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!Kung Infancy: The Social Context of Object Exploration

Roger Bakeman and Lauren B. Adamson

Georgia State University

Melvin Konner

Emory University

Ronald G. Barr

McGill University

BAKEMAN, ROGER; ADAMSON, LAUREN B.; KONNER, MELVIN; and BARR, RONALD G. *!Kung Infancy: The Social Context of Object Exploration*. CHILD DEVELOPMENT, 1990, 61, 794–809. The present study consists of new analyses of systematic observations of !Kung infants made by Konner during the late 1960s and early 1970s. Our intent was to examine claims about the role of object sharing in development by describing how !Kung infants develop interest in objects and how their caregivers act toward them when they are engaged in object-related acts. Results indicated that infants first displayed sustained interest in objects beginning at 4 months of age and that, beginning at about 8 months, they also began to engage in relational play and to give objects to others. Others tended to ignore infants during episodes of object manipulation and play, but moments of object offering were often socially embedded. These findings provide support for claims that there are universal changes in infants' involvement with objects and that their involvement is channeled in a culturally relevant manner by their caregivers.

By the middle of their first year, infants often spend extended periods exploring objects, repeating and revising their actions (Piaget, 1952). Several developmental theorists have stressed that the emergence of this interest in and skill with objects occurs in a social context. For example, Bruner (1972) notes that caregivers set the stage by establishing the circumstances and often providing the substance for object play. In addition, they may share their infants' engagement and provide object-related experiences that the infants could not yet generate by themselves (Vygotsky, 1978).

This early sharing of objects may profoundly influence the infant's understanding of them. Stern (1985), Trevarthen (1988), and others (e.g., Newson & Newson, 1975) argue, for example, that by the end of the first year, infants are capable of "intersubjectivity." As they share attention, affect, and intentions

with partners, they therefore gain "the skills and 'sense' of culture" (p. 39) possessed by skilled partners who are "curators of meaning" (p. 68) (Trevarthen, 1988). Particularly when this sharing involves objects (which Trevarthen calls "secondary" intersubjectivity), the child also gains a sense of the "symbolic potential" of objects and actions.

Three related claims have been made concerning the development of shared object involvement. The first is that there are age-linked changes in the fundamental structure of communication that are universal in all cultures and that, specifically, shared object involvement emerges at approximately 10 months of age. The second claim is that infants are essential participants in structuring episodes of shared object involvement. For example, Trevarthen and Hubley (1978) suggest that the emergence of infants' capacity for secondary intersubjectivity can be gauged

The order of the first two authors is arbitrary. We would like to thank Barbara Rogoff, Irving Sigel, and anonymous reviewers for helpful comments on an earlier draft. Preparation of this paper was supported by grant HD 23206 from the National Institute of Child Health and Human Development, by the Vice President's Research Fund of Georgia State University, and by a W. T. Grant Faculty Scholar award to the fourth author. Correspondence concerning this article should be addressed to either Roger Bakeman or Lauren B. Adamson, Department of Psychology, Georgia State University, Atlanta, GA 30303.

by the occurrence of "a deliberately sought sharing of experiences about events and things" (p. 184).

There is mounting evidence from studies of Western infants to support these two claims. For example, Bakeman and Adamson (1984) have documented that "coordinated joint engagement," during which infants sustain attention both to a partner and a shared object, increases in frequency between 9 and 18 months of age with both adult and peer partners. Several other observers of early social interaction have also noted how actively infants contribute to episodes of shared object exploration. For example, the child in the last half of infancy has been called an eager "apprentice" (Kaye, 1982) who seeks the partner's affective appraisal of objects (Klinnert, Campos, Sorce, Emde, & Svejda, 1983) and instrumental assistance (Rogoff, Mistry, Radziszewska, & Germond, in press). Many other researchers (see Bates, 1979, and Stern, 1985, for reviews) document that infants now begin to initiate communicative exchanges about objects and events by using such intentional acts as pointing and requesting.

The third claim found in many recent discussions of shared object involvement is that caregivers play an essential role in its emergence and its content. Stern summarizes this position well when he writes that the mother "brings the infant's behavior into her framework of created meanings" (1985, p. 134). Trevarthen (1988) expands on this position by suggesting that although the "cooperative motives" of the infant seem to fuel the construction of cultural awareness, caregivers provide the content of this awareness, exposing infants to a wide range of culturally regulated "treatments" that influence the course of subsequent development.

Of the three claims, the third may be the most difficult to evaluate. It can be broadly supported by demonstrations that the "transformation of mother-infant co-operation [at 10 months] takes different patterns in different pairs, and social classes may show consistent differences in style of communication about joint tasks" (Trevarthen, 1988, p. 54). Moreover, it is consistent with the many demonstrations (e.g., Clarke-Stewart, 1973; Hunter, McCarthy, MacTurk, & Vietze, 1987; Jones & Adamson, 1987; Smith, Adamson, & Bakeman, 1988) that there is a link between variations in what mothers do during joint object play and their infants' later cognitive and/or language performance.

But to be evaluated fully, this claim must be assessed with observations of infants who are developing in different cultures, especially understudied, non-Western cultures. Such descriptions are particularly important in light of Stern's (1985) suggestion that different societies may minimize or maximize the need for intersubjectivity. Caregivers in different cultures appear to hold strikingly different opinions about the importance of teaching deeply canalized infant acts such as walking and talking (see, e.g., Schieffelin & Ochs, 1986). Thus there is little reason to think that tacit knowledge about what they should do to support their infants' involvement with objects is uniform across cultures. Yet, despite increased interest in cross-cultural variations in mother-infant interaction (see, e.g., Field, Sostek, Vietze, & Leiderman, 1981; Leiderman, Tulkin, & Rosenfeld, 1977), the literature contains few systematic descriptions of how objects are incorporated into social interactions in markedly different cultural contexts.

The goal of the present study is to provide descriptions of infants' interaction with objects in a culture that ethnographers report does not encourage shared object involvement except when objects are the focus of interpersonal exchange. To develop these descriptions, we reanalyzed the extensive, systematic observations that Konner made of !Kung infants and their caregivers during infancy in order to portray how !Kung infants develop interest in objects and how their caregivers act toward them when they are engaged in object-related acts. Such descriptions should help assess the generalizability of findings that infants display interest in object exploration and object sharing during the middle of their first year and of the claim that adults convey culturally relevant messages about objects by the way they mark moments when infants interact with objects.

