

Cultural and Educational Variations in Maternal Responsiveness

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Two separate studies examined the following hypotheses: (a) that maternal responsiveness is affected by cross-cultural differences in conventions of conversational interaction, and (b) that maternal responsiveness is affected by intracultural differences in mothers' levels of formal education. The first study compared mother-infant interactions among the Gusii of Kenya with those in suburban Boston, Massachusetts. The second study, carried out in the Mexican city of Cuernavaca, examined variations in mother-infant interactions by maternal schooling within a local sample of low-income mothers of similar cultural backgrounds who had attended school from 1 to 9 years. The 2 studies together indicate that maternal responsiveness during infancy, particularly in the verbal mode, is influenced by the mother's cultural background and school attendance, that is, by factors that reflect her history of participation in institutionalized systems of communication and education.

Child development research in the United States has often shown maternal responsiveness to infants to be predictive of their subsequent cognitive and emotional behavior (Ainsworth, Blehar, Waters, & Wall, 1978; Bornstein, 1989; Clarke-Stewart, 1973; Martin, 1981). In some studies, socioeconomic and cultural factors are deliberately controlled through sample selection so that their effects will not be confounded with those of maternal responsiveness. Other studies have shown maternal behavior during infancy to be associated with variations in culture, ethnicity, socioeconomic status (SES), and maternal education (e.g., Bornstein, Tamis-LeMonda, Pecheux, & Rahn, 1991; Cohen & Beckwith, 1976; Field, Sostek, Vietze, & Leiderman, 1981; Leiderman, Tulkin, & Rosenfeld, 1977; Richman et al., 1988), though only a few (e.g., Dixon, Tronick, Keefer, & Brazelton, 1981; Field & Widmayer, 1981) have examined the mother's contingency of response to infant signals. On the whole, the literature to date suggests that social and cultural factors influence maternal responsiveness in humans, but specific evidence on the amount and kind of influence, and the mediating processes, is largely lacking.

The concept of maternal responsiveness as usually used in the literature includes varied forms of behavior contingent on a variety of infant signals; vocalization is included along with other maternal and child behaviors. The literature referred to in the preceding paragraph indicates variation across socially and

culturally defined populations in the particular infant signals (e.g., distress vs. nondistress) responded to as well as in the types of maternal behaviors (e.g., distal vs. proximal) elicited by those signals. In this article we consider two hypotheses: (a) that maternal responsiveness is affected by cross-cultural differences in conventions of conversational interaction, particularly as specified by scripts governing the mother-infant relationship, and (b) that maternal responsiveness is affected by within-culture differences in mothers' levels of formal education.

Hypothesis 1: Maternal responsiveness is affected by cross-cultural differences in local conventions of conversational interaction, particularly as specified by cultural scripts governing the mother-infant relationship. Populations vary in their conventions of normal adult conversation, that is, in the locally dominant norms for mutual gaze, turn taking, affective expression, intonation, and their organization in the canonical scripts that influence all conversations (except as qualified by more specific situational or relational norms). This means that even if some form of "proto-conversational" interaction between mother and infant were universal among human societies, the actual conversational behavior would be differentiated by local conventions of adult speech and by whether or not the language provides a special, simplified register (baby talk) for speaking to infants. But proto-conversation between mother and infant is not a universal cultural script, and mother-infant interaction is further differentiated by a variety of culture-specific norms that exempt babies from verbal interaction altogether, prescribe formulaic routines such as lullabies that are not overtly designed to initiate a communicative exchange, direct the mother to attend to crying and ignore babbling, or specify the variable terms of what Schieffelin and Ochs (1986) called "communicative accommodation" to the infant's capacities. The ethnographic and sociolinguistic evidence reviewed by Schieffelin and Ochs (1986) leaves little doubt that the varying normative contexts of conversation in general and the mother-infant relationship in particular influence the observable interaction of the mother with her prelinguistic infant.

This is generally confirmed by observational studies yielding

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quantitative data. For example, Konner (1977) found variations in frequency of caretaker vocalization to infants 7- to 12-months-old across samples drawn from the Kalahari San, Guatemalans, the Boston working class, and the Boston middle class. Dixon et al. (1981), in their microanalysis of videotaped face-to-face interaction of young infants with their mothers among the Gusii of Kenya and the Boston middle class, found that the Boston mothers attempted more frequently to elicit a reciprocal exchange with their infants, whereas the Gusii mothers more frequently averted their gaze when their infants became visibly excited, reflecting different interactional goals and suggesting the influence of culture-specific conventions on mother-infant interaction.

