



Title	INFANT'S TEMPERAMENTAL DISPOSITION, MOTHER'S MODE OF INTERACTION, QUALITY OF ATTACHMENT, AND INFANT'S RECEPTIVITY TO SOCIALIZATION : INTERIM PROGRESS REPORT
Author(s)	MIYAKE, Kazuo; CHEN, Shin-jen; UJIIE, Tatsuo; TAJIMA, Nobumoto; SATOH, Kimiharu; TAKAHASHI, Keiko
Citation	乳幼児発達臨床センター年報, 5, 25-49
Issue Date	1983-03
Doc URL	http://hdl.handle.net/2115/25200
Type	bulletin (article)
File Information	5_P25-49.pdf



[Instructions for use](#)

INFANT'S TEMPERAMENTAL DISPOSITION, MOTHER'S MODE OF INTERACTION, QUALITY OF ATTACHMENT, AND INFANT'S RECEPTIVITY TO SOCIALIZATION — INTERIM PROGRESS REPORT

Kazuo Miyake, Shin-jen Chen, Tatsuo Ujiie and Nobumoto Tajima

Hokkaido University

Kimiharu Satoh

Hokkaido University of Education, Iwamizawa

Keiko Takahashi

Kunitachi College of Music

This report will present the results of a longitudinal study of 29 first-born Japanese infants growing up in urban middle-class nuclear families. These infants who have been followed from birth through 23 months of age were observed in a standard Ainsworth strange situation when they were 12 months old. Nineteen infants were coded type B, 10 were coded type C and none were coded type A. Analysis of their behaviors in other situations reveals the following results : 1) During the newborn period significantly more C infants than Bs showed extreme crying to the removal of a nipple and home observations at 1 and 3 month periods revealed significantly more irritability among the Cs than among the Bs. 2) Observation of the infants' behavior to the entry of a stranger and temporary separation from their mothers in the situation at 7 months revealed more signs of behavior of fear on the part of the type C than the type B infants. 3) Analysis of 10 min. mother-infant interaction at 7 months revealed that mothers of C infants interrupted the child's play more often, perhaps because the infants were fearful and not playing well. 4) At both 16 and 20 months B infants exhibited a higher proportion of obedient responses to maternal commands than did C infants. 5) Finally at 23 months more C than B babies showed behavioral signs of fear to the approach of a stranger.

Key words : temperamental disposition, attachment, mother-infant interaction, irritability, obedience.

This research was supported by grants from a) The Toyota Foundation (Grants 803173 and 813083 : Principal investigator, Kazuo Miyake), b) The Ministry of Welfare (Research Project on mother-infant interaction : Principal investigator, Noboru Kobayashi), and C) The Japan Society for the Promotion of Science (US-Japan Educational and Cultural Cooperative Research : Principal investigator, Kazuo Miyake)

The authors would like to thank Dr. Annette M. Zehler, visiting scholar, for her invaluable suggestions.

Requests for reprints should be sent to Professor Miyake, Director, RCCCD, Faculty of Education, Hokkaido University, Sapporo, 060, Japan.

The objective of our research is to investigate possible relationships among the several variables of : infant's temperamental disposition, mother's mode of interaction, quality of mother-infant attachment developed, and later affective-behavioral development.

Specific experiences in interacting with the mother during the course of the first year of life are believed to create in the infant special affective and behavioral dispositions which are called the "attachment relation" (Ainsworth, Blehar, Waters and Wall, 1978 ; Bowlby, 1969, 1973, 1980).

A related assumption is that variation in the quality of attachment among one-year-olds may have a considerable influence on the process of the child's socialization (Arend, Gove and Sroufe, 1979 ; Waters, Wippman and Sroufe, 1979).

In addition, the pioneering work by Thomas, Chess and Birch on infant's temperament has led to much research interest in the effect on socialization of this variable as well (Thomas, Chess and Birch, 1968 ; Kagan, Kearsley and Zelazo, 1978). However, few studies on attachment have considered the infant's temperament. Therefore, we believe it necessary to explore temperamental differences among infants and to assess how these might influence maternal behavior, the formation of attachment, and the infant's receptivity to later socialization.

Based on these assumptions, our research investigates : (1) the relation of mother-infant interaction to the infant subsequent attachment to the mother ; (2) the relation between the infant's attachment and his/her receptivity to socialization in the second and third years of life ; (3) the relation between the infant's temperamental characteristic and his/her attachment to the mother, and (4) the relation between the infant's temperament and his/her receptivity to socialization.

Our research has been conducted in Japan where maternal behaviors differ considerably from those found in western countries. Available data imply that Japanese mothers encourage a degree of emotional dependence in their children in contrast to the emphasis on independence normally found in America (Caudill and Weinstein, 1969 ; Azuma, Kashiwagi and Hess, 1981). Secondly, a hypothesis has been proposed by Kagan and his collaborators which states that some infants are temperamentally disposed to be inhibited in times of uncertainty and distress (Kagan, Kearsley and Zelazo, 1978). Moreover, they presented evidence suggesting that children of Chinese descent are more inhibited in unfamiliar situations than are Caucasian children. Since this finding suggests cultural differences, the study of Japanese infants and their mothers should be particularly significant.

Our research developed out of an America-Japan collaborative seminar on social and affective development sponsored by the Social Science Research Council and the Japan Society for the Promotion of Science in 1979 (Kagan and Miyake, co-chairmen). As a result of this seminar, a longitudinal study was started in 1980 involving 26 newborns and their mothers, and has been conducted in close collaboration with Jerome Kagan and Joseph J. Campos.

The sample studied at our research center at Hokkaido University can be described as follows : (1) The infant is firstborn and born at term without serious pre-or perinatal complications ; (2) the mother is at least a high school graduate and not

employed full-time ; (3) the father is engaged in a white collar or professional vocation ; (4) the mother is between 22 and 30 years of age and the father is above 22 years of age, and (5) no other person is living in the home.

The following provides a brief summary of the research results reported in the succeeding sections.

Twenty-nine infants were observed in a standard Ainsworth strange situation when they were 12 months old. Of these infants 21 were followed from birth through 23 months and 8 were followed from 11 months.

On the basis of analysis of videotape recordings, 19 infants were coded type B (securely attached), 10 were coded type C (anxious/resistant) and none type A (anxious/avoidant). Analysis of their behaviors in other situations suggested that there is a strong temperamental variable that is stable and preserved from the newborn period through to 23 months of age and that tends to be associated with the type C infant : 1) Of the newborns, 5 out of 6 Cs versus 7 out of 11 Bs showed much crying in response to removal of a pacifier nipple. Thus, more Cs became upset.

2) Type-C's also appear to be consistently easily irritated when both reaction to interruption of sucking in the newborn period and observation at 1 and 3 months are considered : only 1 of the 12 B's cried often and was easily irritated, compared to 6 out of 7 C's.

3) At 7 months of age, when a stranger entered, 6 out of the 7 C's became fearful versus only 3 out of 8 B's. When the mother left, 6 out of 7 C's became fearful, compared to only 4 out of 8 B's. Regarding heart rate, if we consider fluctuation value, that is, the difference between each episode and baseline, then during the first 20 seconds of the stranger-enter-episode C's showed larger increases in heart rate than B's, 14 versus 7 beats ; i.e. C's showed more signs of being upset. During the first 20 seconds after the mother exited, C's became more anxious : they showed bigger increases in heart rate, 22 versus 6 for B's. At baseline C's showed a heart rate 9 beats higher than that of B's. These results suggest that there is a correspondence between being more fearful and showing a high heart rate at 7 months of age.