The !Kung San are warm-climate gatherers and hunters living in a semi-arid region of northwestern Botswana who have been studied extensively (see Lee, 1979, and Lee & DeVore, 1976; for work specific to infancy, see Konner, 1972, 1976, 1977; cf. Myers, 1988). Certain features of their culture make an examination of !Kung infants' object exploration an excellent case for evaluating the robustness of claims about the emergence of shared object involvement. First of all, infants' everyday activities permit extensive and intense social interactions so that it is reasonable to assume that others will be attuned to changes in their interests and capacities.

Mothers are constantly with their young infants as they carry them more than half their waking hours, sleep with them, and nurse them several times an hour (Konner, 1972; Konner & Worthman, 1980). In addition, mothers and infants are typically in the company of relatives and friends, a situation which Draper (1976) describes as "a rather thick human press" (p. 209).

Second, ethnographic reports suggest that there are specific cultural messages about objects that are conveyed to infants. The !Kung are said to be far less interested in objects per se than in how objects are embedded in a complex system of object exchange called *hxaro* (Lee, 1979). Adults devote considerable time to this system. For example, Wiessner noted that 60% of conversations she recorded "came down to who had what and did or did not give it to whom" (1982, p. 68). Moreover, giving and taking are reported to be emotion-laden acts that occasion "a high level of bickering" (Draper, 1978, p. 45; see also Marshall, 1976).

Infants seem to be taught about the importance of exchanging objects. They are brought into the formal system of reciprocity soon after birth, and between their sixth month and first year, their grandmother begins symbolic training in *hxaro* by guiding the giving of beads to relatives (Wiessner, 1982). Moreover, they are encouraged to share things, and their first words include *na* [give it to me] and *i* [here, take this] (Shostak, 1976).

In contrast, adult tuition related to object manipulation seems minimal. Natural objects such as twigs, grass, and stones; parts of food, such as nutshells and bones; and implements such as the household mortar and pestle are continually available to infants. The typical position of the young infant allows constant access to objects hanging around the mother's neck (Konner, 1976) and, once an infant is mobile, object exploration is never restrained (Konner, 1972). Konner (1972) also notes that caregivers sometimes urge infants to look at interesting objects and hand objects to infants to calm or distract them. Yet adults do not make toys for babies. Nor is there mention that adults encourage increasingly complex forms of object manipulation or object-focused language. Indeed, the folk view of development seems to emphasize a child's need for space to explore, a view that is revealed by the !Kung phrase, *a n/tharo an/te* [he/she is teaching/learning him/herself].

In summary, current ethnographic reports suggest that !Kung infants grow up in a

culture that provides the opportunity for rich and varied exchanges with other people who rarely share their exploration of objects except in the specific instance of object exchange. This cultural context is thus an interesting one for the assessment of claims about the emergence of shared object involvement. By examining what happens during the everyday activities of !Kung infants and their social partners, we address three questions about this process. First, we ask whether or not the developmental pattern of !Kung infants' interest in objects is similar to the pattern reported for infants observed in Western cultures. Second, we ask whether or not !Kung infants appear to actively seek the involvement of social partners as they focus on objects. And, finally, we ask whether !Kung caregivers appear to share infants' involvement with objects in ways that are consistent with ethnographers' reports about the role of object manipulation and exchange in this culture.

Method

Observations and Procedure

Detailed records of the behavior of !Kung infants, and of others' reactions to them, were made by Konner in northwestern Botswana during a 20-month period between 1969 and 1971 and a 6-month period in 1975. The analyses of this corpus presented here focus on what we call an observational segment. A segment consisted of observations of one infant at a particular age and, ideally, consisted of six 15-min sessions, randomly distributed over the waking hours and completed within a week. The entire corpus consists of 68 segments in all. The intent was to represent the behavior of infants at various ages throughout infancy, and so sampling was guided primarily by the age of available infants. Because of the limited number of infants in the population, some were observed more than once, although at different ages, and hence some infants contributed more than one segment of data. Ages of infants when observed ranged from 1 to 99 weeks (0.23 to 22.8 months).

The present report focuses primarily on the 44 segments for infants who were four months old or older when observed. These segments represent 64 hours of recording (40 segments consisted of 6, two of 5, one of 4, and one of 2 15-min sessions) and include observations of 33 different infants (26 infants were observed once, 4 were observed at two, 2 at three, and 1 at four different ages). Female infants were observed for 20 of the 44 segments and, on average, at older ages than males. Means were 15.1 and 11.2 months for

females and males, respectively, $F(1,42) = 6.6, p < .05$.

The observer, Konner, was a member of the Kalahari Research Group, a group that began studying the !Kung in 1963 (see Lee, 1979). Konner had interacted with the mothers prior to observation and had informed them of his desire to observe them as they went about their everyday activities in their village. An observational session was not begun unless the infant was awake, not in the sling at the mother's side, not nursing, and within 15 feet of the mother. Konner recorded codable behaviors as they occurred on a lined recording form. Each line represented 5 sec. Time was marked by an electronic beeper that emitted a signal through an earpiece every 5 sec. The result was interval-recorded data, that is, a record of all behavioral codes that occurred within each successive 5-sec interval throughout the 15-min observational sessions.

Observer Reliability

All data were recorded by Konner who, before going to the field, established reliability with other observers. Once observation began, however, reliability was not further assessed. Although this is not an ideal situation, this lack of reliability statistics should be balanced against the uniqueness of the data collected and the difficulty of collecting any data at all in remote locations, the concreteness of the codes used in this case, and the demonstrated ability of the observer and others, using essentially similar codes, to establish reliability (see Elias, Nicholson, & Konner, 1986).

Codes and Data Reduction

Codes included descriptions of over 100 specific behaviors and were derived, in part, from the work of Blurton Jones, and Tulkin and Kagan, among others (see Blurton Jones, 1972; Tulkin & Kagan, 1972). For the purposes of this report, 12 categories of acts were considered. Five detail *infants' involvement with objects* and represent increasing levels of presumed complexity: (a) Simple Manipulation—infant moves an object but without visual regard; (b) Exploratory Play—infant produces nonrepetitive movement of an object to examine its various properties; (c) Repetitive Play—infant exercises one scheme repeatedly in relation to an object; (d) Relational Play—infant juxtaposes two or more objects as in banging, touching, or throwing; and (e) Offers—infant offers an object, other than food, to another person. Two categories coded *infants' communicative acts*: (f)

Vocalizes and (g) Smiles or Laughs. The remaining five described *others' responses to the infant*: (h) Vocalizes; (i) Encourages—other indicates a course of action to infant, usually without modeling; (j) Entertains—other performs acts that seem intended to please, distract, or cause infant to laugh; (k) Prohibits—other performs acts which seem intended to interrupt or prevent an infant's act; and (l) Offers—other offers an object, other than food, to the infant.

