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ABSTRACT

In order to specify the factor structure and stability of infant and maternal behavior, mother/infant interaction was observed when infants were 12 and 24 months of age. Mothers and infants observed in dyadic interaction in a playroom during a 15-minute free play period represented a heterogeneous sample across gender, socioeconomic status, and birth order. Interactions were recorded on checklists which contained 18 infant and 16 maternal behaviors. The observed behaviors are listed in the text. Two factor analyses were performed at each age level: one for the infants' behavior and one for the mothers' behavior. Subsequently, an oblique factor rotation with a delta value of zero was employed to determine unique dimensions of social behaviors while allowing for the identification of overlap between dimensions. Rotated factor solutions were examined and factors were identified using criterion levels of eigenvalues, loadings, and communality. After a specified number of factors had been determined to be most psychometrically and theoretically useful, the factor analyses were conducted a second time. Results are discussed. (Author/RH)

A Factor-Analytic Study of Mother-Infant Interaction at Ages Twelve and Twenty-four Months

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In studying mother-infant interaction there are several questions, not the least important of which is how to characterize the nature of the interaction itself. Is the interaction made up of a set of different interactions dependent on situation or function or is it made up of a single set which transcends particular contextual constraints? Should one attempt to characterize interactions from single measures such as eye regard or smiling or should one attempt to capture the complex set of behaviors exhibited? By looking at single behaviors we lose the richness and complexity of interaction. However, the use of scales which often captures such complexity has the difficulty of poor inter-observer reliability. One possible solution is the study of the factor structure of the behaviors which make up the interaction. By using many different single measures and combining them into a complex pattern we may be able to obtain high reliability of measurement while not sacrificing the complexity issue.

In the present study we observed mothers and infants in a free play situation where a large set of behaviors were observed. The purpose of this report is to present the factor structure of infant and maternal behavior at ages 12 and 24 months. Moreover, we are concerned with the stability of these factors across age.

Our sample consisted of mother-infant dyads who were observed at ages 12 months (N = 167) and 24 months (N = 156). In the sample there were approximately even numbers of males and females (at 1 year 83 males and 84 females; ~~at~~ 2 years 74 males and 82 females). These subjects were distributed equally between the first four levels of the Hollingshead SES Scale. Birth order was distributed equally across the first, second, third, and fourth-plus borns. Thus, these mothers and infants represent a heterogeneous sample across gender, SES, and birth order.

At ages 12 and 24 months the mother-infant dyads were observed in a playroom situation. The dyads were left alone in a 10 x 12 foot playroom marked with carpet squares and contained 13 toys, a chair, table and magazine. The observer explained that although both mother and infant were being videotaped through a one-way mirror, the major focus of the observation was on the child's behavior. The observation consisted of a 15-minute free play period in an unstructured situation, a brief period of departure when the mother left the playroom, a maximum of 3-minutes separation period when the mother was out of the room, and a 5-minute reunion period during which the mother re-entered the playroom and free play was resumed. Only the 15 minutes of free play will be discussed. Interactions were recorded on checklists which contained 18 different infant and 18 different maternal behaviors. Infant behaviors included vocalizing, looking, smiling, touching, crying, seeking approval, seeking help, gesturing, seeking proximity, toy play, moving toward door, sitting on mother's lap, hugging or holding mother, holding a toy, exploring a toy, sharing a toy, being in the same square as mother, and being in an adjacent square. Maternal behaviors included vocalizing, looking, smiling,

touching, kissing, holding the child, giving directions, reading, seeking proximity, toy play, showing approval, demonstrating the toy, giving the toy, accepting the toy, removing the toy, manipulating the toy, being in the same square as infant, and being in an adjacent square. The inter-rater reliabilities for these behaviors ranged from .76 to .91 with an average of .86.

Two factor analyses were performed at each age: one for the infant behaviors and one for the maternal behaviors. Factor analyses were based on zero-order correlation coefficients for each pair of variables. The correlation matrices for the frequency of mother and child social behaviors were subjected to an oblique factor rotation with a delta value of zero. An oblique rotation was employed so that we could determine unique dimensions of social behaviors while allowing for the identification of overlap between dimensions. Initially, no specified number of factors was imposed on the data. The rotated factor solutions were examined and then factors were identified using the following criteria: (1) factors must have eigenvalues greater than 1.0; (2) factors must have behaviors with loadings of .30 or more; and (3) behaviors must have a communality of .25 or higher. Based on these criteria, factors were determined for each set of mother and child social behaviors at each age level. The factor analyses were then conducted a second time, imposing a specified number of factors that had been determined as most psychometrically and theoretically useful.

