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Hunter-Gatherer Infancy and Childhood

The !Kung and Others

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In the 1970s, based on research among the !Kung San, then hunter-gatherers of northwestern Botswana, and on reviews of the ethnographic literature, some generalizations about hunter-gatherer childhood were put forward. Some features of !Kung infancy and childhood appeared to be representative of hunter-gatherers as described by ethnographers, a set of generalizations that may be called the hunter-gatherer childhood (HGC) model. These descriptions, along with more quantitative studies of !Kung infancy and childhood, suggested that present-day childcare methods are discordant with those in the human environments of evolutionary adaptiveness (EEAs), a discordance that could have developmental implications. Viewed against the phylogenetic background of the parental care patterns of higher primates, it also seemed possible that the HGC model was a species-specific instance of a general pattern characteristic of catarrhines. In addition, some specific theories of development were addressed. For example, the intensity of the mother-infant relationship among the !Kung and some other hunter-gatherers was viewed as supporting John Bowlby's model of the role of attachment in infancy.

However, excellent new research on hunter-gatherer infancy and childhood on the Agta, Efe, Hadza, Aka, and Ache called some of these generalizations into question. As much as or more than the !Kung research, these studies were methodologically sophisticated and focused on infancy and childhood. At the same time, new theory in life history evolution strongly suggested that hunter-gatherer childhood should not follow a single pattern but should adjust itself to widely varying ecological conditions (Belsky 1997; Chisholm 1993, 1999; Hrdy 1997, 1999); infant and child

care should be facultative, not obligatory, adaptations. This may be called the childhood as facultative adaptation or CFA model. It challenged the HGC model and the discordance hypothesis, questioning whether there is anything distinctive about hunter-gatherer childhood as a general adaptation. If correct, it could also undermine the claim that hunter-gatherer childhood supports the validity of specific theories of development, for example Bowlby's theory.

The CFA model is highly consistent with recent advances in natural selection (neo-Darwinian) theory applied to life histories. All life involves compromises and trade-offs, some that appear abhorrent to modern observers. Mothers in all species have many competing demands on their energy that mitigate their investment in individual offspring, notably the demands of other offspring and the mother's own prospect for future reproduction (Hrady 1999). Infanticide at or near the time of birth has long been known as a choice sometimes exercised by mothers in traditional societies, including hunter-gatherers. Among the !Kung, for example, it was reported in about 1 percent of births (Nancy Howell 1979), with the stated goal of enhancing the quality of care and survival of existing children and to avoid caring for seriously defective children, almost certain to fail. Some hunter-gatherers may have used it to bias the sex ratio in favor of males, a practice strongly correlated with the percentage contribution of males to the calorie content of the diet (Hewlett 1991a). Birth spacing and children's contribution to subsistence are other features of hunter-gatherer childhood now clearly in the realm of partly facultative adaptations (Blurton Jones 1993; Hill and Hurtado 1996).

Nevertheless, as pointed out by Tinbergen, there are two kinds of evolutionary causes of any character (Tinbergen 1963): (1) adaptation through natural selection in the environment of evolutionary adaptedness, and (2) constraints on the organism's solutions to adaptive challenges due to its phylogenetic history (Maynard Smith et al. 1985). If the monkey and ape background to hominid evolution entailed a consistent pattern of care of infants and juveniles, one would expect it to have coevolved with aspects of normal or optimal development that might have become dependent on it. If so, this would presumably limit the range of facultative adaptations easily achieved in human evolution, or at least the range achieved without developmental consequences.

This chapter has three purposes. First, it reviews what was actually claimed in the 1970s and 1980s based on the !Kung research and surveys of the older literature, against the background of well-studied higher primates, with some reference to more recent analyses of !Kung data. Second, it reviews the newer hunter-gatherer studies and the challenges presented to the HGC model by this research. Third, it considers whether the HGC model has any remaining validity.

!KUNG INFANCY AND CHILDHOOD

By the 1950s, ethnographers described !Kung infants as having extremely close physical relationships with their mothers and being highly indulged in every way. !Kung childhood and adolescence were said to be relatively carefree and the child group played a key role in socialization after infancy. Physical punishment was rare. Extensive observational research on infancy and childhood supported these generalizations. The results, described in papers published in the 1970s and 1980s, may be summarized as follows.

Nursing Pattern. !Kung infants were breast-fed whenever they fretted and often at other times. In dawn-to-dusk observations, nursing occurred for a few minutes at a time, several times an hour, throughout the waking hours (Konner and Worthman 1980). A sample of 45 infants observed with a higher-resolution procedure—15-minute observations divided into 5-second time blocks—confirmed the pattern. The percentage of 15-minute periods without nursing was less than 25 percent throughout the first 80 weeks of life, even though the observations were never begun during nursing.

In a separate set of observations, 17 mother-infant pairs with infants aged 12–139 weeks (mean = 63.9, s.e. = 9.9) were studied for 6 hours in three 2-hour sessions on separate days, from 0830 to 1030, 1230 to 1430, and 1630 to 1830 hours, with nursing bouts recorded to the nearest 30 seconds (Konner and Worthman 1980). Overall mean values were: nursing bouts per hour, mean = 4.06, s.e. = 0.41; total nursing per hour, mean = 7.83 minutes, s.e. = 1.27; bout length, mean = 1.92 minutes, s.e. = 0.18; average time between bouts, mean = 13.9 minutes, s.e. = 1.28; and longest time between bouts, mean = 55.16 minutes, s.e. = 3.79. Bout length and total nursing time were independent of infant's age, but age strongly predicted the interval between nursing bouts ($r = .71$, two-tail $p < .005$).

Weaning and Birth Spacing. Traditionally the modal weaning age was during the fourth year (M. J. Konner 1977). This was observed prospectively and confirmed by cross-sectional data on the number of infants and children at each age who had not yet been weaned at the time they were first contacted. Weaning was gradual and generally took place some time during the mother's next pregnancy, usually being completed well before the birth. If there was no next sibling, nursing could continue until after age five, in one case (at very low frequency) as late as age eight. Supplementary feeding, including pre-masticated food, began around six months. Weaning did not involve punishment or abrupt cessation of nursing, but weaning conflict could be severe, involving protest and depressed behavior for weeks to months. Retrospective interviews of adult women

showed that memories of weaning and the attendant sibling rivalry could be a lifelong psychological theme (Shostak 1981). Still, some children were weaned easily.

