the three scales, or indeed even the three combined, do justice to the richness of the transaction. The combination of the three, however, led to the results and discussion of the relative importance of affect and teaching for boys and girls. The use of a longitudinal approach, in which each age was examined in relation to both competence at 52 weeks and performance at other ages, seems to be a very powerful tool in pointing out the flow of patterns which would be lost if one simply summed observations over time. There are indications that particular time periods may be more critical as they influence competence. This seems to be a function of sex. If a single time period were to be selected; 31 weeks of

age seems to be most potent for the boys. There is no comparable single age for the girls. Overall, what transpired and was recorded at 25 weeks for boys and girls combined seems to be the single most effective age. It is also clear that early transactions effect competence as measured here. Almost half the significant relationships between items and competence occurred by 25 weeks for the boys; another quarter were at 31 weeks. Over half of those of the girls occur by 25 weeks. The pattern for girls is more even and lower than the pattern for boys.

Generally, the project demonstrated that the use of observation systems developed originally for naturalistic observation in the home is functional for the analysis of video-tapes of structured teaching situations. Further, the mix of theoretical orientations contributes to the richness of our understanding of the meaning of the social transactions between babies and mothers.

From our experience, we believe that analysis by item and by factor increases our understanding of the results since some items singly seem to have persistent predictive power. This power is masked in the factor structure. We would suggest, therefore, that observation of mother-baby transactions in the first year of life at least should be approached from a multiple system viewpoint. The data should be analyzed by sex as well as by age. It should also be analyzed by those items from the various systems which have either important conceptual meaning or a sufficient frequency to enter into a correlational analysis.

The attempt to broaden the definition of competence beyond test scores was not as successful. We still need better ways of analyzing social competence at age one through the use of observation and analysis of video-tapes of structured situations.

Although the Reciprocal Category System proved an effective measure, the verbal requirement on the adult phase of the transaction limited it. We need measures of positive affect which are communicated to a baby through a variety of non-verbal means such as smiles and touches.

Several lines of further research are indicated. We need work on instrumentation for the measurement of social competence and the development of non-verbal affective views of transactions. Conceptually, the sex difference pattern not only needs to be replicated empirically, but also we need a study of the father-baby transactions. We might hypothesize that for father-baby transactions, the affective domain would be more critical for the girls and the neutral teaching domain for the boys, the obverse of the picture presented in our data.

The project has demonstrated that within a social class there are variances in maternal-baby behavior which influence performance on measures such as the Bayley and Series. The social roots of competence clearly begin in this first year of life. The role of those first few months (13 through 31 weeks) highlights the importance of working early with parents in helping them understand their roles and the ways in which their behavior influence test performance early on..

When parent education for infant stimulation began in the recent past (if we ignore Froebel, Pestalozzi and the pre-scientific efforts), the focus was on the activity presented to the child. It seems clear from these results that while the activities per se play a role in performance, beyond them the important elements are in the social transaction. This would suggest that further efforts at parent education or the training of infant day care workers move from solely a curriculum orientation to including a transactional orientation stressing the nature of the relationship whether it be teaching or social-personal. These relationships seem to be ones that affect the pay-off. Along with action programs, a program of research is still needed to uncover more of the transactions which influence baby competence. Longitudinal designs are also essential to examine the long-range effects of early transactions. As Bronfenbrenner quoted his professor, Walter Fenno Dearborn of Harvard: ."Bronfenbrenner, if you want to understand something, try to change it." (Bronfenbrenner, 1974).

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