The question of whether the mother's level of responsiveness is affected by the conventions of conversation and their application to the infant care situation, however, remains a matter of debate, and it has been suggested that where reciprocal vocalization is rare in mother-infant interaction, tactile or other forms of responsiveness may play an equivalent role in the infant's psychological development (Trevathan, 1989). Thus in testing Hypothesis 1, our aim is not only to examine the influence of cultural scripts on observable interaction but also to explore the extent to which this influence has implications for the psychological development of the child.

Hypothesis 2: Maternal responsiveness within a culturally similar population is affected by the mother's level of school attainment, that is, by the number of years she has attended school. The association between a mother's formal education and her behavior to her preschool children is a familiar one in research on child development in the United States (e.g., Laosa, 1980, 1982), though only a few of these studies concern maternal behavior during infancy (e.g., Crockenberg, 1983). In a longitudinal study of 156 children, Feiring and Lewis (1981) found that

the child's development of cognitive and language skills at 24 months is related to the mother's language use at earlier age points. Mothers characterized here as upper-middle SES, i.e., college educated or more, tended to employ a greater amount of verbal interaction as compared to middle SES mothers and had children who performed better on language measures at 24 months. The amount of verbal interaction a child receives at an early age is important and is probably related to the mother's education level. . . . [T]here is a tendency at 3 months for upper-middle SES mothers to vocalize more to their infants. At 12 months, although both SES groups vocalize a similar amount, upper-middle class mothers were more responsive to their children's vocalization. (pp. 87-88)

These findings concerning verbal interaction are typical of the U.S. literature, but it is noteworthy that the educational variation in Feiring and Lewis's (1981) study was between a college-educated group of mothers and a group educated to the high school level and described as middle class, rather than the working-class versus middle-class comparisons that have more commonly yielded such results (e.g., Tulkin & Kagan, 1972). Maternal schooling was confounded with other socioeconomic factors in the comparison of the two groups, because the aim of the study was to identify the effects of SES rather than to isolate the impact of maternal education itself. Such a comparison is interpretable as revealing subcultural differences in the conven-

tional scripts and styles of interaction of different social strata rather than the effect of school experience as an individual variable on maternal behavior. To isolate that effect, it is necessary to control other socioeconomic and cultural factors through sampling or multivariate analysis or both.

In the research reported here, we examine the first hypothesis by comparing samples drawn from the Gusii of Kenya and suburban Boston (LeVine, Miller, & West, 1988) and the second hypothesis through a study of individual differences in low-income neighborhoods of a Mexican city (LeVine et al., 1991).

The Gusii-Boston Comparative Study

Method

Subjects. The first study compared mother-infant interaction in two samples, one from a rural Gusii community of southwestern Kenya, the other from suburban Boston, Massachusetts. The Gusii are an agricultural people with a distinctive language and culture who number more than 1 million and inhabit the highlands east of Lake Victoria in the southwestern corner of Kenya, East Africa (LeVine & LeVine, 1966). Their total fertility rate in 1979 was 8.7 children per woman, one of the highest in the world. Twenty-eight Gusii infants and their caregivers were studied over a 17-month period (from February 1975 to July 1976) with a variety of biomedical, behavioral, and developmental assessment procedures (Dixon, LeVine, Richman, & Brazelton, 1984; Dixon et al., 1981; Keefer, Tronick, Dixon, & Brazelton, 1982; LeVine et al., in press-a). The Boston area sample consisted of 20 infants and their mothers, white middle-class Americans, studied in 1979-1980 for comparison with the Gusii (see Richman et al., 1988). A subgroup of each of these larger samples is examined here: 12 Gusii and 9 Boston mother-infant pairs.

In each community, women were contacted in the last months of pregnancy or shortly after giving birth and were invited to participate in a study of child development. The Gusii mothers were recruited through a local census carried out by the research team, the Bostonians through contacts with privately practicing pediatricians in the Boston area whose patients were largely middle class. All infants who met basic criteria of health, age, and sex and whose families fell within the normal range of socially acceptable family organization within each community were included in the sample. In addition, because hardly any of the Gusii children were firstborns, we restricted the Boston sample to non-firstborn children so that the comparison would not be one of firstborn Bostonians with laterborn Gusii. Table 1 presents some basic demographic information about the two samples and their respective subsamples. In general, the subsamples from each culture are representative of their respective larger samples.