Sleeping Arrangements and Night Nursing. No quantitative observations were done at night, but qualitative observation and interviews showed that it was apparently universal for !Kung infants to sleep with their mothers on the same skin mat at least until weaning. Of 21 mothers nursing infants as old as three years, 20 reported waking to nurse at least once each night, and all stated that their infants nursed without waking them up from two to "many" times or "all night." It was shown that this pattern of highly frequent nursing during the day supplemented by nursing several times a night could explain hormonal changes reducing fertility (Konner and Worthman 1980; Stern et al. 1986). It was suggested that this pattern and departures from it might influence lactation success or failure, infant digestive distress, sleeping pattern, blood glucose dynamics, milk composition, and maternal mood and attitude toward nursing.

Physical Contact. The !Kung were described as having very high levels of skin-to-skin physical contact in infancy, the great majority with the mother: "[!Kung] newborns . . . are carried in a sling which keeps them upright and pressed against the mother's side. No clothing separates the infant's skin from his mother's" (p. 290). Quantitative data based on spot observations showed "a gradual decline in passive physical contact with the mother from a high of about 70 percent in the first months to about 30 percent in the middle of the second year" (Konner 1976a:224) with a peak at about 15 weeks. A second graph of passive physical contact with *anyone* in the same spot observations showed a peak of about 90 percent between 10 and 20 weeks, declining to about 42 percent in the mid-second year. A third paper (Konner 1976b) analyzed passive physical contact within the 15-minute observations, finding patterns quite similar to the results from the spot observations. It also broke down the overall physical contact into maternal, nonmaternal, and child components, as discussed below.

Nonphysical Interactions. While traditional societies use more physical contact and more indulgent nursing practices, industrial societies might compensate with distal communication. For example, in a comparison of mother-infant interaction in Boston with that in a Guatemalan Indian village, the total number of interactions was roughly equal, but in Guatemala about 80 percent of the interactions were physical while in Boston about 80 percent were vocal (Klein et al. 1977; M. J. Sellars 1973). But this is not a generally applicable pattern of difference between modernized and traditional societies. The Guatemalan data were compared with data on inter-

action among the !Kung collected by a very similar method (Konner 1977). The Boston data, also obtained by the same method, showed that professional-class infants had somewhat more verbal interaction than did working-class infants (Tulkin 1977), but the cross-cultural comparison showed that the Guatemalan infants received much less verbal stimulation than even the Boston working class (4 as opposed to 10 percent of observed five-second blocks contained a caretaker vocalization). !Kung observations, however, showed levels of infant vocalization, caretaker vocalization, and reciprocal vocalization equal to those of the Boston working class (Konner 1977).

Overall Indulgence. Ethnographers had described the !Kung as exceptionally indulgent in infant and [STET]. Cross-cultural comparison confirmed this; punishment, especially physical punishment, was rare in infancy and early childhood and uncommon in later childhood. Parents were described as generous and undemanding in almost all aspects of child life and behavior.

One aspect of !Kung indulgence, responsiveness to crying, has been carefully studied. Early papers emphasized the prompt and reliable response to crying in !Kung infants (Konner 1972), with a level of response to spontaneous fret/cry of 78 percent during the 8- to 12-month period (Konner 1977). More detailed analyses of !Kung infant crying showed that while !Kung infants displayed the "normal crying curve" with a peak in the first three months, and also had the same number of crying bouts as infants in a Dutch sample, they had shorter crying bouts and their total crying duration was about half that of Dutch infants (Barr et al. 1991). These analyses confirmed that responsiveness is very high, and the investigators explained the difference in cry/fret duration by reference to differences in caregiving, including physical contact and responsiveness to crying. (Further analysis of response to crying is presented in the next section.)

Nonmaternal Care. This section reviews what was said about care given by !Kung women other than the mother. The role of the father and relations with other children are reviewed separately below. These observations are of interest because the !Kung have often been misrepresented as having almost exclusive maternal care. The first paper (Konner 1972), in a section titled "The Milieu of Development in the First Year," said of !Kung infants,

From their position on the mother's hip they have available to them her entire social world. . . . When the mother is standing, the infant's face is just at the eye-level of desperately maternal 10-to-12-year-old girls who frequently approach and initiate brief, intense, face-to-face interactions,

including mutual smiling and vocalization. When not in the sling they are passed from hand to hand around a fire for similar interactions with one adult or child after another. They are kissed on their faces, bellies, genitals, sung to, bounced, entertained, encouraged, even addressed at length in conversational tones long before they can understand words. Throughout the first year there is rarely any dearth of such attention and love. (p. 292)

A subsequent paper (Konner 1976b) attempted to quantify nonmaternal care, and Figures 2.1 and 2.2 are drawn from that paper. Figure 2.1a shows the total time in physical contact with anyone. Figure 2.1b stratifies this contact by percentage contribution of mothers, nonmothers, and children as a subset of nonmothers. Both graphs also plot the corresponding results of Steven Tulkin's study of ten-month-old girls in Boston, using very similar methods (Tulkin and Kagan 1972; Tulkin 1977). (Kung mothers accounted for 75-80 percent of all physical contact infants received, with no significant change over the first 20 months. However, it was emphasized that

the percentage of all physical contacts with anyone *other* than the mother (20 to 25%) is higher than that of either class in Boston. This means that in spite