As a preliminary analytic step we noted, separately for each of the 12 categories, which intervals contained codes representing that category. Thus the categories are not mutually exclusive, at least not by definition, although in practice different categories of infants' object involvement, for example, almost never co-occurred. Two major kinds of descriptive statistics, computed separately for each segment, were derived from these data: the percentage of 5-sec intervals checked for a particular category and the probability that intervals checked for various categories would co-occur with, or would be preceded or followed by, intervals checked for other behavioral categories.

Results

Three types of analysis were pursued. The first examines how the 12 object-focused activities and social-communicative acts just defined were affected by infants' age, the second focuses on the embeddedness of infants' object-focused activities within social-communicative acts, and the third examines sequential relations between others' acts and a key infant behavior—offers.

Infants' and Others' Acts: *Simple Percentages*

In order to learn at what age these acts first occurred, how often they occurred, and how their occurrence varied with infants' age, we computed the percentage of 5-sec intervals checked for each act, separately for all 68 segments, and then graphed the results (see Figs. 1–3). The X axes indicate the age of the infant when observed (recall that each segment consisted of observations of an infant at a different age) and the Y axes indicate the percentage scores for infants' object-focused acts and infants' and others' social-communicative acts. In addition, we computed and graphed percentages for a superordinate category formed by lumping the five infant object categories together (see Fig. 4).

Because the behavior of primary interest to us—infants' involvement with objects—

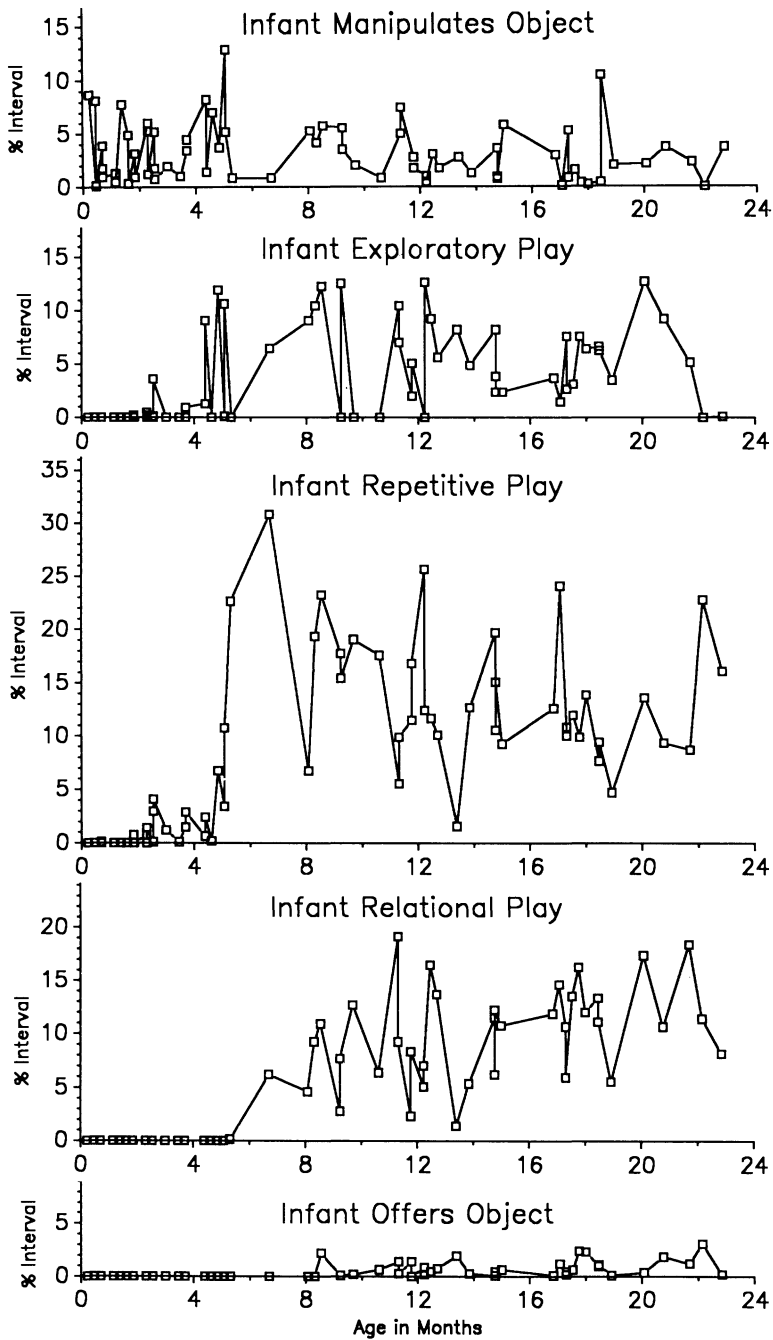


FIG. 1.—Percentages of 5-sec intervals coded for infants' object-focused acts for 68 observational segments. Each segment represents a different-aged infant. Ages ranged from 0.23 to 22.8 months.