Two noteworthy differences between the Gusii and American samples have to do with maternal schooling and parity. The Boston mothers averaged 14-15 years of schooling and 2-3 children, whereas the Gusii mothers had 2-3 years of schooling and 4-5 children on the average. (The Gusii mothers were continuing to bear children and would end up with 10 or more before they stopped.)

Procedure. Infants were observed in their normal home environments at 3-4 months and at 9-10 months. The procedures followed in the Gusii setting and in Boston were somewhat different, but produced roughly equivalent information, as will be described.

Three bodies of naturalistic home observations were collected on each child in the Gusii longitudinal sample: spot observations of the care situation by a local assistant, precoded observations of mother and child by another Gusii assistant (for 6 months of the study), and narrative observations of mother and child by a foreign investigator fluent in the Gusii language and experienced in child observation, Sarah LeVine. The findings from all three approaches are presented

Table 1
Characteristics of the Gusii and Boston Samples

Characteristic	Gusii (n = 28)			Gusii subsample (n = 12)			Boston (n = 20)			Boston subsample (n = 9)		
	M	SD	Range	M	SD	Range	M	SD	Range	M	SD	Range
Mother's age	29.2	6.4	20-41	29.7	6.3	23-41	31.4	3.2	27-38	29.8	2.4	27-33
Mother's education	2.9	3.3	0-10	2.5	2.9	0-7	14.0	2.2	9-18	15.1	2.0	12-18
Father's age	37.4	11.5	20-66	36.3	8.4	28-58	33.9	4.3	29-42	32.3	3.9	29-41
Father's education	5.6	3.5	0-11	6.2	3.3	0-11	14.9	3.5	6-20	16.1	3.3	12-20
Birth order of infant	4.3	2.4	1-10	5.2	2.3	3-10	2.6	.69	2-4	2.4	.53	2-4

elsewhere (LeVine et al., in press-a). Because the narrative observations were the only ones that permitted sequential analysis of mother-infant interaction throughout the study period, they were selected for intensive analysis, and the coding system developed for them provided the basis for the comparative research presented here. The narrative observations were conducted at the infant's home in the daytime for 1 hour every 3 months; mothers and other caregivers were instructed to carry on with their usual activities. The observer recorded each interactive behavior by mother and infant in sequence and noted the time at 1-min intervals. The pace of interaction was so slow that it was possible to record gross behaviors with accuracy and even to inscribe every utterance in full.

These observations were then coded using categories of behavior developed from Clarke-Stewart's (1973) system for coding social interaction. The coding consisted of translating the verbal record into numeric codes without further inference by the coders. This coding scheme contained 47 codes for describing infant behavior and 48 codes for describing caregiver behavior. Some of these codes were the same for infant and caregiver. Categories of behavior shared by infants and caregivers included facial expressions (smiles, frowns, miscellaneous facial expressions), gestures (head and hand gestures), object-mediated behaviors (looking at objects, touching objects, showing objects, etc.), looking at another person, and noninteractive behaviors. Both caregiver and infant could be coded as vocalizing, but specific vocalizations were somewhat different for each. For the infant, vocalizations coded included cry, fret, miscellaneous noise, laugh, vocalize, imitate, talk, sing, and any noise. For the caregivers, vocalizations included talk, sing, imitate, miscellaneous noise, declarative, interrogation, imperative, laugh, praise, reprimand, threaten, or any noise. Both infants and caregivers were coded as engaging in various physical behaviors, but again somewhat different sets were appropriate (only caregivers were coded as holding or jiggling the infants; only infants could be coded as rooting; both could be coded as touching, hugging, or kissing). Finally, a few categories were unique to either the caregiver or the infant. For example, caregiving behavior was something that was only coded for caregivers and included such behaviors as physical caregiving, washing/cleaning, grooming, dressing, offering food or the breast, and so forth. General locomotion was coded only for infants, although either infants or caregivers could be coded as approaching the other.