4) Ten-minute observations of mother-infant interaction in an unstructured lab situation were conducted at 7 months of age. Analysis of the videotape recordings revealed that mothers of C infants interrupted the child's play more often—perhaps because the children were fearful and not playing well. On the other hand when B and C infants were classified according to level of the fearfulness and frequency of mother's interruptions the results suggested that the mother's interruption apparently produced more fearful C infants than B infants.

5) At 11 months in a 10-minute free-play situation C's were much more likely to stop their play and run to the mother, indicating anxiety in the lab situation, and consequently the duration of play was shorter for C's (5 min. versus 1 min.).

6) At 16 months of age in two 5-minute play sessions the infant's compliance with maternal commands in a problem-solving situation was assessed. In addition, at 20 months infant response to maternal postponement of gratification was observed. At both 16 and 20 months B babies exhibited a higher proportion of obedient responses to maternal commands and maternal postponement of gratification than C babies.

7) Finally, though not reported fully in this report, at 23 months of age observations were made of the infant's reactions to a stranger and to a robot. Of the 10 B's, 4 showed signs of fear to the stranger and only one was inhibited to both. On the other hand, of the 10 C's, 7 showed signs of fear to the stranger and 3 were inhibited to both. Of the C's tested, 7 were female and 3 males, while there were only 4 B females. This may indicate a correlation among being a female, being a C and being fearful and inhibited.

Our data indicate that an infant's temperamental disposition to become irritable and fearful can make an important contribution to quality of attachment classifications. The data suggest that classifications of behavior in the strange situation does not seem to be totally independent of the infant's temperamental tendencies. However it is not yet possible to rule out the likelihood of an interaction between the infant's temperament and the mother's practices.

MEASUREMENT OF ATTACHMENT AT 12 MONTHS*

The purpose of using the orginal Ainsworth strange situation procedure (Ainsworth et al., 1978) in this study of Japanese infants was to examine attachment patterns in Japanese infants and, in addition, to examine the applicability and/or validity of the procedure for the Japanese culture. The strange situation procedure was designed to measure an infant's attachment to the mother among American middle class families ; in that culture "a mother does not hesitate to take her baby into unfamiliar environments, and she may leave her baby for a few minutes either alone or with a stranger" (Ainsworth et al., 1978, p. xiii). In contrast, Japanese mothers maintain closer contact with their infants. Thus we hypothesized that : (1) there would be more B-type infants among Japanese subjects than among U. S. middle class subjects ; (2) the number of C-type infants in our sample would be smaller than that of the U. S. sample ; and (3) we would have very few A-type infants, although in the U. S. usually about 20% of a middle class sample is classified as A-type.

METHOD

Subjects : The sample was composed of 29 12-month-old infants (range 11:17 - 13:11) of both sexes (12 boys and 17 girls) from middle class intact families residing in Sapro. Mothers were full-time and primary caretakers. According to interviews with the mothers, in the course of one month the infants were left alone or with another adult (father or grandmother) a mean of 2.5 times. All infants were attached most strongly to the mother.

Strangers : Two senior female unmarried students majoring in psychology alternately took the role of stranger.

Procedure : The orginal strange situation procedure (see table 1) was used in our

*Keiko Takahashi was responsible for the analysis and interpretation reported in this section. The author wishes to thank Dr. Giyoo Hatano for his comments on an earlier draft of this section.

Helpful suggestions regarding the Strange Situation Procedure from Dr. L. Alan Sroufe and Dr. Mary Main are gratefully acknowledged.

TABLE 1
Summary of episodes of the strange situation

Number of Episode	Persons Present	Duration	Brief Description of Action
1	Mother, baby, & observer	30 secs.	Observer introduces mother and baby to experimental room, then leaves.
2	Mother & baby	3 min.	Mother is nonparticipant while baby explores ; if necessary, play is stimulated after 2 minutes.
3	Stranger,mother, & baby	3 min.	Stranger enters. First minute : Stranger silent. Second minutes : Stranger converses with mother. Third minutes : Stranger approaches baby. After 3 minutes mother leaves unobtrusively.
4	Stranger & baby	3 min. or less ^a	First separation episode. Stranger's behavior is geared to that of baby.
5	Mother & baby	3 min. or more ^b	First reunion episode. Mother greets and/or comforts baby, then tries to settle him again in play. Mother then leaves, saying "bye-bye."
6	Baby alone	3 min. or less ^a	Second separation episode.
7	Stranger & baby	3 min. or less ^a	Continuation of second separation. Stranger enters and gears her behavior to that of baby.
8	Mother & baby	3 min.	Second reunion episode. Mother enters, greets baby, then picks him up. Meanwhile stranger leaves unobtrusively.

Note : ^aEpisode is curtailed if the baby is unduly distressed.

^bEpisode is prolonged if more time is required for the baby to become re-involved in play.(Ainsworth et al., 1978)

laboratory as shown in figure 1. Episodes 4, 6 and 7 were curtailed, if distress on separation lasted 2 minutes in maximum. As shown in table 2, it was necessary to shorten the separation time for one child in Episode 4, for 21 children in Episode 6, and for 15 in Episode 7, out of the total of 28 infants. Episode 6 (infant-alone situation) was skipped if the mother was reluctant to leave the room even after 3 extra minutes in Episode 5. Episode 6 was dropped for this reason for only one mother-infant pair, and was also dropped for one female infant who cried throughout Episode 6.

Prior to the experiment, the mother was given instructions about the procedure using a written scenario. The procedure was recorded by three VTR cameras. One trained observer made narrative records of the infant's behavior to the mother and to the stranger from an adjacent observation room.

RESULTS

The infants were classified into A, B, and C attachment categories, based on Ainsworth's original classification. The results of classification are shown in table 3.

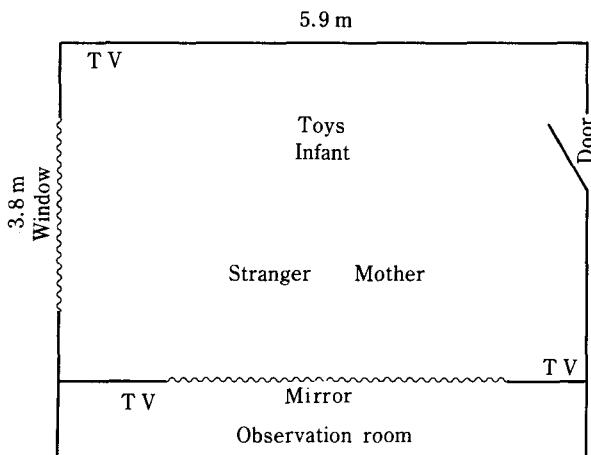


FIGURE 1 Sketch of the physical arrangements of the strange situation.

The following are descriptions of the three classifications used :

A-type, or anxious/avoidant, infants tend to explore without interaction in pre-separation episodes, they behave similarly toward the mother and the stranger, upon reunion they actively avert their gaze and avoid or ignore the mother.

B-type, or securely attached, infants explore actively in preseparation episodes, they actively greet and/or seek contact with the mother in reunion episodes and are able to return to exploration in the mother's presence.

