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A STUDY ON RELATION OF QUALITY OF INTERACTION TO ATTACHMENT CLASSIFICATIONS

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The synchronous interaction of 4-moth mother-infant dyads under natural environment were examined and associated to 12-month attachment classifications. It was found that those dyada that displayed more synchronous interaction at 4 months tended to become B2 and B3 dyads at 12 months whereas those dyads that displayed less synchronous interaction at 4 months tended to become C dyads at 12 months. In addition, C infants cried significantly more than B2 and B3 infants. A significant association was also found between the dyad's synchronous interaction and attachment classifications during the infant's fuss/cry state but not the non fuss/cry state.

INTRODUCTION

Ever since Ainsworth et al, who based on their Baltimore Study have claimed that secure patterns of infant-mother attachment displayed in the Strange Situation were the result of the sensitivity and responsiveness of the mother towards the infant in the preceding months, many investigators have long been searching for the antecedents that are responsible for the different attachment classifications from daily mother-infant interaction. Up till now, studies that have used Ainsworth et al.'s rating scales seem to provide a consistent empirical support that sensitive mothering leads to secure attachment (Grossmann et al., 1985; Egeland et al., 1984). However, the use of rating scale to measure maternal sensitivity was also a shortcoming in these studies. Although rating scales have the advantage of obtaining global information about mother-infant interaction, they cannot specify the kind of behavior that contribute to attachment relationship (Lamb et al., 1985). The criteria for coding the mother and infant behavior is too ambiguous and with low replicability.

On the other hand, studies that have used behavioral measures seem to be less able to provide significant support for Ainsworth et al.'s hypothesis (Bates et al., 1982, 1985; Belsky et al., 1984a; 1984b). One of the most important reasons for their failure may be that the behavioral measures that were used could not capture the interactive aspects from daily interaction that were significant to attachment development. In these studies, the mother and infant behaviors were indenpendently measured and associated to attachment classifications without examining how the mother behavior and infant behaviors are related to each other simultaneously. A recent study by Isabella et al. (1989), who have found a significant relationship between attachment classifications and the dyad's previous synchronous interaction may suggest the interactive proc-

ess of the dyad as a major key to examine attachment relationship.

In Isabella et al.'s study, the concept of 'interactional synchrony' is proposed and defined as 'the extent to which interaction appeared to be reciprocal and mutually rewarding, so that its frequent occurrence would presumably foster development of the infant's working model of mother as available, responsive, and trustworthy'. Mother and infant behavior displayed under natural observation were analysed in terms of co-occurrence patterns within a 15 seccond interval to form a combination of mother and infant behavior. Each behavioral combination was then classified into one of the 3 categories: synchronous, asynchronous or neutral according to an *a priori* operational definition which is focused on the mother's contingent and appropriate response to the infant's cues. (See Appendix B for the different combinations of aynchronous and asynchronous interaction.) (Note: The meaning and measurement of 'synchrony' in Isabella et al.'s study are different from those of the commonly known concept of 'synchrony' proposed by Brazelton and other investigators.)

30 dyads (10 A, 10 B2 & B3, and 10 C) were selected from the 51 subjects of Belsky et al.'s Pennsylvania Infant and Family Project for analysis. By examining the 'synchrony' of the cooccurred behavioral patterns of mother and infant, Isabella et al. obtained a significant association between 'interactional synchrony' and attachment classifications at 1 and 3 months. It is reported that future B dyads tended to display more synchronous interaction and less asynchronous interaction during the first year than future A and C dyads.

Isabella et al.'s coding system seems to provide us a better method for examining the antecedents of attachment relationship. Since the results can be measured in terms of behavioral patterns rather than separate frequencies of the mother and infant categories, valuable information about the interactional processes of the dyad in relation to their attachment status can be obtained. In addition, the consistency of the results can also be assessed cross-situationally and across time.

Besides, their study is the one which claimed to have obtained significant associations between interactive variables and attachment classifications by using behavioral measures, and their findings are consistent with certain basic tenets of attachment theory. If the results of their study are proved to be reliable, associating first year mother-infant interactive variables with attachment status at a later period by using behavioral measures will be possible.

OBJECTIVE

1. In this study, the validity of Isabella et al.'s coding system in associating first year interactive variables with 12 month attachment classifications will be examined.