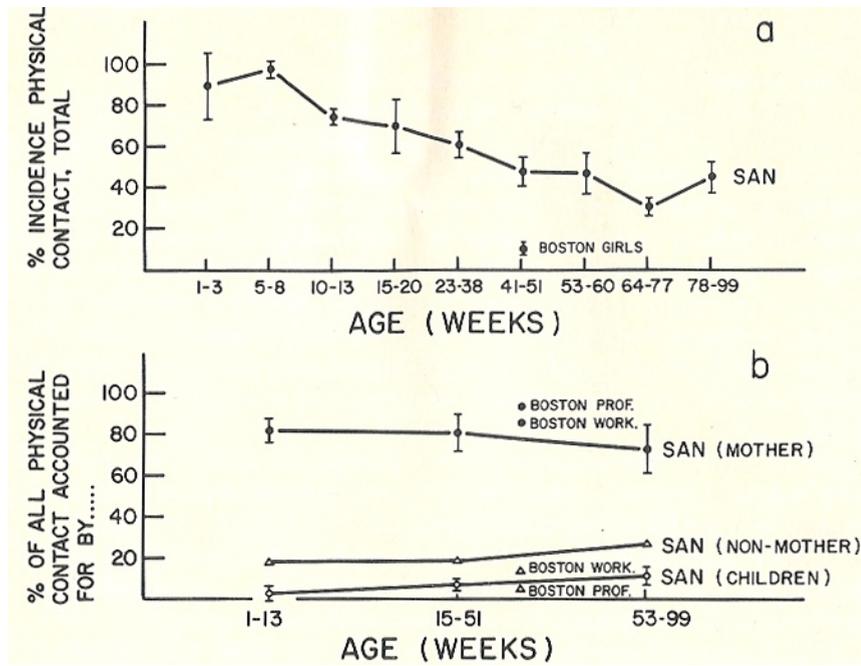


Figure 2.1. Please provide legend.

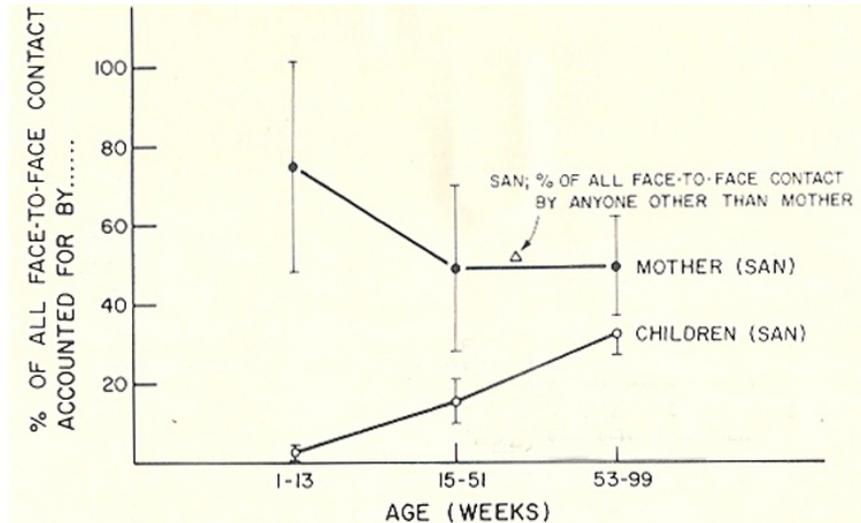


Figure 2.2. Distribution of face-to-face interaction between !Kung San infants and different categories of individuals. Mean and standard error. From Konner, M., "Infants and Juveniles in Comparative Perspective," in Lewis, M. and Rosenblum, L.A., eds., *Friendship and Peer Relations*, New York: John Wiley and Sons, 1975.

of the extremely close relation to the mother, the infant also has a closer relation to others, getting proportionately more contact with others than do Boston infants. (p. 113)

Figure 2.2 shows the distribution of face-to-face contact, which suggests a much higher level of nonmaternal involvement, although the standard errors are large. For the first three months, mothers accounted for about 75 percent of face-to-face contact, but this declined to 50 percent thereafter and remained at that level well into the second year.

The same paper from which these figures were taken also reported data on !Kung two- to five-year-olds and a comparison sample in London, originally reported separately and more extensively (Blurton Jones and Konner 1973). !Kung children, especially boys ($p < .01$; girls $p < .10$), ranged a greater maximum distance from their mothers even though the London children were observed in safe, familiar outdoor spaces in good weather. !Kung children were face-to-face with mothers less and nurtured less by mothers or anyone else than London children (all significant for both sexes at $p < .02$ or better), suggesting that strong maternal dependency did not persist into childhood. A subsequent paper (Konner 1977) proposed an

explanation in terms of the density of social context, citing comparative experimental data on nonhuman primates:

The dense social context, by providing ample alternative stimulation for both mothers and infants, improves the likelihood that mothers will accept the dependent demands of infants. Paradoxically, this results in decreased proximity seeking and other dependent demands at later ages. (p. 318) Although the last inference may not be justified, it emphasized the importance of a highly social context for the !Kung mother-infant relationship. A new analysis of responsiveness to crying in !Kung infants' crying bouts in the original data set shows clearly that nonmothers, especially other adult women, play a prominent role (Kruger and Konner, 2002). !Kung babies cried, at the most, for about one minute per hour, mainly in bouts of ten seconds or less. Eighty-eight percent of all cry bouts received a response, and almost all the others resolved within ten seconds. Responses occurred at the rate of one for every three seconds of crying, the most typical being oral or tactile comforting.

This analysis supports the claim that the caregiving environment of !Kung infants is sensitive and indulgent, but it also offers a nuanced picture of nonmaternal care. !Kung mothers provided significantly more frequent comforting responses (excluding nursing) than did all others combined. Only mothers used nursing as a response, and it was most likely at the younger ages. Finally, the mother always responded to long crying bouts (≥ 30 seconds), and for half of these she was the sole responder. Still, the !Kung mother was almost never alone with a crying baby. On her own, she accounted for only about half of the bout-based responsiveness rate: 46 percent of bouts were responded to by mother alone, while 88 percent of the total received some response. Thus for nearly half the bouts other caregivers either were the sole responders or joined the mother in responding. Even when others did not respond to the cry bout, they were nearly always present and offering care to the baby, sometimes as the primary attendant, at some point during a 90 minute observation set. In summary, the mother was by far the most frequent individual responder to crying and was most responsible for soothing an upset baby, but others made major contributions to the degree, timeliness, and consistency of the response.