C-type, or anxious/resistant, infants are often distressed by the unfamiliar room and the unfamiliar adult, even in the mother's presence. Their exploratory behavior is limited, and they are very distressed by separation. In reunion episodes their proximity and contact-seeking behavior is ineffective ; they are difficult to comfort and often show anger and active resistance to physical contact or interaction.

Contrary to our predictions, in our sample there were fewer infants classified as B-type, but more infants classified as C-type, compared to the Caucasian middle class sample in the U. S. (see table 3). However, as predicted, there were no A-type infants among our subjects.

TABLE 2

Number of infants whose separation time was curtailed

Episode	4	6	7
Male	0	9	7
Female	1	12	8
totals	1	21	15

TABLE 3

Distribution of infants among Sapporo sample

type	B	C	A	totals
Male	9	3	0	12
Female	10	7	0	17
totals	19	10	0	29

DISCUSSION

Why were there so many C-type infants? Does the Japanese culture with its emphasis on caretaking and on the mother-infant bond somehow cultivate an anxious/unstable attachment toward the mother? No conclusions can be formed yet; however, the following three points may be related to our findings.

1. Is the Ainsworth procedure culture-bound?

The original procedure seemed to arouse more stress among Japanese infants than U.S. middle class infants. The infant-stranger and infant-alone episodes were likely to be more unfamiliar to the Japanese infants since they had less experience in being separated from their mothers compared to the U.S. infants. Examining C-type infants' behavior during the procedure, it was clear that three out of the ten C-type infants behaved like B-type infants from Episode 2 through to Episode 5. But, in Episode 6 (infant alone situation), they were too disturbed to recover from the separation distress even after the mother's return. We have distinguished these infants as 'pseudo-C' type, and, in fact feel that they would be more accurately classified as B-type. The 'pseudo-C' infants were definitely different from C-type infants through Episodes 2 to 5. True C-type infants behaved anxiously throughout the procedure, and hesitated to explore the new environment even with the mother. They preferred to use proximal modes of attachment behaviors (touching, approaching) predominantly directed toward the mother, and refused to interact with the stranger even in the presence of mother.

We assume that in any societies, in which the 'strangeness' of the procedure arouses strong stress, 'pseudo-C' infants would be found. These infants would behave like a C-type infants, because of the nature of the experimental procedure, not because of an unstable relationship with the mother.

2. Is the procedure temperament-bound?

In a very stressful situation, temperamental tendencies, such as sensitivity and persistence, will play an important role. For example, a highly sensitive infant, who experiences more stress in the situation, and a persistent infant, for whom recovering from distress is more difficult, will both tend to be classified as C-type infants.

3. Is the duration of distress important?

The duration time of separation distress in Episodes 4, 6, and 7 must affect the infant's classification. As mentioned above, there were many more C-type infants than we had expected among the Japanese sample. Some of them would have been classified as secure B-type infants if the separation had lasted for a shorter period of time.

In Ainsworth's strange situation procedure, infants may be pushed to show attachment behaviors toward the mother by the experimental/artificial stress, induced by the stranger and by being alone. As Japanese infants have rarely been left alone by the mother or cared for by a non-family member, the stress caused by the procedure must be stronger for Japanese infants than for their U.S. counterparts. Therefore, we should perhaps consider a more suitable attachment measurement procedure for Japanese children. For example, we propose a situation in which infants feel comfortable, and in which they have a free option to play with toys or to direct attachment behaviors to the mother.

Though the strange situation procedure seems to be somewhat less valid for Japanese children due to cultural differences in child-rearing patterns, the procedure is still important for cross-cultural comparison. For example, in addition to the classification differences found, the mother's behavior also showed some differences, even though mothers in both countries were instructed in the same way. (e.g. Japanese mothers preferred to use proximal modes to soothe their infants). If we examine carefully the process and results of the procedure, including cultural differences, Ainsworth's measurement of attachment will continue to be useful for cross-cultural studies. Until the cultural variations are more fully understood, however, it will not be possible to clearly interpret the data reported here or other data showing cultural differences (cf., Grossman et. al., 1981, in which 49% of northern German infants were classified as A-type) (see table 4).

TABLE 4

Percentage of B, C, A classifications : Japanese, U.S., and German infants.

Type	B	C	A	
Sapporo	65.5	34.5	0.0	n = 29
U.S.	67.4	4.3	28.3	n = 46, by Main & Weston
Germany	32.7	12.2	49.0	n = 49, by Grossman et al.

ON THE RELATIONSHIP BETWEEN SOME ASPECTS OF INFANT TEMPERAMENT AND ATTACHMENT AT 12 MONTHS*

Infant temperament has received increasing attention from researchers in recent years. Infant temperament can be considered as related to several aspects of early development, one of which is the quality of mother-infant attachment. Within an interactionist point of view, the term "temperament" usually refers not to the inherent characteristics of the infant, but to the caregiver's perception of the infant's characteristics. A main concern of researchers then is to describe how the mother's subjective assessment of the infant's behavioral characteristics is related to the quality of the mother-infant relationship and to the later development of the infant.

Temperament can also be seen as an important basis of what will later be called personality. The present study is concerned with this aspect of temperament and investigated the consistency of particular temperamental characteristics over the first year of life. A now classic study on temperament and its effect in development was carried out by Thomas, Chess, Birch, Hertzig, and Korn (1963). In that study, they correctly pointed out that "the direction of development (of the child) might be considerably influenced by the nature of the child as an organism" (page v). However,

*Shing-Jen Chen was responsible for the analysis and interpretation reported in this section. The author would like to thank the following persons for their cooperation and assistance in the process of carrying out the observations and tests reported in this paper : Dr. Katsuya Uzuki, Dr. Seiichiro Fujimoto, of the Department of Obstetrics, University Hospital, Hokkaido University.

from their pioneering work, there has developed an emphasis on the study of the perceived temperament of the child (through the eyes of the caregiver), a measure which may be insufficient for fully understanding the role of temperament in development (Carey, 1970).

PURPOSES

The objectives of this report were as follows : (1). To explore the possibility of using some objective procedures in assessing infant temperament. (2). To examine the relation between some aspects of infant temperament and the mother-infant relationship.

METHOD

Subjects : Nineteen normal, healthy infants (7 male, 12 female) were followed from birth to 12 months of age. The infant's average birth weight was 2965 g (SD = 360 g), and all Apgar scores at five minutes were above 8. The number of subjects reported here varies from period to period, since not all subjects were successfully tested at each observation.

Procedure : The following procedures were carried out during the newborn period and at one month, three months, seven months and twelve months : (a) Newborn : response to interruption of sucking (RIS). Subjects were allowed to suck a rubber nipple for 20 seconds. After removal of the nipple, the behavior of the infant were recorded on videotape for 60 seconds. Five trials were administered on both the 2nd and 5th (or 6th) days after birth while the infant was still in the hospital. The test was administered in the morning, and an average of 40 minutes after the last feeding, and after the daily bath ; the test was carried out only when the infant was not crying or asleep. After the entire procedure was completed, the videotape was then played back and two research assistants scored the infant's reaction to the removal of the nipple. (b) One month and 3 months : home visit observation. Two research assistants visited the subject's home ; the visit was made in the afternoon around 13:00 for about 2 hours. One of the assistants interviewed the mother, while the second assistant observed the behavior of the infant, and recorded the ongoing behavior every 30 seconds, using a pre-categorized check-list. Special attention was paid to the infant's crying, fussing and thumb-sucking behavior. (c) Seven months : meeting a stranger. The subject was invited to come to the university hospital for a developmental check-up at 7.5 months. Before the check-up, the infant's response to a male stranger was observed. The infant and his/her mother were observed in a series of 8 episodes lasting a total of about 20 minutes. The behavior and facial expression of the infant during these episodes were recorded on videotape. Heart rate was also monitored, and the average HR for every 3 beats was read into one audio input channel of the videotape recorder. A more detailed description of this part of the study is reported in the next section of this report. (d) Twelve months : Ainsworth strange situation. Both the infant and his/her mother were observed in a standard Ainsworth strange situation. (The procedure and results are reported in the preceding section.) The attachment classifications of the infants was used as the measure of the mother-infant relationship.