Page one of the handout summarizes the factors generated for each set of mother and child social behaviors at each age level. Also presented are the items associated with each factor and the percent of variance explained by the particular factor analysis.

Results

Infant factors

At age 12 months, the infant playroom behaviors yielded three factor patterns which accounted for 35% of the total variance. These factors were labeled Comfort Seeking, Social Play, and Solitary Play-Exploration. Comfort seeking characterized an infant who cried, sought proximity to the mother, and did not engage in toy play. Social play was made up of toy play activity with the mother while solitary play-exploration was characterized by infants playing by themselves without communicating to the mother. These factors represent three fairly distinct dimensions of infant social behavior at 12 months in a free play situation. Examination of the correlation matrix of the three factors revealed minimal relationships between these factors.

The same behaviors employed at 12 months were used in the observation and analysis of the 2-year-old children. The factor analysis generated four factors that accounted for 45% of the total variance. Similar to the 12-month analysis Comfort Seeking, Social Play, and Solitary Play-Exploration were found to be characteristic of children's behavior at 24 months. Comfort seeking, once again, contained high positive loadings for crying, seeking proximity, and touching. Social play described ongoing play behavior and solitary play-exploration characterized infants playing by themselves. In addition, a fourth factor pattern labeled Proximal Contact emerged as a general category of child behavior. Proximal contact consisted of children in close contact with their mother; that is, the factor structure contained high positive loadings for touch, lap, same square, and seek proximity.

The intercorrelations between factors at 24 months revealed that solitary play was somewhat negatively related to the other three factors--comfort seeking (-.32), proximal contact (-.22), and social play (-.10)--while comfort seeking and proximal contact tended to be positively related (.31).

Maternal factors

Maternal behaviors at 12 months in the playroom situation yielded four factor patterns which accounted for 58% of the variance. They were Active Toy Play, Distal Contact, Proximal Contact, and Directive Toy Playing. Active toy play describes a mother engaged in toy play behaviors with her child, such as giving the toy, accepting the toy, and removing the toy. Distal contact characterizes a mother who displays affective behavior towards her child from a distance, while proximal contact characterizes a mother in close contact to her infant. Directive play (factor 4) was characterized by playing, like factor 1 (active toy play); however, it was particularly characterized by maternal instruction and direction rather than a give-and-take toy exploration between mother and child.

As would be expected, active toy play and directive toy play were positively related to each other (.45). However, active play was positively related to proximal contact (.15) while directive play was negatively related to proximal contact (-.17) but positively related to distal contact. This finding suggests that directive toy play is employed by the mother when the child is at a distance, i.e., when she tells the child how to play rather than playing with the child. As might be expected, distal and proximal contact were negatively related (-.10).

The 24-month analysis of maternal social behavior resulted in four factors which accounted for 48% of the total variance. Four similar factors emerged as in the 12-month analysis: Directive Toy Play, Distal Contact, Active Toy Play and Proximal Contact. Whereas active toy play emerged as the first factor at 12 months, it was the third factor at 24 months with directive toy play now emerging as the first factor accounting for most of the variance. The shift suggests that mothers are more characterized by directive teaching styles at 24 months as compared to 12 months.

The intercorrelations between the maternal factors at 24 months suggest that the four factors are more independent of each other than at 12 months. However, as at 12 months, active toy play and directive toy play were positively related (.15).

Factor consistency across two years

Of particular interest was the consistency of infant and maternal factors over year one to two. Factor scores were generated for each infant and the infant's consistency across age was observed. The relationships of infant factor scores at age 12 and age 24 months are presented in Table 2a, page 2 of your handout.