Father Care and Involvement. An early paper stated, "Fathers account for a greater proportion of vocalizations to infants during the first 3 months (10%) than do American fathers" (Konner 1976:114). The comparison was with a study in Boston (Rebelsky and Hanks 1971) that kept a microphone in cribs around the clock and estimated the average amount of vocalization by fathers to three-month-olds to be 37 seconds per 24-hour period. Thus

!Kung fathers were described as both less involved than mothers and more involved than Western fathers. A chapter focused on !Kung paternal care in two editions of the same book (Katz and Konner 1981; West and Konner 1976) said,

Since fathers . . . are often available . . . their potential contact with infants and children is high. They often hold and fondle even the youngest infants, though they return them to the mother whenever they cry and for all forms of routine care. Young children frequently go to them, touch them, talk to them and request food from them, and such approaches are almost never rebuffed. Boys are not expected to become involved in hunting activity until early adolescence at the soonest and then follow their fathers and uncles on hunts for years before being able to conduct hunts themselves. Information transfer on such hunts has an "observational learning" rather than a "teaching" character. . . . Traditional male initiation rites involve making boys dance in the cold for a few days, frightening them in the dark, and making small cuts on their foreheads to signify their accession to manhood. (Katz and Konner, 1981, p. 167)

This sketch was one of five drawn to show the range of father involvement in nonindustrial societies in the ethnographic record. The paper noted that "the !Kung are classified by Barry and Paxson as 'high' on closeness of fathers to infants and young children in the sample of non-industrial societies surveyed. They thus represent the upper end of the range of direct male care of offspring seen in the ethnographic record." (n = 80 societies, Barry and Paxson 1971; Katz and Konner, 1981, p. 177).

The data on infants came from 15-minute observations marked in continuous five-second time blocks, as described above. Forty-three infants were observed six times at from one to four age points, throughout the daylight hours and throughout the year. Criteria for observation onset were that the infant was awake, not in the sling, not nursing, and within fifteen feet of the mother. Father availability was not a criterion. Data on the number and percentage of observations of boys and girls in two age groups in which fathers interacted with the infant at all were analyzed. Overall father participation for the sexes and ages combined was 13.7 percent. Fathers were more likely to interact with boys than girls at the older age only ($\chi^2 = 4.61, p < .05$).

Since observation onset was contingent on the mother's presence, the comparison was biased against fathers, but it showed that randomly distributed 15-minute time samples would have about a 90 percent chance of finding interaction between mother and infant, compared with 13.7 percent for fathers. However, the density of interaction within the 15 minutes is also much greater for mothers than for fathers. Table 2.1 shows the amount of interaction and its breakdown by type of proximity, with boys and girls

Table 2.1 Mean Number of 5-Second Blocks Parent Was Primary Caregiver, by Proximity

	<i>Father</i> (all observations)	<i>Father</i> (when present)	<i>Mother</i> (always present)
<i>Age: 0-26 weeks</i>			
Physical contact	3.80	43.27	123.46
Face-to-face	0.74	8.46	11.56
Within 2 feet	0.09	1.07	10.54
2 to 15 feet	0.00	0.00	11.00
<i>Age: 27-99 weeks</i>			
Physical contact	3.85	32.13	58.41
Face-to-face	0.25	1.43	3.69
Within 2 feet	2.26	13.00	32.91
2 to 15 feet	0.77	4.41	8.38

combined. Shown are the average number of five-second time blocks in which father or mother were the primary caregivers, and whether they were face-to-face, in physical contact, within two feet, and more than two feet away from the infant. For the father, figures for all observations and for only those in which he is present are shown separately.

Father participation, defined as father score divided by combined parental score, was 2.3 percent for younger and 6.3 percent for older infants. Although the differences in total participation are very large, the distribution of caregiving among the four proximity types was remarkably similar, including a parallel decrease with age in the proportion of physical contact, even though only mothers nursed or cleaned infants. In a different data set, the father was present in 30 percent of observations on !Kung two- to six-year-olds, as opposed to 19 percent in parallel observations made in London (Blurton Jones and Konner 1973).

To place these findings in cross-cultural perspective, a study of 3- to 11-year-olds in six cultures including the United States showed father presence ranging from 3 to 14 percent, with 9 percent in the United States (Whiting and Whiting 1975). While these data are not really comparable due to the larger age range, !Kung fathers did seem to be closer than fathers in other subsistence types. This was underscored by several other comparisons, discussed below.

Relations with Children. During the second half of the second year, toddlers began to play with other, mainly older, children, and an early paper was devoted to these relationships (Konner 1976). It was emphasized that given the modal group size of around 30, peer groups in the strict sense-

groups of children the same age and sex-were very unlikely and indeed were not observed. Play groups almost always consisted of both sexes and a range of ages. Among the adaptive functions suggested for these play groups were facilitating relationships in two- to five-year-olds (bypassing the commonly observed Western developmental pattern of parallel play), socialization of younger children, practice of caregiving by older children, and lightening the mother's burden of childcare.

Carefree Childhood. There were also extensive studies of older children by Draper and others (Draper 1972, 1976; Marshall 1976). Children were not assigned tasks of any economic importance nor were they expected to feed themselves by foraging, although they often did. They played in mixed-age, mixed-sex groups that meandered around the village-camp or the surrounding bush. Draper studied the assignment of responsibility to children as it relates to subsistence ecology, and she showed that children in more !Kung groups were given more tasks, while traditional !Kung children were among the most responsibility-free in the cross-cultural range. Nevertheless, descriptions of child groups noted that although

the principal concern of the group is always play. . . . This may and typically does include . . . play at subsistence, which however playful, may produce food. . . . It invariably includes also, though incidentally, protection and care and teaching of infants and children by older children. (Konner 1976)

Thus the relatively carefree life of !Kung children included a limited amount of useful work.