Observations in the Boston sample were collected with a portable event recorder called the MORE (Micro-Processing Observation Recording Equipment). In order to generate comparable data, the coding categories were the same ones used in the Gusii study. There were some differences between the Gusii and Boston data collection: (a) The use of the MORE enabled event-level recording with the added feature of marking, in this case, 5-s time intervals as they occurred. (b) Certain categories were added for those behaviors or contextual variables that did not occur during the Gusii observations—for example, baby equipment such as walkers or infant seats or gestures such as peek-a-

boo. (c) Seven observers, rather than one, rotated as collectors of data. (d) Infants were observed in interaction with their mothers for a total of four 1-hr periods at each age point. As with the Gusii study, mothers were asked to go about their normal activities while the observers were present. See Richman (1983) for more details on the methods.

Although the slow pace of the Gusii interaction and the relatively low level of inference involved in the coding provide confidence in the data, we further reduced the threats of observer and coder bias by collapsing the codes into a small number of crude categories with a high degree of face validity: talk, look, touch, hold, and feed/nurse for the mothers, and vocalize, cry, and look for the infants. In the American study, the graduate student observers were trained by watching videotapes of mothers and infants from the community who were comparable to the subjects in the study. Observers watched tapes in pairs and discussed their coding in order to reconcile any differences. This training and the MORE technology enabled the observers to deal with the sometimes faster-paced Boston interaction, and the coded data were eventually collapsed into the same eight categories used for the Gusii. Thus both bodies of data used the same simple categories, involving a minimal amount of inference in observation and coding and a maximum amount of face validity in their interpretation.

Results

Table 2 shows the rank orders by their frequencies of the five maternal behaviors among the Gusii and Boston mothers. As reported elsewhere (Richman et al., 1988), Gusii mothers most often hold and touch their infants at both age points. American mothers also hold their 3-4-month-olds the most, but by 9-10 months their predominant mode of interaction is talking and looking at their infants. We interpret this as showing that the Gusii mothers seek to quiet and soothe their babies, whereas

Table 2
Rank Ordering by Frequency of the Maternal Behaviors for Gusii and Boston Mothers to Infants at 4 and 10 Months of Age

	4 months		10 months	
	Gusii	Boston	Gusii	Boston
Hold	Hold	Hold	Hold	Look
Touch	Look	Look	Touch	Talk
Talk	Talk	Talk	Talk	Hold
Look	Touch	Touch	Look	Feed/nurse
Feed/nurse	Feed/nurse	Feed/nurse	Feed/nurse	Touch

the American mothers pursue a style in which verbal interaction and stimulation of the infant play an important part.

The rank ordering by frequency of the infant behaviors within each sample (not shown) is as follows: for the Gusii at 3–4 months—cry, vocalize, look; for the American infants at the same age—vocalize, look, cry. At 9–10 months, Gusii infants are vocalizing the most, crying the next most, and looking the least. Boston infants continue their earlier pattern: They vocalize and look much of the time, with crying being much less frequent.

How does the evidence from the Gusii–Boston comparison bear on Hypothesis 1, that mothers of different cultures respond differently to comparable infant behaviors? Table 3 displays the mean proportions of maternal responses to three infant behaviors (vocalize, look, and cry) among the Gusii and Boston mothers. For this analysis, a behavior of the mother was defined as a response to an infant behavior if it was recorded as occurring immediately after the infant behavior (Gusii) or in the next interval after an infant behavior (Boston). These numbers are conditional probabilities in which the number of responses that the mother made to a particular infant behavior is divided by the raw frequency of that infant behavior; that is, they show the number of responses that the mother made, given the number of opportunities she had to respond. (In the Gusii observations, the response would be immediately following the infant behavior but in a slightly varying time frame, whereas in the Boston study the response would be the maternal behavior[s] occurring in the next 5 s.)

As Table 3 indicates, the Gusii and Boston mothers show different patterns of responsiveness to the infant behaviors of nondistress vocalization, looking, and crying at 3–4 and 9–10 months of age. Gusii mothers most frequently respond to all of the infant behaviors, whether by 3–4 month-olds or 9–10-month-olds, by holding and other physical behaviors. Boston mothers most frequently respond to infant looking and crying by holding at 3–4 months, but they respond most frequently to

all three infant behaviors at 9–10 months by talking and looking. For mothers in both cultures, these response patterns are similar to the overall frequencies of their behaviors. Furthermore, the more frequent talking and looking of the Boston mothers in response to infant vocalization at both ages suggest that they are treating the baby's babbling as incipient speech, thus creating the "proto-conversations" that have been described elsewhere for American white middle-class mother–infant interaction (Ochs & Schieffelin, 1984).