Infant Consistency. Infants who sought comfort seeking at 12 months also showed comfort seeking behavior at 24 months. In addition, infants who sought comfort seeking at 12 months showed high proximal seeking and low solitary play at 24 months. Social play with the mother at 1 year was negatively related to comfort seeking at 2 years suggesting that infants who engaged early in social play did not require comforting at 24 months. Social play also showed some consistency over years one and two. No other relationships were observed. In summary, the infant's need for seeking comfort appears

to be the most consistent over this time period

Maternal Consistency. Maternal behavior factor scores (see Table 2b) showed somewhat more relationships over this time period. While 30% of the infant relationships were significant over the two-year time period (with two of them being negative), 38% of the maternal correlations were significant (all positive). Mothers who engaged in active toy play at one year also engaged in active toy play and directive toy play at two years. Moreover, mothers who engaged in directive toy play at one year were mothers who engaged in active toy and directive play at two years. Thus, mothers who engage their infants in toy play at one year tend to do so at two years. The nature of the toy play, whether directive or engaging, does not appear to be differentiated over time.

Of interest is one other maternal behavior factor, distal contact. This factor score represents mothers who appear to sit and watch their infants at play rather than play with them. This factor also contains positive affective behavior so that rather than being not interested, these mothers appear to be interested but more likely to watch their children play than to play with them. The highest correlation across the two ages is in this factor indicating that mothers of 1-year-olds who use this style are most likely to use it when the child is 2-years-old. This across-age consistency suggests that environmental consistency in the form of maternal behavior exists when the situation is held constant. Mothers who play continue to play, mothers who watch continue to watch.

This environmental consistency is paralleled in the consistency of the infant factors. The causal relationship is unclear. The infant's consistency may be a function of the environment (that is, the mother) acting consistently

or the environment's consistency (that is, the mother's consistency) may be a function of the child's consistency. Whatever the causal relationship, it is clear that in the same free play situation infants and mothers show consistent behavior across the first two years of life. The relationships of these behaviors to other social and cognitive factors are still being explored.

We view the generation of these factors to be related to the situation in which they were observed and to the class of behaviors chosen for study. Clearly a situation such as free play is designed to elicit play and teaching interactions whereas a situation such as bath or meal time would be likely to elicit other behaviors and factors. Thus, these factors cannot be considered to be inclusive of all the possible mother-infant interactions. However, limiting the observation to a free play situation, these factors appear to capture the major dimensions of the interactions which took place. As such, the factors as opposed to the behaviors themselves appear to have strong face validity.

Table 1

Summary of Factor Composites

Factor Name	Main Variables
12 Month - Infant	
1. Comfort Seeking	Touch, Cry, Seek Proximity, Lap, Toy(-)
2. Social Play	Vocalize, Hold Toy, Share Toy, Look
3. Solitary Play	Toy, Explore Toy, Vocalize(-), Gesture(-)
	Total Variance = 35%
24 Month - Infant	
1. Comfort Seeking	Cry, Seek Proximity, Touch, Move/Door
2. Social Play	Play/Person, Share Toy, Touch
3. Proximal Contact	Same Square, Touch, Lap, Seek Proximity
4. Solitary Play	Toy, Hold Toy, Explore Toy
	Total Variance = 45%
12 Month - Mother	
1. Active Toy Play	Toy, Accept Toy, Give Toy, Remove Toy
2. Distal Contact	Look, Smile, Read(-), Vocalize
3. Proximal Contact	Touch, Kiss, Hold, Same Square
4. Directive Play	Vocalize, Toy, Give Directions, Show Approval
	Total Variance = 58%
24 Month - Mother	
1. Directive Play	Vocalize, Give Directions, Toy, Demonstrate To
2. Distal Contact	Look, Smile, Vocalize, Show Approval
3. Active Toy Play	Toy, Manipulate Toy, Vocalize
4. Proximal Contact	Touch, Hold, Same Square
	Total Variance = 48%

Table 2a

Longitudinal Relationships Between Infant Factors

12 to 24 Months

	Comfort Seeking	Social play	Proximal	Solitary Play
Comfort Seeking	.16 *	.01	.23 **	-.28**
Social Play	-.19 *	.15	-.02	-.05
Solitary play	.09	.00	.07	-.05

Table 2b

Longitudinal Relationships Between Maternal Factors

12 to 24 Months

	Directive Play	Distal Contact	Active play	Proximal
Active play	.21 **	.04	.24 **	-.05
Distal contact	.17 *	.40 **	.09	-.14
Proximal Contact	.06	-.12	.06	.09
Directive Play	.18 *	.12	.32 **	.03

** $p < .01$

* $p < .05$