Adolescent Sexuality. Adolescence was treated in a chapter that emphasized the reproductive experience of girls (Konner and Shostak 1986), but the relevant demographic facts had already been established (Howell 1979). Prospective study of menarche (marked by a dramatic ritual) gave a mean age of 16.6 and a median of 17.1 years, with the majority passing this milestone between 16 and 18 (p. 178), by which time about half were married. Careful retrospective study of women who were 45 years old or older in 1968 estimated the age at first birth at a mean of 18.8 and a median of 19.2 years, with all but a handful of mothers having had their first births between ages 17 and 22 (p. 128). (Completed fertility determined retrospectively was 4.7 live births, with a mean age of last birth in the middle thirties.)

Playful experimentation with sex began in early childhood and continued through middle childhood (Konner and Shostak 1986; Shostak 1981). Since children did not assume responsibility for subsistence until the late

teens and their play groups were frequently out of sight of adults, sexual curiosity flourished. Adults did not approve of sexual play and when it became obvious they discouraged it, usually by verbal chastisement with no real consequences. Interviews with adults revealed that they considered sexual experimentation in childhood and adolescence to be inevitable and normal. For adults, sexual activity was considered essential for mental health, and !Kung sometimes referred to mentally ill people (for example, a woman who ate grass) as deranged because of sexual deprivation.

Despite childhood sexual experimentation, the transition from the sexual play of childhood to the real sex of adulthood could be difficult, especially for girls. Half were married before menarche (16.5 years), typically to men about ten years older. Thus a teenage girl was confronted with the sexual advances of an adult man after having had prior experience only with boys her own age. These advances were supposed to be delayed until menarche, but the transition from sex play with age-mates to adult sex was often stressful (Shostak 1981). The years from age 16.5, when first menstruation occurred, to age 19, the mean age at first birth—a delay due mainly to adolescent subfertility—were important ones. The young woman was sexually mature but did not have to care for a family and made little contribution to subsistence. She could gradually adopt adult roles and adult sexuality without having to deal with the consequences of early pregnancy.

THE GENERALIZED HGC MODEL AND THE EVIDENCE FOR DISCORDANCE

A review attempted to set the !Kung findings in phylogenetic context among the primates, to evaluate evidence in the older literature for similar patterns in other hunter-gatherers (i.e., other EEAs) and to assess possible changes since the hunter-gatherer era that might be viewed as discordant (Konner 1981). The review stressed that there were many gaps in the data, and that changes from the higher primate background to the hunter-gatherer pattern were likely to be largely genetic, while subsequent changes would be overwhelmingly cultural.

Hunting-gathering was defined to exclude equestrian hunting as a recent historical development and greater emphasis was placed on warm-climate hunter-gatherers as more representative of the EEAs. No cases were excluded for other reasons, such as a history of contact with non-hunter-gatherers. There were at that time no other systematic studies of hunter-gatherer infancy and childhood besides that of the !Kung. Nevertheless there were fairly detailed accounts of infancy and childhood that accorded with the !Kung findings (e.g., Turnbull 1965; Holmberg 1969; Balikci 197?).

In addition to these isolated supporting instances, there was cross-cultural survey research on child training practices, organized and summarized much of this research up to the 1960s (Textor 1967). Random perusal of Textor's summary is methodologically unsound (it is essentially a compendium of all significant relationships among variables derived from all previous quantitative cross-cultural research), but deliberate hypothesis testing carries less risk of improper rejection of the null hypothesis.

The hypothesis that hunting-gathering societies resembled the !Kung in infant and childcare more than did other nonindustrial societies was supported by this examination. The variables assessed in older studies were not always the most relevant in current terms. Still, the data compiled by Textor showed a consistent tendency for societies relying on food gathering to have more indulgent infant and child training practices than other nonindustrial societies.

Specifically, "pain inflicted on infant" was lower ($p < .05$), while "overall indulgence of infant" ($p < .05$) and the ease and lateness of toilet training ("anal satisfaction potential"; $p < .01$) were rated as higher in societies subsisting primarily by food gathering ($19 \leq n \leq 40$) than in those subsisting by other means ($22 \leq n \leq 34$). In childhood, "anxiety over responsible behavior" ($p < .01$), "anxiety over obedient behavior" ($p < .01$), and "anxiety over self-reliant behavior" ($p < .05$) were rated as lower in food gathering ($30 \leq n \leq 35$) than in other societies ($37 \leq n \leq 42$). Only at adolescence, when "female initiation rites" ($p < .01$) were found to be more severe in foraging societies ($n = 38$) than in nonforaging ones ($n = 27$), was the pattern of indulgence reversed. Also, adolescent peer groups were less common ($p < .05$) in foraging ($n = 23$) than in nonforaging societies ($n = 14$), consistent with other findings and demographic predictions indicating the unlikelihood of same-age peer groups at any time during childhood in hunting-gathering societies. (For citations of the specific cross-cultural studies relied on by Textor, see his volume or Konner 1981, note 6.)

Another study, focused on infancy (Lozoff and Brittenham 1978), compared ten warm-climate hunting-gathering societies with 176 other nonindustrial societies on infant care practices rated by Barry and Paxson (1971). The ten (!Kung San, Hadza, Mbuti, Semang, Vedda, Tiwi, Siriono, Boto-cudo, Shavante, and Chenchu) were all those that met the criteria of living between the latitudes of $22^{\circ}30'$ N and $22^{\circ}30'$ S, and having less than 10 percent dependence on agriculture, animal husbandry, and fishing for their subsistence, as coded by Murdock and Morrow (1970). Very close mother-infant contact, late weaning, and indulgent responsiveness to infant crying were highly characteristic of the hunting-gathering groups. Late weaning was also found in other nonindustrial societies, and the mother was always the principal caregiver in infancy, but other aspects of the mother-infant bond were closer and more indulgent in hunter-gatherers.

In addition, whether measured by body contact, sleeping distance, response to crying, or weaning age, mother-infant contact and maternal indulgence of infants were lower in the United States than in the 176 nonindustrial cultures. This supported a previous finding (Whiting and Child 1953) that patterns of infant and childcare and training in Chicago during the 1940s were substantially below the median in indulgence for a large representative sample of nonindustrial societies (including hunter-gatherers), except in the area of aggressiveness training, where Chicago was more indulgent. In "oral socialization," "anal socialization," sex and modesty training, and independence training, parents in Chicago were considered very strict or at least more strict than the average nonindustrial society.