Both groups of mothers are responsive to infant signals, but their different behaviors indicate divergent goals and styles. The responsiveness of the Gusii mothers is directed toward soothing and quieting infants rather than arousing them, as was also noted by Dixon et al. (1981) in their analysis of the videotaped face-to-face interaction of these mothers with their babies in a structured situation. The responsiveness of the Boston mothers, especially as their infants become more communicative later in the 1st year, is designed to engage the infants in emotionally arousing conversational interaction. Gusii mothers see themselves as protecting their babies, not as playing with or educating them. From their point of view, emotional excitement should be avoided, and verbal communication can wait until the child is capable of speech.

These differences in the goals and styles of maternal responsiveness can be interpreted in a variety of ways, given the many differences between the cultural traditions and socioeconomic situations of the Gusii and Bostonian mothers. Gusii conventions of adult conversation involve much less mutual gaze and affect expression than their Boston counterparts, so it is possible that this canonical script for conversation has influenced observable mother–infant interaction. Furthermore, there is a specific prescription of emotional restraint for parents with their mature children that may have even greater force in this situation, and older Gusii mothers tend to ridicule the idea of talking to children before they are capable of speech, which they estimate at about 2 years of age. Although Gusii infor-

Table 3
Mean Proportions of the Maternal Behaviors as Responses to Infant Vocalizations, Cries, and Looks in the Gusii and Boston Samples

Maternal behavior	Infant behavior					
	Vocalize		Look		Cry	
	Gusii	Boston	Gusii	Boston	Gusii	Boston
4-month-old infants						
Talk	.10	.19	.19	.25	.10	.21
Look	.04	.31	.19	.37	.03	.22
Touch	.09	.05	.28	.04	.20	.08
Hold	.51	.26	.88	.18	.44	.30
Feed	.04	.02	.01	.02	.09	.02
10-month-old infants						
Talk	.05	.20	.12	.25	.07	.29
Look	.02	.29	.07	.29	.05	.29
Touch	.08	.02	.22	.02	.20	.03
Hold	.18	.10	.31	.08	.33	.23
Feed	.01	.01	.01	.04	.03	.07

mants do not formulate an explicit concept of good mothering, it is abundantly clear from what they say and do that their concept of requisite responsive care during infancy entails comforting distress but not engaging the baby in conversational interaction.

It is also possible to attribute the greater emphasis on verbal communication among the Boston mothers to their much longer average exposure to schooling, but the confounding of maternal education with so many other variables makes this untestable with such small and homogeneous samples. The cross-cultural comparison brings out divergence in patterns of maternal responsiveness across human societies, but a more controlled study is needed to explore the impact of specific variables.

The Mexican Study

Method

To test Hypothesis 2, we selected a country with recently expanded female school enrollments, where wide variations in maternal school attainment could be found within relatively homogeneous local populations—namely, Mexico. Beginning the study in 1983, we chose an urban research site in order to ensure the availability of a sufficient number of women who had completed primary school. The medium-sized city of Cuernavaca (1980 population: about 200,000) in the state of Morelos 50 miles south of Mexico City was selected. Within Cuernavaca, we chose two low-income neighborhoods, an old inner-city section and a new squatter settlement, in which to conduct a census of women aged 15–35 with children under 4 years of age, restricting our sample to those with at least 1 and no more than 9 years of school. This educational range included the majority of childbearing women in the neighborhoods (typical of urban Mexico in 1983) and eliminated the extremes of those who had never attended school and those who had completed high school, in order to focus on whether completing primary school (6 years of school) and obtaining postprimary education (*secundaria* in the Mexican system, equivalent to junior high school) make a difference in maternal behavior. A sample of 333 mothers who met these criteria were interviewed concerning family life, reproductive history, and child care, and a subsample was chosen for the observational study on the basis of having a child approaching either 5 or 10 months of age; all such mothers in the larger sample were selected for home observation.