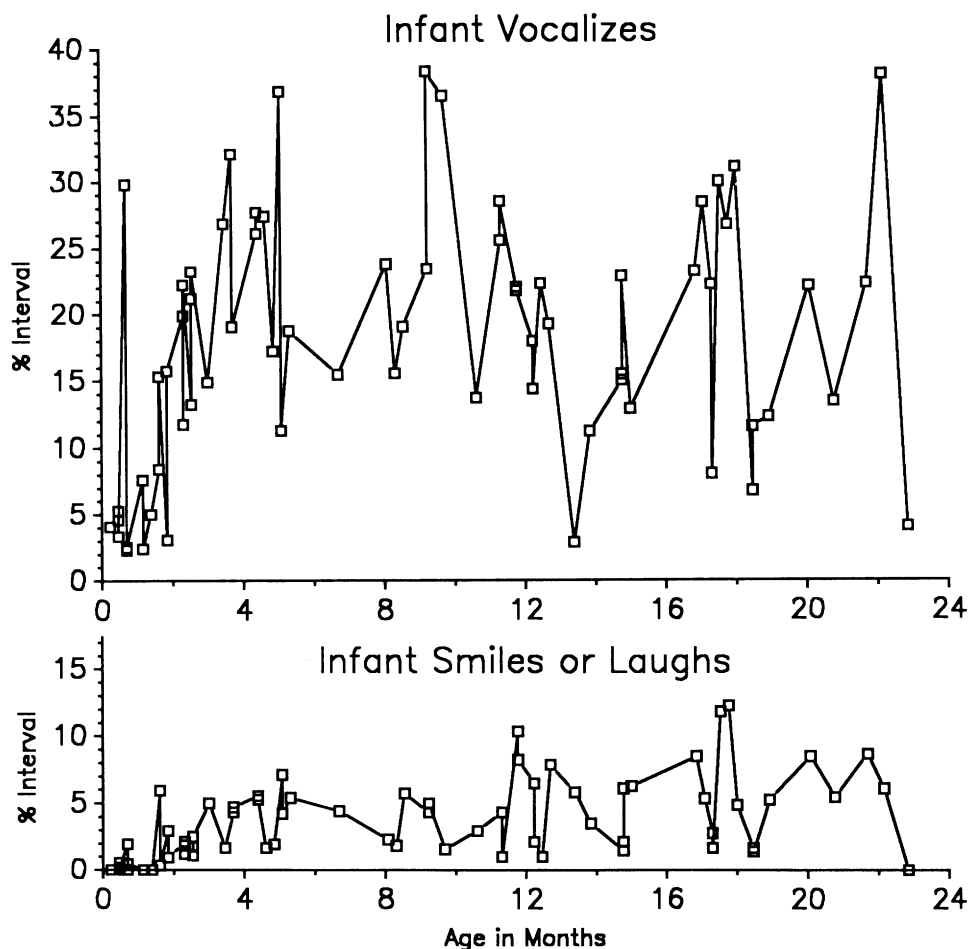


FIG. 2.—Percentages of 5-sec intervals coded for infants' social-communicative acts for 68 observational segments. Each segment represents a different-aged infant. Ages ranged from 0.23 to 22.8 months.

occurred rarely if at all during the first 4 months of life, most of our analyses are based on the 44 segments for infants 4 months of age or older, although for relational play and infants' offers, only the 36 segments of infants 8 months of age or older were used. Most of the behaviors we examined occurred at least once during most of these segments: repetitive and relational play, infant vocalizing, and other vocalizing, encouraging, and offering occurred in all segments considered; manipulation, infant smiling/laughing, and other entertaining and prohibiting in all but one; infant offering in all but three; and exploratory play in all but seven.

Mean percentages for each category, for the segments falling within the age ranges specified, are given in Table 1. Infants' object involvement was quite frequent, occurring during 30% of the intervals. Vocalization was

also a common event: infants vocalized during 21% of the intervals, and during 7% others vocalized to infants. However, these scores should be regarded as upper bounds. Because they are percentages of 5-sec intervals checked, they will overestimate the actual proportion of time devoted to the various categories.

Age trends.—The first type of infants' object involvement to appear developmentally was simple manipulation, followed by exploratory, repetitive, and relational play and infants' offers. As previously noted, the amount of object manipulation before 4 months appears highly variable; in addition, there was essentially no exploratory or repetitive play recorded before 4 months and essentially no relational play or infants' offers before 8 months of age (see Fig. 1). The lumped cate-