The range of variability in intermediate-level societies (those relying primarily on horticulture, agriculture, animal husbandry, and/or fishing) was much greater than that for hunting-gathering societies or industrial societies, and they constitute the great majority of the empirical base on which cultural anthropology rests. Variation in childcare practices is not random with respect to basic mode of subsistence and ecological situation. For example, Textor compared cultures that were large or small states with those in which the highest level of political integration is the minimal state, autonomous community, or family (Textor 1967).

Like the earlier-mentioned comparison (foraging vs. nonforaging societies), this one suggested a trend in the cultural evolution of childcare. The hypothesis of decreasing indulgence with increasing political complexity was confirmed on six measures of infant and childcare comparable to the ones mentioned in the foraging-nonforaging comparison. In addition, three other variables relating to child life showed significant differences. Punishment of premarital sex was more severe in 89 more complex than in 90 less complex societies ($p < .001$). Exclusive mother-child households (father sleeps elsewhere, no extended family) were more likely in more complex societies ($p < .001$). Paradoxically, desire for children was higher in more complex societies,¹ where indulgence of children was lower.

This appeared to be consistent with what was thought to be the higher birth rate of agricultural societies, but an excellent cross-cultural study by Hewlett (1991a) called this difference into question. Although in the expected direction, the higher fertility and lower infant mortality in agricultural and pastoral societies are not statistically significant. Even small differences could account for Neolithic population expansion, but not substantial differences in infant and childcare. However, Hewlett found that hunter-gatherers were more likely to have multiple caregiving than horticultural and pastoral cultures, due to the greater population density (compactness) of the immediate settlement. He confirmed that hunter-gatherer group size makes them more likely to have multiage child play groups and cited other cross-cultural research showing that fathers are more involved

with infants and children among hunter-gatherers and on islands, apparently because male-male competition is low (Alcorta 1982; Hewlett 1991a).

PHYLOGENETIC RECONSTRUCTION OF SELECTED CHILDCARE VARIABLES

Based on the then available literature, an attempt was made to reconstruct the higher primate and human cultural background to infant and childcare practices (Konner 1981). Hypothetical sketches characterized the evolution of parental care based on studies of higher primates (monkeys and apes), human hunter-gatherers, intermediate-level (nonindustrial, nonforaging) societies, and industrial societies. Data on contemporaneous patterns led to inferences about sequences, with all the usual reservations about that strategy. The higher primate picture was confirmed in reviews by others (Martin 1995; McKenna 1981, 1987; Pereira and Fairbanks 1993).

1. Physical Contact with Mother and Others

Mammals vary in mother-infant physical contact (Blurton Jones 1972). "Cache" vs. "carry" alludes to two of the options, distinguishing mammals that hide their infants while mothers forage (e.g., some ungulates, rabbits, and tree shrews) from those in which infants cling to their mothers or are carried (marsupials, bats, and most primates). A third category, following, involves low direct physical contact but high proximity. Nonhuman higher primates without exception (whether or not tarsiers are included) maintain continuous physical contact with infants in the first weeks of life; except in marmosets, the mother accounts for most of this contact. There is a gradual decline in physical contact over the course of the first weeks to months, depending on the pace of development in a given species.

While the !Kung data reported above come mainly from out-of-the-sling observations (underestimating total physical contact), carrying devices afford an approach to assessing physical contact cross-culturally that can be used with older ethnographies (Whiting 1971). Variations include (1) almost constant carrying in a sling at the mother's side, back, or front, with or without direct skin contact; (2) some carrying alternating with time in a crib, cradle, or hammock, or on a blanket on the ground or floor; and (3) very little or no carrying, with infant tied in a cradleboard or swaddled tightly. (Cradleboard-bound or swaddled infants can also be carried, without skin-to-skin contact.) These variations were related to ecological conditions, especially climate. Forty out of 48 cultures in the tropics (between latitude 20° N and 20° S) had close and frequent physical contact, usually with carrying devices, whereas 29 out of 37 societies outside those latitudes used heavy swaddling or cradleboards, regardless of continental location.

Based on these data, Whiting argued that hunting-and-gathering is neither necessary nor sufficient for carrying in close physical contact. However, the two exceptions to the rule about cold-climate societies are the Eskimo and the Yahgan of Patagonia, both nonmounted, "classical" hunter-gatherers with close contact. Hunting-gathering may thus be a sufficient condition for close contact but not a necessary one. In any case, since the great majority of human evolution took place in tropical regions, the inference that early humans had close physical contact, probably using a sling for carrying, remains sound, while intermediate-level societies cover the range from close contact in a sling to little or no contact in a tightly tied cradleboard. It is likely that the two variables of level of subsistence organization and, perhaps more important, ambient temperature together explain much of the variation in carrying method. Perhaps leaving behind the hunting-gathering mode of subsistence permitted, but did not cause, a decrease in direct contact using a sling as the main carrying method.

Until the recent reintroduction of the baby carrier, the Western infant was kept horizontal in a baby carriage or pram or reclining in a stroller, and experienced fewer motor challenges, less tactile and vestibular stimulation, less direct maternal contact, and less vertical posture compared to young infants in hunter-gatherer societies (Konner 1977). The widespread use of baby carriers, including sling- or pouchlike devices, beginning in the late 20th century may be a partial return to ancestral patterns, although without the high levels of skin-to-skin contact characteristic of hunter-gatherers.

2. Nursing Frequency

Mammals may be divided by feeding type into two groups, "continual" vs. "spaced" feeders (Ewer 1968; Ben Shaul 1962; Blurton Jones 1972). Continual feeders' infants cling to their mothers (most primates, bats, and marsupials) or follow them (the most precocial ungulates). Spaced feeders leave their infants in nests (tree-shrews and rabbits) or in movable caches (eland and certain other ungulates). Milk composition (Ben Shaul 1962) and sucking rate (Wolff 1968) are correlated with spacing of feeds; continual feeders have more dilute milk, with lower fat and protein content, and suck slowly. Spaced feeders have more concentrated milk and suck faster. Lipid and protein composition and sucking rates of higher primates, including humans, is consistent with their classification as continual feeders. This was shown to be true for most monkeys (Horwich 1974), chimpanzees (Clark 1977), and human hunter-gatherers. All of the latter for whom observations were available were reported to nurse at least twice an hour.