Subjects. A total of 72 mothers had babies available for home observation at 5 and 10 months. The average mother in this subsample was 23.4 years old (range = 14.9 to 35.6 years), had attended school for almost 7 years (range = 1 to 9 years), was married to a man with 7 years of education (range = 1 to 17 years), and had had 2 children (range = 1 to 8). The group of 72 was divided into two cohorts for purposes of the observational study: one of 30 infants that was observed at 5 and 10 months, and another of 42 infants observed at 10 and 15 months. In this article we focus on the 10-month data, which included the full sample of 72 and permits comparison with the Gusii and Boston data.

Procedure. Each mother–infant pair was observed by a Mexican field assistant in social interaction during four 20-min sessions over a 2-day period at each age point. The observer used an observational instrument consisting of 10 maternal behaviors (vocalize, hold, look, feed, physical, approach, caretaking, gesture, object-mediated, other action) and 10 infant behaviors (vocalize, look, cry, motor, physical, object-mediated, gesture, approach, explore, self-engaged), which approximated the collapsed categories derived from the earlier Gusii and American studies. The observer checked off the occurrence of any of the behaviors on an optical scanning sheet while an audio beeper sig-

nalled 8-s intervals to provide a timeline; coding was continuous. The procedure was designed to allow relatively easy, rapid, and reliable data collection without the use of automatic recording devices. The three observers were trained using videotapes of mother–infant pairs from the community. Interobserver reliability of at least 80% was achieved for each category before data collection began.

Results

The same eight behaviors presented for the Gusii and Boston samples are here examined for the Mexican sample at 10 months of age: look, talk, hold, touch, and feed for the mothers and vocalize, look, and distress for the infants. For the Mexican mothers interacting with 10-month-old infants, the rank order of frequency was look, talk, hold, touch, and feed. The infants were most frequently vocalizing, looking, and crying, in that order. These patterns are most similar to those of the Boston mothers at 10 months.

For purposes of examining maternal responsiveness in these data, we followed procedures identical to those used in the Gusii–Boston comparison. Table 4 shows the proportions of the five maternal behaviors as responses to infant vocalizing, looking, and distress. The Mexican mothers most often looked and talked in response to both vocalizing and looking from their infants and in response to crying. The next most frequent response to infant vocalizing and looking was maternal touch, followed by holding. In the case of infant distress, the next most frequent response was mother holding, followed by touch. Feeding was a rare response to any of these infant behaviors. These results from Mexico again appear most similar to the behavior of the Boston mothers with their 10-month-olds, with one difference. In the Boston sample, maternal rates of talking and looking in response to infant behaviors were very similar. In Mexico, maternal looking was a much more frequent response than maternal talking (mothers looked in response to infant behaviors in approximately one half or more of the intervals). The Mexican mothers monitor their infants visually, intervening as the occasion requires with more active behaviors such as talking, touching, or holding.

To test Hypothesis 2, we examined the correlations of maternal schooling with four categories of maternal responsiveness at 10 months, as shown in Table 5. (Mother's touching has been dropped from the table because its correlations with schooling

Table 4
Mean Proportion of Maternal Behaviors in Response to 10-Month-Old Infant Behaviors in the Cuernavaca Sample

Maternal behavior	Infant behavior					
	Vocalize		Look		Cry	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Look	.46	.21	.59	.21	.60	.33
Talk	.19	.12	.27	.15	.31	.27
Hold	.12	.15	.14	.15	.21	.25
Physical	.14	.13	.16	.12	.17	.19
Feed	.02	.03	.06	.06	.04	.08

Note. *n* = 72.

Table 5
Correlations of Maternal Schooling With Four Types of Maternal Responsiveness to Infant Behaviors at 10 Months of Age in the Cuernavaca Sample

Maternal response	Infant behavior		
	Vocalize	Look	Cry
Look	.21*	.22*	.25**
Talk	.29***	.28**	.18
Hold	-.15	-.28**	-.14
Feed	.09	-.15	.26**

Note. $n = 72$.

* $p < .10$. ** $p < .05$. *** $p < .01$.

were consistently close to 0.) Although not all of the correlations are significant, it is clear that the more schooling a Mexican mother has had, the more she talks and looks, and the less she holds, in response to the three categories of infant behavior at 10 months. (A similar pattern of correlations was found for maternal response to infant motor behaviors [LeVine et al., 1991].) Mothers with more education are also significantly more likely to feed their crying infants.