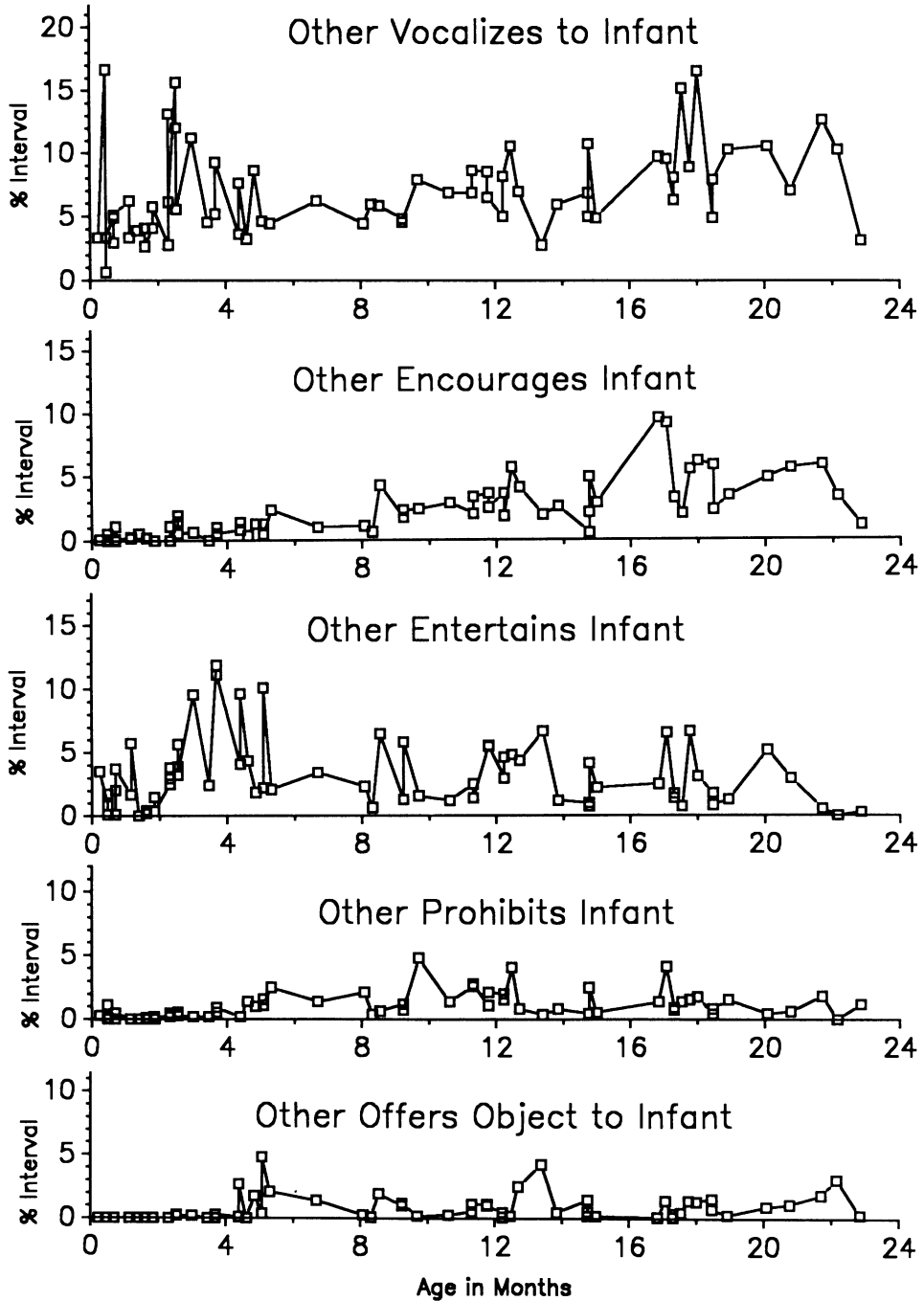


FIG. 3.—Percentages of 5-sec intervals coded for others' social-communicative acts for 68 observational segments. Each segment represents a different-aged infant. Ages ranged from 0.23 to 22.8 months.

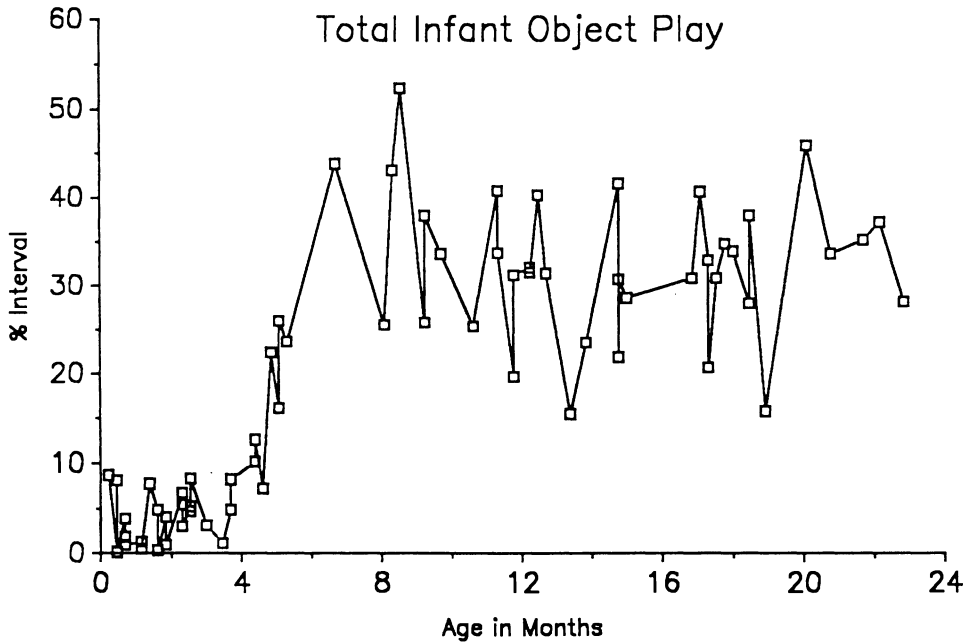


FIG. 4.—Percentages of 5-sec intervals coded for infants' total object involvement for 68 observational segments. Each segment represents a different-aged infant. Ages ranged from 0.23 to 22.8 months.

gory of total infants' object involvement suggests three phases: low and variable amounts before 4 months, consisting mainly of object manipulation increasing from 4 to 6 months; and higher but not increasing amounts from 6 to 24 months of age (see Fig. 4).

Age trends were tested statistically by regressing the percentage scores for each seg-

ment on the infant's age for that segment. Scores before 8 months of age for relational play and infants' offers, and before 4 months of age for other acts—scores that were mainly zero—were not included in the analysis. The linear trend for total infants' object involvement (after 8 months) was not significant. Partly this is because linear trends for exploratory and repetitive play and infants' offers

TABLE 1
PERCENTAGES, RATES, AND MEDIAN DURATIONS FOR INFANTS' AND OTHERS' ACTS

Act	Percentage	Rate	Duration
Infant manipulates object	3.2 (2.8)	11 (9.1)	1.4 (.44)
Infant engages in exploratory play	5.5 (4.2)	19 (13)	1.2 (.63)
Infant engages in repetitive play	12.6 (6.9)	31 (16)	1.9 (.52)
Infant engages in relational play	10.1 (4.5)	19 (8.1)	2.5 (.72)
Infant offers object8 (0.8)	4.3 (4.4)	1.0 (.35)
Infant vocalizes	20.5 (8.6)	75 (26)	1.3 (.15)
Infant smiles or laughs	4.8 (2.9)	20 (11)	1.3 (.31)
Other vocalizes to infant	7.3 (3.0)	36 (13)	1.2 (.08)
Other encourages or directs infant	3.1 (2.1)	16 (9.1)	1.2 (.11)
Other entertains infant	3.2 (2.4)	11 (7.6)	1.5 (.38)
Other prohibits infant	1.5 (1.1)	9.2 (6.5)	1.0 (.18)
Other offers object to infant	1.1 (1.1)	6.6 (6.2)	1.0 (.18)
Infant involved with objects, total	29.9 (9.8)	54 (15)	2.2 (.49)

NOTE.—Scores are means (and standard deviations) and are based on 36 segments for relational play and infants' offers (infants 8 months of age or older), 44 segments otherwise (infants 4 months of age or older). Percentages are percentages of 5-sec intervals coded for the particular behavior during a segment; rates are episodes per hour (an episode is a sequence of 5-sec intervals, all coded for the particular behavior); and durations are median episode durations, measured in intervals.

TABLE 2
PERCENTAGES INVOLVING DIFFERENT PARTNERS FOR SELECTED ACTS

ACT	PARTNER						
	Mother	Woman	Sib	Child	Father	Man	Other
Vocalizes to infant	50	18	13	9	5	5	1
Encourages infant	45	24	8	8	3	6	5
Entertains infant	31	21	19	12	4	4	9
Prohibits infant	52	13	10	7	8	3	7
Offers to infant	52	14	8	11	3	5	6
Infant offers	46	16	12	10	5	4	6

NOTE.—Scores are percentages of 5-sec intervals coded for the particular behavior. Percentages may not sum to 100 across a row due to rounding. "Woman" represents a woman not the mother, "Child" a child not a sibling, and "Man" a man not the father. "Other" is a generic code, indicating that the partner was not further specified.

were not significant, partly because a negative trend for manipulation and a positive trend for relational play canceled each other out. The slopes, or unstandardized regression coefficients, indicated that manipulation decreased 2.2, whereas relational play increased 4.6, percentage points per year within the age ranges 4–24 and 8–24 months, respectively. Proportions of variance accounted for (R^2) by these two linear trends were .119 and .142, $F(1,42) = 5.6$ and $F(1,34) = 4.9$, $p < .05$ for both.