RESULTS AND DISCUSSION

One of the objectives of this study was to examine the relationship between infant temperament and the quality of the mother-infant relationship. It was hypothesized that there would be some consistency in the temperament evaluation measures carried out during the first year, and also that there would be a relationship found between infant temperament and mother-infant attachment classification. These hypotheses were supported by the results of the study, as follows :

1. *Newborn period*: RIS. The reaction of the infants to the nipple removal was divided into 5 categories : (1) No response, (2) Searching, (3) Searching and fuss, (4) Searching, fuss and cry, (5) Fuss and/or cry without searching. The first two do not involve obvious affective expression, while affective expression is the most dominant behavior in the last category. The third and the fourth categories exhibit a typical coping style of infants and children, and indeed, adults, in response to milder frustration : that is, problem-solving attempts followed by affective expression when the attempt fails.

Among 11 of the babies classified as B, or securely attached, according to Ainsworth's strange situation classification, four did not show a full cry even once during the two 5-trial sessions, whereas only one out of the six babies classified as C, or insecurely attached, was a non-crying baby.

Three mean reaction times were measured and compared : (1) Latency to obvious response, (2) Latency to full cry, (3) Immediacy of cry (latency to full cry after beginning of obvious response). While the latency to obvious response did not differ very much between B and C babies, C babies showed a longer latency to full cry : they had a longer fussing and/or searching period ; in addition, C babies' full cry was not as immediate as that of the B babies. These results are summarized in table 5.

2. *Observation at one and three months* : Only 3 out of 12 B babies, but 4 out of 7 C babies showed a large proportion of fussing, crying and thumb-sucking behavior. Combining this result with that of the RIS, 6 out of 7 C babies consistently scored as fussy, with much crying and thumb-sucking from the newborn period to three months. Only one out of 12 B babies was consistently classified in this way (see table 6).

TABLE 5
Results of RIS by attachment classification

Classification in Ainsworth Situation	Number of Non-crying Subjects	Mean RT(sec.)		
		Latency to Response (SD)	Full-cry (SD)	Immediacy (SD)
B (N=11)	4 (36.3%)	8.7 (5)	16.4 (9)	8.7 (8.9)
C (N=6)	1 (16.6%)	7.26 (4.4)	22.86 (4.06)	17.5 (15.1)

TABLE 6
Consistently irritable infants

Classification in Ainsworth Situation	One & Three Months (fuss, cry & thumb-sucking)	From Newborn Period to Three Months (fuss, cry & thumb-sucking)
	B (N=12)	3
C (N=7)	4	6

3. *Seven months : Meeting a stranger.* Although both behavioral and HR data were collected, in this report, only the result of the behavioral data will be described. The behavior during the two most stressful episodes (stranger entry and mother exit) was scored and the fearfulness shown by the infant was rated. As shown in table 7, more C babies than B babies were rated to have shown fearfulness in both situations.

TABLE 7
Fearful infants in strange situation at 7 months

Classification in Ainsworth Situation	Strange Entry			Mother Exit		
	Avoid Str.	App. Str.	Fearful	Avoid Str.	App. Str.	Fearful
B (N=8)	2	2	3	3	3	4
C (N=7)	3	2	6	4	2	6

Note : Str. = stranger, App. = approach

The data reported above suggest that selected measurements of infant temperament show some consistency over the first 7 months, and these measurements in turn are related to the behavior of the infant in the Ainsworth strange situation at 12 months.

The selected procedures used in this study can perhaps best be described as measuring an infant's irritability. Our data suggest that babies who are irritable before 3 months tend to be more fearful at 7 months. Furthermore, infants who are classified as C babies at 12 months tend to be irritable and fearful babies at the earlier ages.

THE RELATIONSHIP BETWEEN INFANT'S TEMPERAMENTAL
DISPOSITION AT 7 AND 11 MONTHS AND
ATTACHMENT AT 12 MONTHS*

The purpose of this section is to examine the possible relationship between infant temperamental characteristics as observed at 7 and 11 months, and the type of mother-infant attachment, as observed at 12 months.

The relationship of the infant's characteristics during the neonatal period to later attachment has previously been examined by Waters et al. (1980) and Crockenberg (1981). In these two studies, the Brazelton Neonatal Behavioral Assessment Scale (NBAS) was used to measure infants' temperamental characteristics. It was found that those infants later classified as anxious/resistant showed signs of unresponsiveness, motor immaturity, problems with physiological regulation (Waters et al., 1980), and irritability (Crockenberg, 1981) when observed during the neonatal period. Similarly, Scarr & Salapatek (1970), Paradise & Curcio (1974), and Berberian & Snyder (1982) have suggested that temperamentally fussier infants show more fearful reactions to a stranger at 8 and 9 months. However, the time span between the NBAS at 7 or 10 days and the strange situation at 1 year (Waters et al., 1980) is too long for attempting to draw relationships between the two. And there is a problem in the studies by Scarr & Salapatek, Paradise & Curcio, and Berberian & Snyder in that only the Thomas and Chess (Thomas et al., 1963) questionnaire was used for measuring the infant's temperamental characteristics.

In this study, infants' temperamental disposition toward extreme fearfulness or inhibition (Kagan, 1982) was measured at 7 months and 11 months ; thus, observations were carried out over a shorter time period than in the previous studies. Infant disposition was measured by observing the infants' reactions to a stranger and in a laboratory play situation at two different points in time. In addition, heart rate (HR) data were also used for measuring the infants' affective reactions to a stranger at 7 months. A series of studies have suggested that HR response can be very useful in detecting emotional and perceptual reaction in infancy. The following patterns of findings regarding HR change have been reported : Campos (1976) has reported that when the infant seems to be attending to the environment or orienting toward a stimulus, HR decelerates, and when the infant seems to be averting his/her gaze or attempting to avoid a stimulus, HR accelerates. Also, Kagan (1982) has found that infants who show extreme inhibition of fear in strange or unfamiliar situations also show higher and more stable heart rates. Thus, individual differences in HR and HR variability may serve as indicators of a disposition to inhibition in unfamiliar contexts.

METHOD

Subjects : Eighteen infants and their mothers were subjects. All mother-infant pairs were observed at 12 months and classified for the quality of the mother-infant attachment relationship (Ainsworth, et al., 1978). The infants were classified as B : securely attached and C : anxious/resistant attached. Of the infants observed at 7

*Kimiharu Satoh was responsible for the analysis and interpretation reported in this section.

months, 11 were coded type B, and 7 were coded type C. Of the 16 infants observed at 11 months, 10 were coded type B, and 6 were type C. Heart rate data was analyzed for all subjects ; however videotape data at 7 months for 3 subjects was not available ; therefore, the analysis of infants' reactions to the stranger at 7 months was based on a total of 15 subjects.