These results suggest that underlying the pattern seen for the whole sample of Mexican mothers in Table 4 are two divergent, schooling-related patterns of maternal responsiveness at 10 months of age—one in which looking and talking, or carrying on conversational exchanges, has become an important part of maternal care (as in the Boston sample), and another one in which holding the infant is the predominant mode of responding to infant behaviors (as in the Gusii sample). Father's schooling has no effect on any of the maternal responsiveness variables, and birth order affects only a few (it is mainly negatively related to maternal responsiveness to crying).

We examined this finding across the three age points (5, 10, and 15 months), using simple regression to predict the logistically transformed probability of each maternal responsiveness variable with mother's schooling. With the obtained models, we then calculated "fitted logits" by substituting in two different levels of maternal education: 2 years and 9 years. The results of these calculations are shown in Figure 1. The steepness of the slope of the line connecting the predicted values indicates the strength of the relationship with maternal schooling at a particular age point. The relative height of the line reflects the probability of the behavior (lines that are higher reflect more probable behaviors).

At 5 months, when babies are being held much of the time, there is little difference in holding between the mothers with 2 years and those with 9 years of schooling. By 10 months, however, when the frequency of holding has dropped for the sample as a whole, the average level is much lower for mothers with 9 years of schooling. Mothers' verbal and visual responsiveness to three infant behaviors tends to show the opposite trend, although verbal response to infant vocalization is higher for the more educated mothers at all age points. By the time their infants are 10-months-old, the mothers with 9 years of education were more responsive verbally and visually. The 15-month data indicate that this general trend increases further for the older

infants, indicating a greater trend toward conversational interaction among the more educated mothers with their infants. On the whole, the correlational analysis of the Mexican observations at 10 months (Table 5) and the regression analyses at 5 and 15 months as well as at 10 months (Figure 1) provide evidence supporting Hypothesis 2, that maternal responsiveness within a culturally similar population is affected by the mother's level of school attainment.

General Discussion

These two studies indicate that cultural and educational variations affect maternal responsiveness in specific ways, confirming and amplifying the two hypotheses formulated at the beginning of the article. The Gusii-Boston comparison showed that two groups of mothers differing by conventions of conversational interaction and norms of mother-infant interaction are both responsive to their infants, though differently. The Gusii are physically responsive, particularly to crying rather than nondistress vocalization; the Boston mothers are predominantly verbally and visually responsive, about equally to babbling and crying. These cultural differences are evident at 3–4

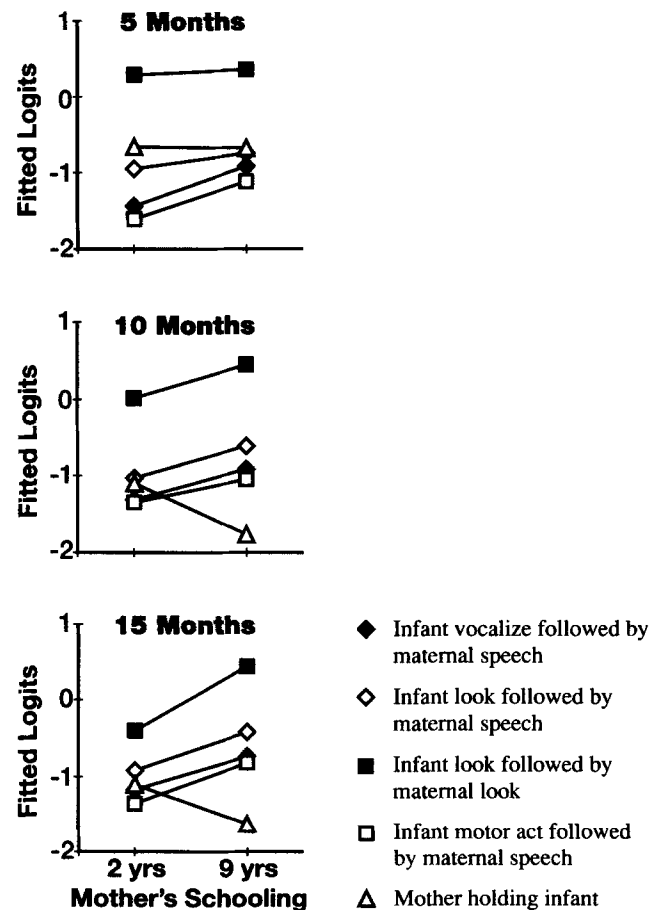


Figure 1. Fitted logits, calculated from a regression analysis of mother's education on five types of maternal responsiveness at 5, 10, and 15 months.