2. It is noted that in Isabella et al.'s coding system, the amount of infant fuss/cry may make the mother to behave more asynchronously (See Appendix B). Consequently it

is necessary to investigate the amount of infant fuss/cry among different attachment groups. The dyads's synchronous interaction will also be measured separately according to the infant's fuss/cry state and non fuss/cry state in order to minimize the effect of infant factor on the quality of interaction.

METHOD

Subjects :

14 subjects who have completed the 4 month home observation and the Strange Situation at 12 months were selected from the second cohort of the Hokkaido University Longitudinal Studies. 7 B-dyads were randomly selected from the 15 B2 and B3 subjects and all the 7 C-dyads subjects in the second cohort were analysed. All the dyads were predominantly from urban nuclear middle class families. Only B2 and B3, infants that are regarded as most securely attached, were selected so that our results can be compared with that of Isabella *et al.'s.*

Procedures

Each dyad was observed at home at 4 months and assessed by the Strange Situation procedure at 12 months.

Coding System

For each dyad, a period of 30 minutes interaction (120 15-second units) excluding feeding and diapering episodes videotsped during the 4 month home observation was coded. The interaction of each dyad was coded by using the behavioral categories from Issbella et al. (1989) as listed in Appendix A. As shown in Appendix A, there are 12 behavioral categories for the mother and 11 behavioral categories for the infant. The behavioral categories are arranged in an ascending order from the lowest to the highest interactional level. For example, for mother categories, no. 1 ' No behavior ' is the category which has the lowest interactional level with her infant and no. 12 ' Three-step interaction ' is the one with the highest interactional level. (cf. Ng, 1990, for operational definition of each category).

For each successsive 15-second interval, the mother and infant behaviors with the highest interactional level within the interval were coded. The interaction was expressed in terms of co-occurrence of mother and infant behavior within a 15-second interval. Each co-occurrence of infant and mother behavior was represented by a cross-classification of the 11 infant- and 12 mother-behavior-scale categories, that is, an 11 (infant behavior) $\times$12 (mother behavior) matrix in which each cell serves as an index of one particular combination of mother and infant behavior.

Fach cell of mother and infat behaviors occurred within the 15-second interval was defined as a member of one of the three measurement categories : synchronous, asynchronous and neutral. Those co-occurrences of maternal and infant behaviors assumed to represent reciprocal and mutually rewarding behavioral exchanges were defined as ' synchronous ' ; those believed to represent onesided, unresponsive, or intru-

sive behavioral exchanges were defined as 'asynchronous'; and those thought to reflect neither synchronous nor asynchronous exchanges were defined as neutral. (cf. Isabella et al., 1989 for details on the operational definition of synchronous, asynchronous and neutral interaction.)

Reliability

The interaction for each subject was coded by one coder. For reliability, the interaction of 5 infants, 10 minutes each, thus making a total of 200 15-second units, were randomly selected from the sample and was coded by another coder. The agreement between the two coders was 87% for mother categories and 82% for infant categories. The overall agreement for the synchrony of each 15-second interval was 92%.

Assessments at 12 month Ainsworth Strange Situation

At 12 months, the Ainsworth Strange Situation assessment was conducted following the procedures described in Ainsworth et al. (1978). For details, please refer to Miyake et al., 1983.

RESULTS

Association between interactional synchrony and attachent classifications

In this analysis, median test is used to test the association between the dyad's synchronous interaction and attachment classifications. Synchronous interaction was measured in terms of the proportion of synchronous interaction intervals for each dyad within the observation time. The median score was then used to separate the subjects into two groups, one above the median, the other below the median. Due to the small sample size, Fisher's Exact Probability was calculated.

Table 1 shows that there was a significant association between synchronous interaction and attachment classifications (Fisher's Exact Probrability=.0513). In other words, those dyads that displayed more synchronous interaction at 4 months tended to become B2 & B3 dyads at 12 months and those dyads that displayed less synchronous interaction at 4 months tended to become C dyads at 12 months.

TABLE 1

Median test

	Synchronous interaction		
	Above median	Below median	
B	6	1	7
C	2	5	7

Figher's Exact Probability= .0513

Figure 1 shows the distribution of the percentage of synchronous and asynchronous interaction (calculated as the percentage of synchronous or asynchronous behavioral combinations of the total observation units) for both B and C dyads. It is seen from the figure that the B and C dyads can be separated into 2 groups approximately with the group of B dyads high on the axis of synchronous interaction and low on the axis of asynchronous interaction whereas the group of C dyads are the opposite.