Similarly, the amount of infants' vocalizing and smiling or laughing and the amount of others' speaking to, encouraging, entertaining, and prohibiting infants appears lower and more variable before 4 months, higher thereafter (see Figs. 2 and 3). In addition, others hardly ever offered objects to infants younger than 4 months. Age trends for infants' vocalizing, infants' smiling or laughing, and others' prohibiting and offering were not significant. With increasing age, however, others spoke to and encouraged infants more but entertained them less. The unstandardized regression coefficients indicated that others' speaking to infant increased 3.2 and others' encouraging increased 2.7, whereas others' entertaining decreased 2.0 percentage points per year within the age range 4–24 months. Proportions of variance accounted for by these three linear trends were .223, .304, and .130; $F(1,42) = 12.1$, 18.4, and 6.3; $p < .01$, .001, and .05, respectively.

Sex effects.—Because sex and age were related (recall the mean ages for segments involving female and male infants were significantly different), an analysis of covariance with age as the covariate was used to test for sex effects. Only one score suggested a sex effect: males were somewhat more likely than females to smile or laugh, $F(1,41) = 5.6$, $p <$

.05. The adjusted mean scores were 5.9% for males, 3.7% for females. Otherwise, no sex effects were found, either for the remaining infants' and others' acts listed in Table 1, or for others' acts broken down for mothers and nonmothers separately.

Partner effects.—In addition, mothers and nonmothers did not differ with regard to encouraging, prohibiting, or offering objects to infants; and infants were no more likely to offer objects to mothers than nonmothers. Nonmothers, however, vocalized to and entertained infants more than mothers. Mean percentages for vocalizing were 3.1% and 4.3%, and for entertaining were 1.1% and 2.1% for mothers and nonmothers, respectively, $t(43) = -2.36$ and -3.72 , $p < .01$ and .001.

For the analyses just described, we distinguished acts involving infants' mothers from acts involving other partners but did not make finer distinctions because of the small numbers involved. Nonetheless, for descriptive purposes, it is informative to know who the other partners were. As noted in Table 2, infants were most likely to be involved with their own mother (range = 31%–52%), next most likely with another woman (13%–24%) or a child (16%–31% for siblings and other children combined), and least likely with their father or another man (8%–11%).

Infants' and Others' Acts: Episode Rates and Durations

Defining an episode as a run of successive 5-sec intervals all checked for the same category, we computed the rate (number of episodes per hour) and median episode duration (in intervals) for the categories studied (see Table 1). Because a behavior that occurs at the beginning of one interval and again at the end of the following interval would be counted as a two-interval episode, these

scores may underestimate the actual rate and overestimate the actual duration.

Taken together, percentage, rate, and duration provide a better picture of how the acts studied were distributed in time. For example, episodes of relational play were longer than episodes of repetitive play, which in turn were longer than episodes of exploratory play. The rate for relational play (about one episode every 3 min), however, was lower than the rate for repetitive play (about one episode every 2 min), and so as a result the amount of time devoted to these two types of play was about the same (10.1% and 12.6%, respectively).

Some sort of infant involvement with objects was a common event. An episode of infants' object involvement occurred almost once a minute on the average and often lasted for two 5-sec intervals or more. It is not surprising, then, that typically one of the object involvement categories was noted during 30% of the intervals analyzed. In contrast, object offering was a relatively rare event. It occurred once every 9 min on the average, when someone offered an object to an infant (4 months of age or older) and once every 14 min, when an infant (8 months of age or older) offered an object to someone else. Typically, offering was a brief event; the median duration was 1.02 and 1.03 intervals for offers by and to infants, respectively.

Infants' and Others' Acts: Co-occurrences

In order to examine whether infants' object-focused and social-communicative acts tended to co-occur (or not) with others' social-communicative acts, first we tallied co-occurrences within intervals—separately for the various pairs of infants' and others' acts and separately for either 44 or 36 segments depending on the acts examined. Then, for each pair of acts, we compared the observed joint frequency with its expected value, given base rates for that segment. Finally, we counted the number of segments for which observed co-occurrences were less than (or more than) expected and evaluated whether these tallies deviated significantly from an even split using a sign test (two-tailed). Results of these analyses are given in Table 3. If infants' and/or others' acts never occurred in a segment, observed and expected were both zero. The number of such segments is noted in Table 3 but was not included in the analysis.

In general, when infants were engaged in object-focused activity (manipulating or exploring objects or engaging in repetitive or

relational play), others spoke to, encouraged, or entertained them less than at other times. Moreover, others offered objects to infants less during such intervals (with the exception of repetitive play, which evidenced no significant pattern) and also offered less during intervals when infants were themselves offering objects. However, when infants vocalized and smiled or laughed, others spoke to them more than at other times. Others also entertained more when infants smiled or laughed but encouraged less when infants vocalized. (See Table 3; similar patterns were noted when counts computed separately for mothers and nonmothers were examined.)

Thus the general response to infants' involvement with objects was inhibition of social-communicative acts. This is most evident when others' acts are lumped. For a significant number of segments, the probability of some response (vocalize, encourage, entertain, prohibit, offer—labeled "Total other" in Table 3) was less than expected during intervals when infants were engaged in object manipulation, and exploratory, repetitive, or relational play. For their part, infants were unlikely to vocalize during object manipulation and unlikely to smile during manipulation, exploratory, repetitive, or relational play (see Table 4).

The only exception to this general pattern of disassociation between infants' object involvement and social-communicative acts involves infants' offers. Considered separately, no association was noted for others' vocalizing and encouraging, and disassociation was noted for others' entertaining, prohibiting, and offering. Yet, the probability that others would act in some way ("Total other") when infants offered was greater than expected for 22 of 33 segments ($p < .10$, two-tailed). Moreover, for 30 of 33 segments ($p < .001$, two-tailed) infants were likely to accompany their offers with vocalizations (see Tables 3 and 4).