In intermediate-level societies, the range of variation is great. While feeding frequency following the !Kung pattern occurs in some cultures, in

others this is precluded by the organization of subsistence activities, notably mother's work load (Nerlove 1974; B. Whiting 1963, 1972; Whiting and Whiting 1975; Whiting and Edwards 1988). In many intermediate-level societies the organization of work necessarily results in daily mother-infant separations of several hours, precluding very frequent nursing. For example, among the Kikuyu of Kenya the mother might work in the garden part of the day, leaving her infant with a girl or young woman (often an older sibling of the infant), in the home village compound (Leiderman and Leiderman 1977).

Mothers in the industrialized West have long been spaced feeders. Differences between "demand" and "scheduled" (three- or four-hourly) feeding bouts are of minor interest in this context, since in American homes "demand" feeding sorted itself out to about six 4-hourly feeds a day in the mid-20th century (Aldrich and Hewitt 1947) and about three hours in more recent decades—far from the meaning of demand feeding among hunter-gatherers. Even if there are no long-term psychological effects of the change from frequent to spaced feeding, it would be useful to know the effects on infant feeding difficulty, colic, sleep-activity cycles, and blood glucose dynamics, as well as on maternal mood, sustained milk production, and likelihood of conception, all largely unknown (but see Stern 1986). In view of the marked suppression of gonadal hormone secretion in !Kung nursing women, with the degree of suppression a function of time between nursing bouts (Konner and Worthman 1980), there may be a prolactin-mediated, timing-dependent suppression of gonadal function by nipple stimulation (Stern et al. 1986). This would help to account for frequent conception during breast-feeding in modern populations.

3. Age at Weaning

In most higher primates, weaning follows the onset of pregnancy. In many Old World monkeys this occurs at about a year of age, although in baboons (larger and slower developing) it is usually two years (DeVore 1965). In chimpanzees (Goodall 1986; Clark 1977) and in at least some human hunter-gatherers (Konner 1972, 1977) it occurs at about four years. In most monkey species the age at weaning is one-fourth to one-third the age at sexual maturity for females (Tanner 1962; Schultz 1963, 1969); Martin 1990. However, the great apes have significantly later weaning ages and longer birth spacing than human hunter-gatherers, a difference probably due to the unique (among primates) human trait of provisioning juveniles with food after weaning (Lancaster and Lancaster 1983, 1987). It has been suggested that earlier weaning in early humans became possible when bone marrow was discovered to be a suitable weaning food (Binford 1983). In many traditional cultures, "kiss-feeding" or offering pre-masticated food

ensures that infants have the mother's germs in any case, and some antibodies, particularly IgAs, are delivered with the food, probably specific to microbes to which mother and infant have been jointly exposed. The advantage of such softened food in the weaning process, partly predigested by the mother's saliva, is probably significant, and the behavior is widely seen in intermediate-level as well as in hunting-gathering societies (Eibl-Eibesfeldt 1983, 1988).

Age at weaning in intermediate-level societies reportedly ranges from immediately after birth in the Marquesas Islands (Linton 1939) to a number of cultures that wean as late as do the !Kung. As with direct-contact carrying, leaving the hunting-gathering subsistence mode behind appears to permit rather than constrain societies to wean earlier. The relative acceptability to infants of cow's milk and cereal gruels may mediate the effect of subsistence mode on weaning age. The decline of weaning age in !Kung hunter-gatherers as they became more settled and gained access to cow's milk exemplifies this. Still, 83 percent of 176 societies in the Barry and Paxson (1971) sample that were *not* hunter-gatherers had weaning ages of two years or older. Thus weaning is late in intermediate-level societies, though perhaps not as late as in hunter-gatherers. Most of the world's settled agricultural populations have in recent times had a birth interval of two to three years, with weaning in the second year (Morley 1973:306).

In the United States in the 1970s about 10 percent of infants were breast-fed at three months of age, and about 5 percent at six months (Fomon 1974:9), as opposed to 58 percent breast-fed at a year of age during the period 1911-16 (p. 2). Similar declines and similarly low current levels were observed in Britain, Sweden, Poland, and other modern industrial countries. The developing world has seen a similar decline in breast-feeding (Fomon 1974:1-16; Morley 1973), although rates appear to have stabilized (UNICEF, 2000). The American Academy of Pediatrics (1997) has officially recommended breast-feeding for over a quarter of a century, and this has increased breast-feeding in the United States, but it has not affected the worldwide decline, especially among the poor (Corbett 2000; Guttman and Zimmerman 2000; Sellen 1998), which is almost a hallmark of modernization.

4. Sleeping Distance and Night Nursing

Mother-infant sleeping distance remains a neglected feature of the human infant's caregiving environment from the viewpoint of research, even though bedtime protest and night waking are very common (Bernal 1973; Goodlin-Jones et al. 2001; Spock and Parker 1998). In all higher primates and among hunter-gatherers for whom - ethnographic information

is available, mother and infant slept in immediate proximity, if not direct physical contact. As noted above, almost all !Kung mothers reported that their infants woke up repeatedly during the night to nurse, and some additional nighttime nursing bouts usually took place while the mother slept, and it has also been shown in cosleeping American mother-infant pairs in the laboratory (McKenna et al. 1999).

However, variation in mother-infant sleeping distance is restricted in nonindustrial societies. Of 90 cultures in the Barry and Paxson (1971) sample for which information was available, mother and infant slept in the same bed in 41, in the same room with bed unspecified in 30, and in the same room in separate beds in 19. In none of the 90 did mother and infant sleep in separate rooms, a feature of the mother-infant bond that probably did not precede the industrial state.