Procedure : 1. "Strange Situation" Observation at 7 Months

Infants were tested in a sparsely furnished room, 4m by 3m. There was about a 10-minute warm-up period during which the procedure was explained to the mother. The infant was seated in a high chair beside the mother, and then the experiment began. The procedure consisted of a series of six episodes presented in the same order for all subjects. A brief summary of the procedure is presented in table 8. After the baseline session a male adult stranger entered the room and approached the infant, speaking to infant, touching the infant, and shaking its hand. These same behaviors were continued as the mother left the room and then again entered the room (Episodes 3, 4), and were also repeated when the stranger entered for the second time (Episode 6). Each strange situation was videotaped and all ratings of the infant's reactions were carried out using these videotaped records. The infant's behaviors in reaction to the stranger were coded for : avoidance behavior, approach behavior, negative vocalization (e.g., fussing), crying, and inhibited behavior (e.g., stopping playing when the stranger enters). In addition, continuous heart rate were gathered during the entire session.

TABLE 8
Summary of strange situation procedure (7 months)

Episode	Persons* Present	Time(Min.)
1. Baseline	M, I	3
2. Stranger-Enter I	M, I, S	2
3. Mother-Exit	I, S	2
4. Mother-Reunion	M, I, S	2
5. Stranger-Exit	M, I	2
6. Stranger-Enter II	M, I, S	2

Note : M=Mother, I=Infant, S=Stranger

2. Free Play Session at 11 Months

The baby and the mother went to the same play room that had been used for the observation of the mother-infant interaction at 7 months and the infant's play behavior was observed for ten minutes. The infant was given many toys and asked to play with them alone at the center of the room. The mother sat in one corner of the room with a female experimenter, and conversed with the experimenter. She was instructed not to interact with her baby unless necessary during the 10 minute session. The infant's activity with the toys was videotaped and the later coding was based on these records. The major variables coded were : number of toys used, varieties of manipulation per one minute, mean duration of play with one toy, number of times the infant broke off a play activity to run to the mother, and mean duration of continued play (without

running to the mother).

RESULTS AND DISCUSSION

1. "Strange situation" observation at 7 months

Results of stranger reaction ratings in Episodes 2 and 3, as the stranger entered and the mother exited, are shown in tables 9a and 9b. When the stranger entered and approached the infant, 6 out of the 7 C-type babies showed fearful or inhibited reactions, and 3 babies tried to avoid the stranger. In contrast, only 3 out of 8 B-type infants showed such fearful behavior. When the mother left the room, 6 out of 7 Cs became fearful, compared to only 4 out of 8 Bs. These results suggest that C babies as a whole tend to be more anxious and inhibited in a stressful situation compared to B babies.

Table 10 presents B and C babies' mean HR (Beats Per Minute) for 20-second periods. C babies showed a higher and more stable HR than B babies through each of the first three experimental episodes. During the first 20 seconds at baseline, for example, C infants' HR was higher than B infants' HR by about 10 points, and C

TABLE 9(a)

Infant behavior in strange situation at 7 months by attachment classification (I)

ATTACHMENT TYPE	Stranger-Entry							
	Avoid		Approach		Negative Vocal.		Inhibited	
B-Type	2/8	25%	2/8	25%	4/8	50%	3/8	37.5%
C-Type	3/7	42.9%	2/7	28.6%	2/7	28.6%	6/7	87.5%

TABLE 9(b)

Infant behavior in strange situation at 7 months by attachment classification (II)

ATTACHMENT TYPE	Mother-Exit									
	Avoid		Approach		Negative Vocal.		Cry		Inhibited	
B-Type	3/8	37.5%	3/8	37.5%	5/8	62.5%	4/8	50%	4/8	50%
C-Type	4/7	57%	2/7	28.6%	3/7	42.9%	4/7	57.1%	6/7	85.7%

TABLE 10

B- and C-type babies' mean HR(BPM) in strange situation at 7 months

EPISODE	B-type(n=11)	C-type(n=7)
Baseline(first 20 sec.)	141.9	152.2
Stranger-Enter(first 20 sec.)	143.5	150.9
Mother-Exit(first 20 sec.)	141.9	146.0
Mother-Exit(last 20 sec.)	157.4	171.2

Note : Data shown are based on the average HR of B- and C-type babies at each episode.

infants' mean SD of HR was 9.3 in contrast to a mean SD of 12.9 for B infants. Differences in heart rate between each episode and baseline are shown in table 11. It was expected that C's, who tended to be more fearful in reaction to the stranger, would show HR acceleration during the stranger-entry episode, based on the results of the study by Provost & Gouin Décarie (1974). In that study, infants who were rated as reacting positively to a stranger showed large and statistically significant HR decelerations to the approach of the stranger ; and, in contrast, infants rated as reacting negatively showed steady HR increases during the stranger's approach. As shown in table 11, however, HR acceleration at the stranger's entrance was not found for the C infants, although C infants exhibited more fearful or inhibited reactions. This is a puzzling finding for which we are not able to offer any explanation. However, the expected pattern of difference did occur in the last 20 seconds of the mother-exit session, which was possibly the most stressful episode : C infants showed a higher HR 171.2 BPM compared to 154.4 BPM for the B infants. These HR's represented an increase of 20.5 BPM for C's versus 12.6 for B's.

TABLE 11

B- and C-type babies' HR changes at stranger-entry and mother-exit session

ATTACHMENT TYPE	Stranger-Entry	Mother-Exit	Mother-Exit
	(first 20 sec.)	(first 20 sec.)	(last 20 sec.)
B-type	+ 3.54	+ 0.77	+12.61
C-type	- 1.29	- 4.67	+20.56

Note : HR change was obtained by subtracting mean HR at baseline(20 sec.) from mean HR at stranger-entry(20 sec.)/mother-exit(20 sec.) for each subject. Mean HR change is the average for each group.

Summarizing the findings at 7 months, C infants showed both higher HR and, as described above, more fearful or inhibited behaviors in the strange situation than did B infants. These results therefore support Kagan's hypothesis that heart rate may indicate differences in temperamental characteristics. The results also suggest that there are differences between B and C-type infants in their reactions to relatively stressful situations that may be related to temperamental characteristics.

2. Free play observation at 11 months

Results of the analysis of the infant's play activities are presented in table 12. There were no differences between B's and C's in the number of toys used, and varieties of manipulation per one minute. However, it was found that C's were much more likely to stop their play activity and run to the mother than were B infants (5.5 times versus 1.9). Consequently, the mean duration of play activity was shorter for C's, 5 minutes versus 1 minute. These results thus again indicate that C's, as opposed to B's tended to be more fearful or anxious in the laboratory situation.

CONCLUSION

The purpose of this study was to examine the possible relationship between the infant's temperamental disposition or behavioral characteristics and the mother-infant

TABLE 12
B- and C-type babies' behaviors in free play session at 11 months

	B-type (n=10)	C-type (n=6)
Number of toys used	8.80 (2.86)	8.83 (2.34)
Varieties of manipulation per 1 min.	9.44 (1.88)	9.89 (2.81)
Mean duration of manipulation per 1 toy	18.90 sec. (14.18)	13.45 sec. (4.71)
Number of times leaves play activity	1.90 (1.58)	5.50 (2.81)
Mean duration of play activity(min.)	5.0 min.	1.0 min.

attachment bonding.

Infants classified at 12 months as insecurely attached or anxious/resistant were generally more fearful or inhibited in reaction to a stranger at 7 months, and tended to be more anxious in a free play session at 11 months.