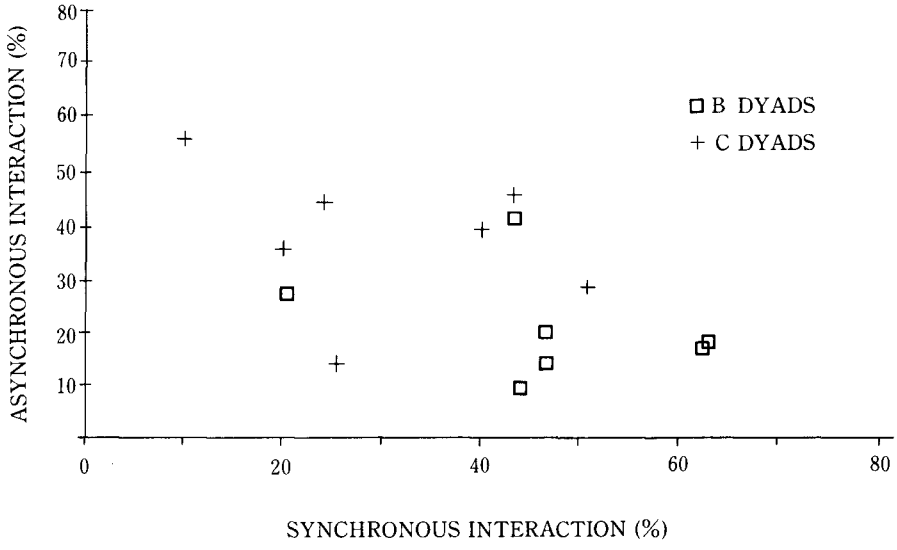

FIGURE 1 Distribution of B and C dyads on synchronous vs asynchronous interaction.

Infants' fuss/cry

The frequencies and the average duration of the category 'Infant fuss/cry' were examined. Since F test showed no significant difference between the variances of the B and C groups, t-test was conducted. T-test revealed a significant difference for frequencies ($t=1.81$ $P<.05$; one-tailed test) but not for average duration (Table 2).

TABLE 2

Means and SDs of fuss/cry frequencies and average duration

	B	C	t value	P
Frequencies	9.00(7.29)	21.96(15.94)	1.81*	< .05
Average duration (no. of units)	2.20(1.08)	3.60(1.91)	1.6	(n. s.)

Note: T-test is one-tailed test.

Association between synchronous interaction and attachment classifications during fuss/cry and non fuss/cry episodes :

During fuss/cry state ;

Each dyad was measured by the proportion of 15-sec synchronous interaction intervals divided by the frequencies of fuss/cry intervals during the fuss/cry and non-

TABLE 3

Median test

		Synchronous interaction		
		Above median	Below median	
fuss/cry state	B	6	1	7
	C	1	6	7

Fisher's Exact Probability= .015

fuss/cry states. Table 3 shows a significant association between synchronous interaction and attachment classifications (Fisher's Exact Probability= .015).

The association between synchronous interaction and attachment classifications is not significant (Fisher's Exact Probability= .14) (Table 4).

TABLE 4

Median test

		Synchronous interaction		
		Above median	Below median	
Non-fuss/cry state	B	5	2	7
	C	2	5	7

Fisher's Exact Probability= .14

DISCUSSION

The significant global association between 4 month interactive variables and 12 month attachment classifications obtained in our analysis suggests that the individual differences in Strange Situation behavior is related to the quality of prior mother-infant interaction. This result confirmed Isabella et al. (1989)'s findings. However, further analysis revealed that C infants cried more than B infants, indicating the effect of infant factor on interaction. To minimise this effect, the association between synchronous interaction and attachment classifications was examined separately during the infant's fuss/cry state and non-fuss/cry state. The result showed that B2 & B3 dyads was more synchronous than C dyads only when the infant was in a negative state. When the infant was not fussing or crying, B2 & B3 dyads and C dyads were not significantly different in their interactional synchrony. These may imply that C mothers were basically not different from B mothers in their responsiveness. They were not able to respond to their infants appropriately only when their infants were in a more demanding state. Consequently, it is suggested that mother and infant interaction during the infant's negative state is important to the development of attachment relationship. When the infant is most in need of its mother, her contingent and appropriate responses to its distress signals are most influential to the infant's perception about its mother's availability and responsiveness. The quality of such early stage interaction my be indicative of the quality of their attachment relationship that are classified by the Strange Situation within which the infant experiences separation distress.