Others' Acts: Occurrences Before, After, and Surrounding Infants' Offers

From the analyses just presented, there is some evidence that social-communicative acts and infants' offers co-occurred, at least in the same interval. In order to examine whether others elicited or responded to infants' offers in adjacent intervals, we tallied, separately for others' social-communicative acts and separately for the 36 segments, first the occurrences of another's act in the interval just before, and second just after, an interval

TABLE 3

NUMBER OF SEGMENTS FOR WHICH CO-OCCURRENCES OF OTHERS' ACTS IN THE SAME INTERVAL AS INFANTS' ACTS WERE LESS THAN, OR GREATER THAN, EXPECTED

OTHERS' ACT	INFANTS' ACT						
	Manip	ExpPl	RepPl	RelPl	Offer	Vocs	Smile
Vocalizes:							
<	35***	29**	34***	30***	17	6	7
=	1	7	0	0	3	0	1
>	8	8	10	6	16	38***	36***
Encourages:							
<	37***	27**	37***	28**	19	32**	19
=	1	7	0	0	3	0	1
>	6	10	7	8	14	12	24
Entertains:							
<	41***	33***	37***	33***	23*	27	0
=	1	7	1	1	4	1	2
>	2	4	6	2	9	16	42***
Prohibits:							
<	41***	14	23	19	30***	27	27
=	1	7	1	2	4	1	2
>	2	23	20	15	2	16	15
Offers:							
<	40***	27**	23	28**	27***	27	26
=	2	7	1	0	3	1	2
>	2	10	20	8	6	16	16
Total other:							
<	39***	25***	34***	30***	11	9	1
=	2	7	0	0	3	0	1
>	3	12	10	6	22	35**	42***

NOTE.—For each group of three numbers, the top represents the number of segments for which the observed co-occurrences were fewer than expected; the bottom, more than expected. The significance of these two numbers was assessed with a sign test (two-tailed). If the infant's act and/or the others' acts never occurred, expected and predicted were both zero. The middle line gives the number of segments for which this was true. Total other includes vocalizes, encourages, entertains, prohibits, and offers. Counts are based on 36 segments for relational play and infants' offers, 44 otherwise.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

TABLE 4

NUMBER OF SEGMENTS FOR WHICH CO-OCCURRENCES OF INFANTS' ACTS WERE LESS THAN, OR GREATER THAN, EXPECTED

INFANTS' ACT	INFANTS' ACT					
	Manip	ExpPl	RepPl	RelPl	Offer	Vocs
Vocalizes:						
<	34***	24	19	19	3	...
=	1	7	0	0	3	...
>	9	13	25	17	30***	...
Smiles:						
<	37***	32***	31**	31***	20	3
=	2	8	1	1	4	1
>	5	4	12	4	12	40***

NOTE.—Counts are based on 36 segments for relational play and infants' offers, 44 otherwise. Other details are as noted for Table 3.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

TABLE 5
NUMBER OF SEGMENTS FOR WHICH OCCURRENCES OF OTHERS' ACTS IN AN INTERVAL BEFORE OR AFTER INFANTS' OFFERS WERE LESS THAN, OR GREATER THAN, EXPECTED

Others' Act	Before	After
Vocalizes:		
<	19	19
=	4	3
>	13	14
Encourages:		
<	21	20
=	4	3
>	11	13
Entertains:		
<	20	22*
=	5	4
>	11	10
Prohibits:		
<	25**	26***
=	5	4
>	6	6
Offers:		
<	24**	19
=	4	3
>	8	14
Total other:		
<	10	8
=	4	3
>	22*	25**

NOTE.—Counts are based on 36 segments. Other details are as noted for Table 3.

* $p < .05$.
 ** $p < .01$.
 *** $p < .001$.

coded for an infant's offer. Results of these analyses are given in Table 5.

There is no evidence that others' vocalizing, encouraging, entertaining, prohibiting, or offering, considered separately, occurred more often than expected in intervals either

just before or just after intervals containing infants' offers. Indeed, prohibiting and offering before, and entertaining and prohibiting after, were significantly less likely to occur than would be expected from their overall rates of occurrence. There is evidence, however, that others elicited or responded to infants' offers in one of these ways. For a significant number of segments, the probability that another person would act (vocalizing, encouraging, entertaining, prohibiting, or offering) in an interval just before, or just after, the infant offered was significantly greater than expected.

The preceding analyses suggest that others acted in some way, at some point close in time, to infants' offering. In order to examine this possibility further, we tallied, separately for the 36 segments, the occurrences of another's act in the interval just before, during, or just after an interval checked for an infant's offer. Results of these analyses are given in Table 6. Consistent with the analyses already presented, the probability that others vocalized, encouraged, entertained, prohibited, or offered in an interval just before, during, or just after one in which the infant offered was significantly greater than expected for 26 of 33 segments.

Discussion

These observations of !Kung infants provide support for the prevalent notion that there are universal changes with development in infants' involvement with objects. The coding scheme was derived from observations with Western infants and was designed to capture developmental distinctions concerning the level of complexity of infants' acts, ranging from relatively simple episodes of object manipulation without visual regard to more complex forms of relational play. Like

TABLE 6
NUMBER OF SEGMENTS FOR WHICH OCCURRENCES OF TOTAL OTHERS' ACTS IN AN INTERVAL BEFORE, DURING, OR AFTER INFANTS' OFFERS WERE LESS THAN, OR GREATER THAN, EXPECTED

OTHERS' ACT	INFANTS' ACT						
	Manip	ExpPl	RepPl	RelPl	Offer	Vocs	Smile
Total other:							
<	38***	21	29*	30***	7	10	1
=	1	7	0	0	3	0	1
>	5	16	15	6	26**	34***	42***

NOTE.—Counts are based on 36 segments. Other details are as noted for Table 3.
 * $p < .05$.
 ** $p < .01$.
 *** $p < .001$.

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Western infants, !Kung infants younger than 4 months spent little time involved with objects; at most they might spend relatively brief periods manipulating them without visual regard. They first displayed sustained interest in objects during their everyday activities between 4 and 6 months of age. From then on, the amount of involvement with objects remained fairly constant while its form changed.

It is especially interesting to note that !Kung infants did not begin to engage in relational play or to give objects to other people until about 8 months of age, even though they played with objects considerably earlier. During both object offers and relational play with objects, infants must coordinate their attention between two foci, be they a social partner and an object or two aspects of an object array. Their relatively late emergence in both Western samples (Bakeman & Adamson, 1984) and the !Kung sample supports the idea that the age when coordination of attention first appears may be fairly constant across a broad range of environmental conditions.