These results imply that a young infant's temperamental characteristics may make an important contribution toward the later development of the mother-infant attachment relationship.

THE RELATIONSHIP BETWEEN MOTHER-INFANT INTERACTION AT 7 MONTHS AND ATTACHMENT AT 12 MONTHS *

The purpose of this section was to examine the relationship between characteristics of mother-infant interaction at 7 months and attachment at 12 months. For this purpose, securely and insecurely attached pairs were compared for the quality of interaction.

According to Ainsworth, Blehar, Waters and Wall (1978), the mother's sensitivity and responsiveness in the child's early years is related to the type of attachment developed. It was proposed here that when a mother is sensitive and responsive to her infant, then a more interactive or "meshed" type of relationship would be developed. Thus, it was expected in this study that those pairs who had established more meshed relationships would develop a more secure type of attachment. The following three aspects of interaction were used as indices of a meshed relationship ; (1) effectiveness of mother's stimulation ; (2) mother's responsiveness ; (3) extent to which the mother respects the infant's intention and need.

*Tatsuo Ujiiie was responsible for the analysis and interpretation reported in this section.

METHOD

Subjects : 19 first-born infants (6 males and 13 females) and their mothers were subjects. All infants were 7 months of age at the beginning of the study.

Procedure : 1. Mother-infant interaction—We recorded and analyzed 10-min mother-infant interaction sessions carried out in an unstructured laboratory situation at 7 months. The categories of behavior observed were as follows : mother's stimulation, mother's response, mother's interruption of infant's behaviors and soothing. The category of mother's stimulation was divided into two subcategories : (a) effective stimulation—stimulation which was successful in eliciting behavior from the infant ; i. e., this category represented a combined measure of the mother's stimulation plus the infant's responsiveness to stimulation ; (b) responsive stimulation—stimulation which followed infant behaviors.

2. Type of attachment—Type of attachment was measured at 12 months. The attachment classifications were carried out using Ainsworth's classification.

RESULTS AND DISCUSSION.

To test the relationship between mother-infant interaction and type of attachment, securely attached (B classification) and insecurely attached (C classification) pairs were compared for the frequency of occurrence of each category of maternal behavior. The results showed that all B and C mothers stimulated their infants about equally as often, and all infants, regardless of type of attachment, responded to their mothers' stimulations relatively well. However, B mothers were more responsive to their infants' ongoing behaviors than were C mothers. Therefore, at 7 months, B mother-infant pairs were more interactive than C pairs. However, the level of responsive stimulation alone cannot predict the type of attachment (see table 14), and other

TABLE 13
Frequency of each category of interaction

	Stimulation *	Effective ** stimulation	Responsive ** stimulation	Interruption
B N 12	438 (48.9%)	307 (70.1%)	238 (54.3%)	26 $\bar{x} = 2.25$ (SD 2.83)
C N 7	303 (51.3%)	200 (66.0%)	133 (43.9%)	45 $\bar{x} = 6.43$ (SD 2.64)

Note ; * The numbers in parentheses represent percentages of the total maternal behaviors.

** The numbers in parentheses represent percentages of maternal behaviors directed toward stimulating the infant.

factors must also be considered. For example, in the results, it was also found that C mothers more than B mothers interrupted their infants' ongoing behavior quite often. A frequency interrupt or not interrupt can perhaps be interpreted as a measure of the degree to which the mother respects or is sensitive to the infant's intention and need. If so, then the results may be taken as indicating differences between B and C mothers

TABLE 14

Infants classified by level of responsive stimulation and attachment category

	B	C
High	7	10
Low	5	9

TABLE 15

Infants classified by level of interruption and attachment classification

	B	C
High	3	6
Low	9	1

in their level of sensitivity. As shown in table 15, the level of the mother's interruption of the infant's behaviors at 7 months was predictive of the later type of attachment, $\chi^2 = 6.54$, $p < .05$. However, three mother-infant pairs developed a secure type of attachment despite the mothers' higher level of interruption. And, of the mothers who interrupted only infrequently, one mother-infant pair developed an insecure type of attachment. Why? One possible interpretation is that the infants' temperamental characteristics played an intermediate role between the mother's sensitivity and the type of attachment developed. To test this possibility, the attachment categories were broken down by the level of infant inhibition (see pp. 1-14 in this report.) and the level of mother's interruption (table 16). Thus, table 16 indicates that the effect of the mother's interruption differs according to the level of the infant's inhibition. Uninhibited infants will apparently develop a secure attachment regardless of their mothers' characteristics.

TABLE 16

Relationship among level of interruption, infant's inhibition and attachment

	B		C	
	Inhibited	Uninhibited	Inhibited	Uninhibited
Interruptive	0	3	5	1
Non-interruptive	2	4	1	0

tics. On the other hand, inhibited infants are more influenced by the characteristics of their mothers' behavior. That is, if a mother interrupts her infant's behavior frequently, the infant will develop an insecure attachment : and if mother does not tend to interrupt the infant's behavior, then the infant will develop a secure attachment.

These results suggest that there is a significant role played by the infant's characteristics, such as temperament, in the development of attachment. Due to the small size of our sample, this conclusion can be only tentative. Nevertheless the results are enough to suggest the necessity of further research concerning the role of the infant in the development of mother-infant relationships such as attachment.

QUALITY OF ATTACHMENT AND COMPLIANCE IN THE SECOND YEAR *

Ainsworth et al. (1978) reviewed data indicating that infants who are classified as securely attached (B-type attachment) at one year of age later exhibit higher levels of

socio-emotional behavior and cognitive performance compared to insecurely attached infants, both A-type (anxious/avoidant) and C-type (anxious/resistant). They concluded that secure attachment to the mother is an important indicator of later successful adaptation. They also suggested that part of the reason for this better adaptation of B-type infants is their greater receptivity to their mothers' early intervention efforts compared to that of A- and C-type infants. In fact, several studies have found that children who are classified as securely attached to their mothers are significantly more obedient to maternal commands or prohibitions in the second year of life than are insecurely attached children (Londervill & Main, 1981 ; Matas et al., 1978).

The purpose of this section is to examine whether this relationship between quality of attachment and later obedience/compliance holds true for Japanese children. The fact that differences in the proportions of A-, B- and C-type infants have been found for Japanese vs. U. S. samples (see pp. 1-8 in this report) indicates that some differences might be expected regarding this relationship as well.

Specifically, three questions were addressed in this study : (a) For Japanese subjects, do securely attached children exhibit more compliance with maternal commands than do insecurely attached children? (b) Is there any developmental change in the relationship between security of attachment and compliance between 16 months of age and 20 months of age? (c) Do differences occur in the attachment-compliance relationship depending on the type of compliance situation tested?

METHOD

Subjects : The sample consisted of 29 middle-class mothers and their first-born infants who were followed from 11 months or earlier to 20 months of age. Seventeen B-type infants (7 male, 10 female) and 10 C-type infants (3 male, 7 female) were observed at 16 months of age and 13 B-type infants (5 male, 8 female) and 8 C-type (1 male, 7 female) were observed at 20 months of age.

Procedure : 1. *Compliance with maternal commands in a problem-solving situation at 16 months of age*

Infants were observed for two 5-minute play sessions after an initial, introductory play session of at least 5 minutes. Two toys were presented to the infant : a block game and a "magic board". The block game consisted of 18 blocks of different shapes which could be fitted into a box with correspondingly shaped holes. The magic board was a board on which infants could draw pictures with a special pencil and then erase them by sliding a special button. The toys were selected to be too difficult for the infants to play with by themselves and so they required that the infant obtain the monther's assistance.