As a conclusion, the result that attachment status is related to prior mother-infant interaction implies a possibility for associating first year interactive variables with 12 month attachment classifications by using specific behaviorally-based measures. In other words, measuring the way how the two partners behave concurrently enables us to look into the quality of their interaction in relation to attachment. Furthermore, that the quality of interaction during the infant's fuss/cry state is associated with attachment classifications also suggests future studies on attachment antecedents to emphasize on interaction during the infant's distress. The way maternal sensitivity interacts with the infant factor may be better depicted if it can be measured and compared under different states of the infant.

Shortcomings of the present study and propects for future research

While this study can be said to have proved the validity of Isabella *et al.*'s coding system in associating 'interactional synchrony' with attachment status, it should be noted that the sample size is small and only data of 4-month-olds are investigated. Therefore, more infants at differet age should be analysed in order to confirm these findings. It should also be noted that only B2 & B3 infants which are considered as the most securely attached were selected to compare with C infants. The validity of this coding system on the those of the A infants as well as B1 and B4 infants is still not known.

Obtaining a significant association between interactional synchrony and attachment status during the infant's fuss/cry state but not the non-fuss/cmy state does not mean that the quality of interaction when infant is not distrssed is unimportant. Further longitudinal studies are necessary to elucidate the complex intercorrelation among the qualities of interaction, different infant states and attachment classifications.

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APPENDIX A

List of Mother and Infant Behavior Categories

Mother	Infant
1. No behavior	1. Sleep/drowsy
2. Leisure activity	2. No behavior
3. Leisure and attend to infant	3. Explore
4. Attend to infant	4. Look at mother
5. Vocalize to infant	5. Vocalize
6. Stimulate/arouse	6. Vocalize and look at mother
7. Stimulate/arouse and vocalize to infant	7. En face interaction
8. En face interaction	8. Response/explore
9. Rcsponse to infant vocalization	9. Fuss/cry
10. Soothe	10. Three-step interaction
11. Response to vocalization and soothe	11. Response/explore and en face
12. Three-step interaction	

* From Isabella, Belsky and von Eye (1989).
Developmental Psychology, 1989, Vol. 25, No. 1, 12-21.

APPENDIX B

Specific Combinations of Mother and Infant Behavior Categories Representing Instances of Synchronous and Asynchronous Interaction

Synchronous co-occurrences	Asynchronous co-occurrences
infant explore, mother en face	infant sleep, mother vocalize
infant look at mother, mother three-step interaction	mother stimulatc/arouse
infant vocalize, mother response/vocalize	mother stimulate/arouse and vocalize
mother three-ster interaction	infant no behavior, mother vocalize
infant vocalize and look at mother, mother response/vocalize	mother stimulate/arouse
mother three-step interaction	mother stimulate/arouse and vocalize
infant en face, mother vocalize	infant explore, mother stimulate/arouse
mother stimulate/arouse	mother stimulate/arouse and vocalize
mother stimulate/arouse and vocalize	infant vocalize, mother no behavior
mother en face	mother leisure
mother response/vocalize	mother leisure and attend
mother soothe	mother attend
mother responseKxocalize and soothe	mother wocalize
mother three-step interaction	mother stimulate/arouse
infant response/explore, mother stimulate/arouse	mother stimulate/arouse and vocalize
mother stimulate/arouse and vocalize	infant vocalize and look, mother no behavior
mother en face	mother leisure
mother response/vocalize	mother leisure and attend
mother soothe	mother attend
mother response/vocalize and soothe	mother vocalize
mother three-step interaction	mother stimulate/arouse
infant fuss/cry, mother soothe	mother stimulate/arouse and vocalize
mother response/vocalize and soothe	mother no behavior
infont three-step interaction, mother en face	mother leisure
mother response/vocalize	mother leisure and attend
mother response/vocalize and soothe	mother attend
mother three-step interaction	infant fuss/cry, mother vocalize
infant response/explore and en face, mother response/vocalize	mother stimulate/arouse
mother soothe	mother stimulate/arouse and vocalize
mother response/vocalize and soothe	mother en face
mother three-step interaction	mother response/vocalize

(*Note*) The order of behaviors presented to represent each cell of the contingency table (i. e., infant behavioral category, then mother category) is a matter of style and is not suggestive of the sequencing of behaviors that occurred in interaction.

* From Isabella, Belaky and von Eye (1989). Developmental Psychology, 1989, Vol. 25, No. 1, 12-21.