Although by the end of their first year !Kung infants seem able to attend to both people and objects, our findings provide at best equivocal support for the notion that they attempt to involve others in their exploration of the object world. On the one hand, we observed that during object-focused activity they tended to smile less than at other times. On the other hand, when they did offer objects to others, they routinely marked their object offers with vocalizations. Such a coordination of offers and communicative acts is consistent with the claim of Eckerman and Stein (1982; see also Bakeman & Adamson, 1986) that offering objects is one of the earliest interactive skills mastered by toddlers.

Similarly, others also appeared to differentiate between infants' offers and their manipulation and play with objects. In general, infants' involvement with objects was largely unmarked by others, whereas their vocalizations and smiles were consistently noted. The exception to this pattern involved infants' offers, which were often embedded within some social-communicative act such as vocalizing or encouraging.

This pattern of co-occurrence between infants' and others' acts is consistent with ethnographic reports and with the notion that in !Kung culture communication focuses more on the interpersonal than the referential. This lends support to Sahlins's (1972) claim that messages about object sharing, as compared

to objects per se, are central to hunter-gatherers' social organization. It is also consistent with Trevarthen's view that the manner in which caregivers and infants share object involvement may provide an essential introduction to the cultural significance of objects.

Although our findings document a pattern consistent with more broadly drawn descriptions of !Kung child rearing and with recent theories of early social development, they also prompt concerns that are important to address in future studies. The first concern is that, since no compelling single pattern of either infants' or others' acts was evident during object offers, our analyses do not provide a clear image of the specific messages conveyed to infants about object exchange. The data do suggest that others neither explicitly prohibited infants' offers, nor did they prompt them with their own object offers. In addition, the data suggest that infants' offers tended to be embedded in any of a variety of social-communicative contexts. An important next step would consider what is being said and done during moments of object exchange. In particular, it would be interesting to know how relatively rare events that are thought to follow formal cultural scripts, such as the practice of *hxaro*, are structured with young infants.

The second concern is that our findings may challenge current theories of early communication development (e.g., Adamson, Bakeman, & Smith, 1990; Bruner, 1983) that suggest that joint attention to objects with a nurturing language user is an important condition for the facilitation of language acquisition. !Kung infants do not seem to experience sustained joint attention to objects even though they experience care that is characterized by "indulgence, stimulation, and nonrestriction" (Konner, 1976, p. 245). For example, we found that they were as likely to be offered an object by another as they were to experience a prohibition. This pattern of relatively infrequent shared attention to objects coupled with nurturing care suggests that a study of !Kung children's early language acquisition and use might be very provocative, particularly in light of recent concern with the possibility that there may be more than one route to language competence (e.g., Nelson, 1981).

One caution needs to be noted. The argument just presented relies on an implicit comparison between the !Kung and Western subjects who have been observed in recent

studies of early communication development. Yet the conditions of observation are hardly comparable. The !Kung were observed as they went about their everyday activities, and the observations involved many notable cultural features such as several potential social partners and no toys. But most of the studies of shared object play from our culture are based on brief, videotaped observations of mothers and infants engaged in structured "free play" with an array of toys (e.g., Bakeman & Adamson, 1984; Landry & Chapieski, 1989; Trevarthen & Hubley, 1978). Such situations tend to foster shared object involvement, and so perhaps it is not surprising that, when these different situations are compared, the !Kung caregivers seem unattentive to their infants' involvement with objects.

In order to assess the uniqueness of the findings reported here, findings based on comparable data collected in a Western setting are clearly desirable. Such comparisons are fraught with problems including the need to hold constant age, situation, coding scheme, and observational procedure. One study that offers a possibly valid and instructive comparison is Clarke-Stewart's (1973) observations of interactions between lower-class mothers and their 9-18-month-old infants in New Haven, Conn. Her subjects were observed at home for periods of 1½ hours during which the mother was instructed to "continue her normal duties and ignore the observer" (p. 13). Like Konner, Clarke-Stewart used systematic interval coding in an attempt to describe the full range of activities during an infant's typical day.

Of course, the two data sets are not fully comparable. Two particular differences constrain comparison. First, Clarke-Stewart used a 10-sec as compared to a 5-sec interval width. This difference means that her observations are more likely than Konner's to overestimate percentages. Second, her codes related to object involvement were not differentiated into categories based on type of act.

There are two important differences in the object related experiences of infants in these two samples. The first involves who plays with the baby. Clarke-Stewart did not eliminate people other than the mother from her observations. Yet they were rarely present, and they interacted with the infant for less than 2% of the time, on the average. In contrast, people other than the mother account for about half of the !Kung infants' social input, and overall, they spoke to and entertained the infants more than mothers even

though the mothers were present. This contrast provides yet another reminder (see, e.g., Tronick, Winn, & Morelli, 1985; Whiting & Edwards, 1988) that in only some cultures do mothers act as the sole, or even primary, "curators of meaning" (Trevarthen, 1988).

The second contrast involves the sheer amount of joint object involvement. Clarke-Stewart reports that infants in her sample spent, on the average, about 40.4% of their time playing with and exploring toys and other objects. !Kung infants spent somewhat less of their time, 29.9% on average, playing with objects. However, the Clarke-Stewart mean falls within the 95% confidence interval for the !Kung mean, suggesting that this difference is not significant. More instructive for our purposes, however, is the contrast involving how often others shared object involvement with the infant. In Clarke-Stewart's study, 4.5% of the intervals were coded for mothers' stimulating baby with materials, a figure that Clarke-Stewart thought was distressingly low. Yet in Konner's archive, others entertained, encouraged, or gave objects to infants during only 1.6% of the intervals when infants were engaged with objects (SD = 1.1%). In this case, the Clarke-Stewart mean falls outside the 95% confidence interval for the !Kung mean.

This comparison suggests that !Kung infants may indeed be experiencing a relation between the social and the object worlds that is markedly different from one widely thought to facilitate the development of early language and object manipulation skills. Common to infants everywhere, after 6 months of age they seem propelled toward objects. Perhaps unique to !Kung infants is the extent to which their object exploration is ignored by nurturing caregivers. What consequences, if any, this has for the course of subsequent development—whether, for example, this pattern presages a life-long approach to the object world that values the exchange of objects over their manufacture and possession—are questions that require future ethnographic and quantitative study. At the very least, the !Kung infants' experience with objects raises the intriguing possibility that mastery of early skills can course through different social contexts than the Western ones usually studied.

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