The mother was instructed in how to play with the toys before the session, and then was asked to show her infant how to play with these toys at the beginning of each five minute play session. The mother sat next to the infant while she explained the use of the toys, and then left the infant with the toys and moved to a seat two meters away. The entire procedure was recorded on videotape. Mother-infant interaction

* Nobumoto Tajima was responsible for the analysis and interpretation reported in this section.

during the infants' play with the toys was initiated only by the infant's, request for help from the mother.

The number of maternal commands and the number of infant responses to these maternal commands were tabulated. The infant responses were coded as exhibiting obedience, active disobedience or passive disobedience. A behavior was coded as "obedience" if the infant either obeyed or attempted to obey the mother's request/command. A behavior was coded as "active disobedience" if the infant did not comply with the mother's instruction but, rather, did something else and/or responded with negative vocalization ; and as "passive disobedience" if the infant simply did not respond to the maternal command.

2. Infant response to maternal postponement of gratification at 20 months of age

Each infant was observed in a situation where, seated on a high chair with a restraining belt, he/she could play with one pair of toys (a cup and a plate) placed on the table attached to the high chair. However, a much more interesting set of toys (including dolls, cars, books etc.) was also presented, but on the floor out of the infant's reach. The infant therefore had to depend on the mother's help in order to play with these toys. The mother was again seated two meters from the infant and was asked to fillout some questionnaires. She was instructed not to comply with the infant's demand for the toy on the floor until she had completed the questionnaires.

The number of demands/requests made by the infants, the mothers' responses (e.g. commands, prohibitions) and the infants' responses to the maternal failure to immediately comply with the request (postponement of gratification) were tabulated. The infants' responses were coded according to the same categories as were used for the 16-month assessment.

RESULTS

1. Compliance with maternal commands in the problem-solving situation

Table 17 shows the means for maternal commands, and for infant obedient and infant disobedient responses in the play sessions ; the results of t-tests comparing these means by quality of attachment groups are also presented in table 17. The means in table 17 represent means per minute since the duration of the play session varied among subjects, depending on the length of time that the mother spent explaining the

TABLE 17

Means for maternal and infant variables and t-test by attachment type in the problem-solving situation

	Attachment classification at 12 months					
	Secure(N=17)		Insecure(N=10)		t-test	
	M	SD	M	SD	t	P
Maternal commands	1.65	0.84	1.74	1.20	-.21	n.s.
Infant obedient response	0.84	0.62	0.59	0.34	1.12	n.s.
Infant disobedient response	0.82	0.60	1.15	1.02	-1.02	n.s.

Note ; Means are mean number of behaviors per minute.

toys to the infant. As the number of passive disobedient behaviors was small, these were combined with active disobedient behaviors for one general category of disobedience.

As shown in table 17, no difference was found between B- and C-type infants in the number of maternal commands or prohibitions, $t = -.21$, $df = 25$, n.s.. Also, no significant differences occurred between two attachment groups for obedient or disobedient responses, $t = 1.12$, $df = 25$, n.s.; $t = -1.02$, $df = 25$, n.s. respectively, (although B-type infants tended to comply with maternal commands more than did C-type infants).

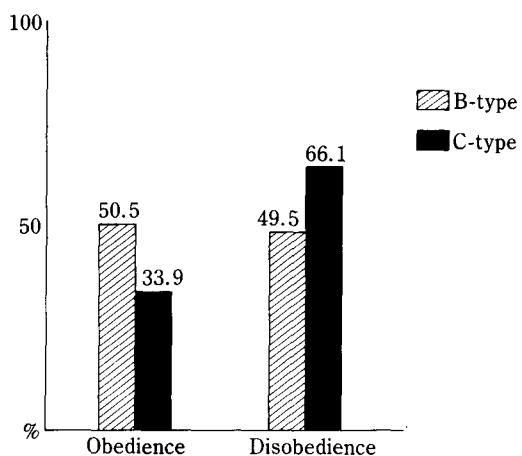


FIGURE 2 Proportion of obedience-disobedience by attachment type in the problem-solving situation

However, as indicated in figure 2, the proportion of obedient responses relative to disobedient responses was significantly higher for B-type infants than for C-type infants, $\chi^2 = 12.04$, $df = 1$, $p < .005$. Thus, these data indicate that securely attached infants exhibited more compliance with maternal commands than did insecure infants.

2. Compliance with maternal postponement of gratification

Table 18 presents the mean number of infant demands/requests, of maternal responses/commands, and of infant's obedient and disobedient responses to the mother's failure to fulfill the request ; results of t-tests comparing these means for the two attachment groups are also shown. Again, the means are defined per minute, since the play session duration varied over the mother-infant pairs. As in the previous (16-months) experiment, active and passive disobedience were combined into a general disobedience category, due to the small number of passive disobedience responses.

No significant differences were found between the two attachment groups for the number of infant requests/demands, $t = -.030$, $df = 19$, n.s., the number of maternal responses/commands, $t = -.206$, $df = 19$, n.s., or for infant's obedient and disobedient responses, $t = .765$, $df = 19$, n.s.; $t = .492$, $df = 19$, n.s. respectively.

There was, however, a significant difference found for B-type versus C-type

TABLE 18

Means for maternal and infant variables and t-test by attachment type in the postponement situation

	Attachment classification at 12 months					
	Secure(N=13)		Insecure(N= 8)		t-test	
	M	SD	M	SD	t	p
Infant requests / demands	0.68	0.29	0.68	0.40	-.030	n.s.
Maternal requests / commands	1.13	0.64	1.20	0.68	-.206	n.s.
Infant obedient response	0.54	0.35	0.41	0.38	.765	n.s.
Infant disobedient response	0.59	0.47	0.79	0.54	-.492	n.s.

Note ; Means represent mean behaviors per minute.

infants in the proportion of obedient responses, $\chi^2 = 4.42$, $df = 1$, $p < .05$ (see figure 3), indicating again, as in the problem-solving situation, that the more securely attached infants tended to exhibit more compliance to maternal commands.

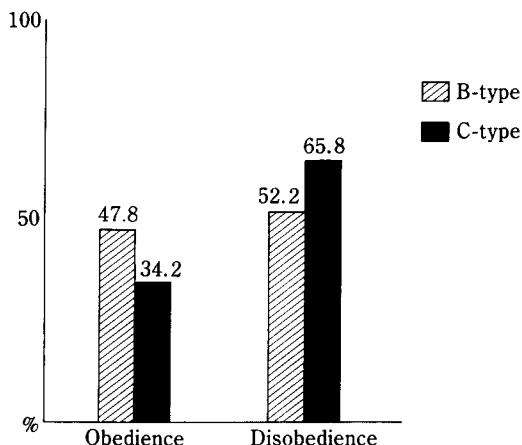


FIGURE 3 Proportion of obedience-disobedience by attachment type in the postponement situation

DISCUSSION

We have found that infants who are securely attached to their mother exhibit a higher proportion of obedient responses to maternal commands than do insecurely attached infants at both different ages (16 months and 20 months of age), and in different situations (problem-solving and postponement situation). Although this finding seems to be generally consistent with the findings of some U. S. studies (Londervill & Main, 1981; Matas et al., 1978), there also appears to be some cross-cultural difference in the results. For example, while for our B-type infants there was no difference in the proportion of obedient-disobedient responses over the two situations, some U. S. studies have indicated that B-type infants are less obedient to maternal commands in a "clean-up toys" situation than in a problem-solving situation (Matas et al., 1978). We

will have to examine this type of difference further in order to determine whether it represents a consistent cross-cultural difference. If found, it might indicate some cross-cultural variation in the mechanisms mediating the relationship between secure attachment and compliance.