months but more pronounced at 9–10 months, partly because of the greater physical distance that Boston mothers put between themselves and their babies at the later age, when Gusii mothers retain the earlier pattern of close proximity and tactile contact. The increasing cultural divergence may also reflect the mutual establishment of a communicative pattern between infant and mother as the infant's capacities for social and communicative response continue to grow. We have interpreted this cultural difference in maternal style of responsiveness in terms of the Gusii mothers' goal of soothing and minimizing infant arousal, in contrast to the Boston mothers' goal of visual and vocal engagement, stimulation, and positive emotional arousal. Furthermore, the gaze aversion of Gusii mothers in the videotaped face-to-face situation when their babies were becoming positively excited was one of the distinctive findings of the microanalysis by Dixon et al. (1981). In short, the Gusii mothers, by comparison with the Boston sample, show a pattern of responsiveness that is strikingly designed to reduce distress and maintain calm in the infant during the 1st year of life.

These group differences in behavior reflect divergent cultural scripts for mother–infant interaction, one of which promotes conversational exchange as understood in the West, the other of which promotes a distinctly different model of maternal responsiveness that seems to be consistent with nonpathological development. This divergence can be explained in various ways, but no definitive explanation is possible in the context of a two-culture comparison with small samples.

It is possible to claim, however, that the fairly extreme deviation of Gusii mothers from the norms of maternal responsiveness prevalent in middle-class America raises fundamental questions about what is normal and pathogenic in responsiveness to infants. We see no indication in this evidence that one group of mothers is more responsive than the other, only that they are responsive in different ways to their infants' signals. The rarity among the Gusii of the kind of communicative engagement that has been held to be universally required for the healthy psychological development of human infants (Trevarthen, 1989) underscores the necessity of conceptualizing the universal needs of infants in terms more open to cultural variation. These findings suggest that the Gusii and Boston infants begin participating during the first few months of life in conventionally organized patterns of communicative interaction, of which maternal responsiveness is a central part, and that these patterns provide an entry into the culture-specific systems of meaning that constitute the environment for their subsequent psychological development (Bruner, 1990). How the nonverbal communication and tactile responsiveness of Gusii mothers, and their greater responsiveness to the crying than to the babbling of their infants, affects the latter's psychological development, is a matter of speculation at this point but constitutes a challenge for future research.

The Mexican study was designed to test Hypothesis 2 by examining educational differentials in maternal responsiveness without concomitant variations in social stratification. The low-income neighborhoods of Cuernavaca, where female school attendance is relatively recent and where wide-ranging individual differences in school attainment occur among women of the same street, socioeconomic status, and culture, were well suited to this purpose. The correlations of maternal

school attendance, which ranged from 1 to 9 years, with verbal and visual responsiveness to infants were strikingly and surprisingly similar to relationships found in the United States at much higher levels of maternal education. The relationships in the Mexican sample were found at 5, 10, and 15 months and were largely unrelated to husband's schooling or birth order of the child. Maternal schooling emerges from this study as an important influence on maternal responsiveness during infancy in and of itself, rather than as reflecting the social variables with which it is often associated.

The question of how schooling affects maternal responsiveness cannot be entirely answered on the basis of these Mexican findings. Nevertheless, the relationship of a mother's schooling to her verbal responsiveness strongly suggests that the school experience provides women with verbal skills and models of adult–child verbal instruction that they would not acquire without schooling and that are carried forward into the way they care for their infants as parents (LeVine et al., 1991). Thus schooling inadvertently constitutes socialization for a particular kind of mothering involving early reciprocal vocalization, that engages mother and infant in a long-term relationship based on verbal communication.

It should be noted that the findings from both studies involved a contrast between verbal and nonverbal forms of maternal responsiveness, partly because of the gross behavioral categories used and perhaps also because educational levels varied between the Gusii and Boston samples as well as within the Mexican sample. The determinants and consequences of verbal interaction during infancy remain promising topics for investigation, but an even greater challenge is presented by the description and analysis of nonverbal forms of maternal responsiveness.

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