In addition, before concluding that the same mechanisms underlie the relationship between quality of attachment and receptivity to socialization, there are other problems that should first be investigated. These concern the content of the mother's commands, the infant's temperamental characteristics, and developmental change in level of competence.

1. Relationship between the content of maternal commands and infant compliance

In this study the content of the requests/commands given by the mothers to their infants was not analyzed. However, it is possible that an infant's compliance may depend on the kind of commands given. For example, in the postponement situation, most mothers typically gave their infants a response such as : "Wait a minute, please. I'll be finished soon, and then I'll do it for you". However, some mothers of B-type infants gave responses which temporarily resolved their infants' frustration. One such mother, whose infant made the most requests/demands for the better toys (1.5 times/min.), could elicit an obedient response from her infant by giving him suggestions regarding the available toys (the cup and plate) such as "How about drinking milk from the cup?", and "Then, wash your cup, please".

Such variation in the nature of the mother's response strategy may be an important variable in determining the infant's compliance or noncompliance. Further research should be directed toward examining this aspect of a compliance situation as well.

2. The relationship between infant temperamental characteristics and compliance

An infant's response to maternal directions could also be affected by the infant's perception of the given situation. The infant's perception of the situation would in turn be at least partially related to his/her general temperamental characteristics, such as inhibition (Kagan, 1982) or fearfulness. In our study, for example, one infant throughout the experiment showed fearfulness, begging his mother to take him away from the situation, and consistently rejected his mother's commands. (This case was dropped from the analysis.)

Though this certainly represents a very extreme case, it does point up the fact that there are individual differences in perception of a situation. These differences are most likely related to temperamental characteristics, and should also be taken into account when considering an infant's response to maternal commands.

3. Developmental change in level of compliance

As an infant gains in competence, he/she will begin to become more independent, particularly in those situations which the infant is able to handle without the mother's assistance (Londervill & Main, 1981). This developmental aspect should be taken into account in attempting to define the relationship between quality of attachment and

compliance. That is, the proportion of obedient behavior might be expected to vary with the type of situation, and with the infant's level of competence (which could also be related to developmental level). With an increase in competence and control over his/her environment, the infant may begin to display more willfulness, reflecting a developing sense of self. Such willfulness may produce more disobedience, yet the increased disobedience might reflect an adaptive phase and represent a necessary step in the child's development.

In conclusion, examination of such additional variables as these may lead toward greater understanding of the factors underlying the relationship found between quality of attachment and compliance.

REFERENCES

- Ainsworth, M. D. S., Blehar, M. C., Waters, E. & Wall, S. *Patterns of attachment : A psychological study of the strange situation*. N. J. Lawrence Erlbaum Associates, 1978.
- Arend, R., Gove, F. L., Sroufe, L. A. Continuity of individual adaptation from infancy to kindergarten. *Child Development*, 1979, 50, 950-959.
- Azuma, H., Kashiwagi, K & Hess, R. D. *The influence of maternal teaching style upon the cognitive development of children*. Tokyo : The University of Tokyo Press, 1981 (In Japanese).
- Berberian, K. E. & Snyder, S. S. The relationship of temperament and stranger reaction for younger and older infants. *Merrill-Palmer Quarterly*, 1982, 28, 79-94.
- Bowlby, J. Attachment. *Attachment and loss*. Vol. I. New York : Basic Books, 1969.
- Bowlby, J. Separation, anxiety and anger. *Attachment and loss*. Vol. II. New York : Basic Books, 1973.
- Bowlby, J. Loss. *Attachment and loss*. Vol. III. New York : Basic Books, 1980.
- Campos, J. J. Heart Rate : A sensitive tool for the study of emotional development in the infant. In L. P. Lipsitt (Ed.) *Developmental psychobiology*. N. J. : LEA, 1976, 1-31.
- Carey, W. B. A simplified method of measuring infant temperament. *Journal of Pediatrics*, 1970, 77, 188-194.
- Caudill, W. & Weinstein, H. Maternal care and infant behavior in Japan and America. *Psychiatry*, 1969, 32, 12-43.
- Crockenberg, S. B. Infant irritability, mother responsiveness, and social support influences on the security of infant-mother attachment. *Child Development*, 1981, 52, 857-865.
- Grossman, K. E., Grossman, K., Huber, F. & Wartner, U. German children's behavior towards their mothers at 12 months and their fathers at 18 months in Ainsworth's strange situation. *International Journal of Behavioral Development*, 1981, 4, 157-181.
- Kagan, J., Kearsley, R. B. & Zelazo, P. R. *Infancy : Its place in human development*. Cambridge : Harvard University Press, 1978.
- Kagan, J. Heart rate and heart rate variability as signs of a temperamental dimension in infants. In C. E. Izard (Ed.) *Measuring emotions in infants and children*. Cambridge University Press, 1982, 38-67.
- Londervill, S. & Main, M. : Security of attachment, compliance, and maternal training methods in the second year of life. *Developmental Psychology*, 1981, 17, 3, 289-299.
- Main, M. & Weston, D. R. The quality of the toddler's relationship to mother and to father : related to conflict behavior and the readiness to establish new relationships. *Child Development*, 1981, 52, 932-940.
- Matas, L., Arend, R. A. & Sroufe, L. A. : Continuity of adaptation in the second year: The relation between quality of attachment and later competence. *Child Development*, 1978, 49, 547-556.
- Paradise, E. B. & Curcio, F. Relationship of cognitive and affective behaviors to fear of strangers in male infants. *Developmental Psychology*, 1974, 10, 476-483.
- Provost, M. & Gouin Décarie, T. Modifications du rythme cardiaque chez des enfants de 9-12 mois au cours de la recontre avec la personne étrangère, cited in Campos, J. J. Heart Rate : A sensitive tool for the

- study of emotional development in the infant. In L. P. Lipsitt (Ed.) *Developmental Psychobiology*. N. J. : LEA 1976. p.22.
- Scarr, S. & Salapatek, P. Patterns of fear development during infancy. *Merrill-Palmer Quarterly*, 1970, 16, 53-90.
- Thomas, A., Chess, S., Birch, H. G., Hertzig, M. E. & Korn, S. *Behavioral individuality in early childhood*. New York : New York University Press, 1963.
- Thomas, A., Chess, S., & Birch. H. G. *Temperament and behavior disorders in children*. New York : New York University Press, 1968.
- Vaughn. B., Egeland, B. & Sroufe, L. A. Individual differences in infant-mother attachment at twelve and eighteen months : Stability and change in families under stress. *Child Development*, 1979, 50, 971-975.
- Waters, E., Wippman, J. and Sroufe, L. A. Attachment, positive affect and competence in the peer group. *Child Development*, 1979, 50, 821-829.
- Waters, E., Vaughn, B. E. & Egeland, B. R. Individual differences in infant-mother attachment relationship at age one : Antecedents in neonatal behavior in an urban, economically disadvantaged sample. *Child Development*, 1980, 51, 208-216.