Current Western culture derives from that of the agricultural peoples of northern Europe, who used cradles and swaddling extensively. Departing from the universal pattern for nonindustrial societies, Americans often have infants sleeping in separate rooms from their parents. The syndromes of bedtime protest (Spock 1976; Spock and Parker 1998) and night-waking (Bernal 1973) may be artifacts of Western sleeping arrangements (Konner and Super 1987; McKenna et al. 1993, 1999).

In any case, American middle-class sleeping arrangements are often honored in the breach as well as the observance (Rosenfeld et al. 1982). A well-known pediatrician wrote a column in the 1970s for a mass circulation national women's magazine explaining how to get infants to sleep in a separate room. Deluged with letters from women who sleep with their babies, he wrote a second column saying that this was alright too (T. B. Brazelton, personal communication). It is clear that some mothers in Western cultures have returned to the practice of cosleeping (Brazelton 1990; Hanks and Rebelsky 1977; Schacter et al. 1989; Sears and White 1999), with consequences for reproductive endocrinology as well as subsequent night-waking (Elias et al. 1986; Elias et al. 1986; Stern et al. 1986).

5. Paternal Care

Judging from the distribution of male parental behavior in monkeys and apes, it seems clear that in the ancestral parenting adaptation of higher primates, male involvement was minimal (Martin 1990). Prominent exceptions are the marmoset family (*Callitrichidae*) and the gibbon family (*Hyllobatidae*), both of which independently evolved pair bonding with high levels of direct paternal care (Mitchell and Brandt 1972; Taub and Mehlman 1991; Wright 1990). In addition, there are modest but notable levels of interaction between adult males and infants in Japanese macaques (*M. fus-cata*), Barbary macaques (*M. sylvanus*), olive baboons (*P. ?cynocephalus*), and

Hamadryas baboons (*P. hamadryas*), although it is not clear that the interaction is always beneficial to the infant (Hrdy 1974).

Humans have both pair bonding and relatively high father involvement for higher primates generally, but there is great cross-cultural variation. Barry and Paxson used "regular close relationship" to describe the highest level of father involvement in their cross-cultural sample (the !Kung, for example), and their criteria suggest that this was comparable to "half or less of time" on the maternal scale. Since there were few cultures with fathers in this highest category, and few with mothers in this or the next lowest category, paternal and maternal care distributions were almost nonoverlapping. For early childhood the overlap increased considerably. The rankings are shown in Table 2.2. If this equivalency of rankings is approximately correct, then 4 percent of fathers are close to infants, compared with 98 percent of mothers. In early childhood 9 percent of fathers are close, compared with 66 percent of mothers. (If "mother provides half or less of care" is omitted, the respective figures for mothers are 90 and 27 percent. But it is highly likely that most infants in the "half or less" category had "regular close relationships" with mothers.) In this spectrum !Kung fathers are close. It was also possible to stratify the closeness of father-infant relationships by subsistence ecology, as shown in Table 2.3.

The closeness of fathers in horticultural societies suggests that the division of labor is important; where women provide the most subsistence fathers are called into play. There appears to be a divergence among foraging societies, with gathering strongly predisposing fathers toward closeness, hunting predisposing toward distance (although $n = 3$), and fishing about

Table 2.2 Percentage of Cultures by Ranked Level of Parent-Child Proximity

%		Role of Father	%		Role of Mother
Infancy					
5	1	no close proximity	0	7	Practically all care is by others
15	2	rare proximity	0	6	Most care except nursing by others
37	3	occasional proximity	2	5	Mother's role is significant but . . .
39	4	frequent proximity	8	4	Mother provides half or less of care
4	5	regular close relationship	44	3	Principally mother, others imp't roles
			43	2	Principally mother, others minor roles
			3	1	Almost exclusively the mother
Early Childhood					
1	1	no close proximity	2	5	Practically all time away from mother
11	2	rare proximity	33	4	Majority of time away from mother
19	3	occasional proximity	39	3	Half or less time with mother
60	4	frequent proximity	27	2	Principally mother, others imp't
9	5	regular close relationship	0	1	Almost exclusively mother

Source: Data from Barry and Paxson (1971).

Table 2.3 Father-Infant Proximity and Primary Mode of Subsistence

<i>Primary Mode of Subsistence</i>	<i>Father-Infant Proximity</i>	
	<i>Distant</i>	<i>Close</i>
Gathering	1	7
Hunting	3	0
Fishing	6	4
Herding	4	1
Simple agriculture	12	6
Horticulture	3	10
Advanced agriculture	16	6

equally divided. Lozoff and Brittenham (1978), using a smaller sample of hunting-gathering societies, found them to have closer father-infant and father-child contact than other nonindustrial societies. The discrepancy may be due to the type of hunting prevailing in cultures that depend predominantly on this subsistence mode.

MODELS OF HIGHER PRIMATE AND HUNTER-GATHERER CHILDHOOD

The Catarrhine Mother-Infant Complex. It appeared that old world monkeys and apes had certain features of the maternal relationship in common. These features are listed in Table 2.4. It gradually became apparent that there were important species differences in some of these measures. For example, even within the macaque genus (*Macaca* spp.) the response to separation varied from severe (rhesus, *M. rhesus*, and pigtailed, *M. nemestrina*) to relatively mild (bonnets, *M. radiata*) depending on the extent of nonmaternal care (alloparenting). This feature in turn varies among the

Table 2.4 The Catarrhine Mother-Infant Complex

1. Hemochorial placenta
2. Singleton birth
3. Twenty-four-hour physical contact in first weeks
4. Twenty-four-hour proximity until weaning
5. Nursing more than three times per hour while awake
6. Night nursing until weaning
7. Weaning at around 30% of the age of first ovarian cycles
8. Separation from mother → protest
9. Isolation rearing → dysfunctional behavior

old world monkeys and apes; in some species mothers allow no alloparenting while in others it is substantial (Hrdy 1974). Alloparenting affords the possibility of earlier weaning, shorter birth spacing, and higher reproductive rates (Ross and MacLarnon 2000).

Male (not necessarily paternal) involvement also varies dramatically. Barbary macaques (*M. sylvanus*) and Japanese macaques (*M. fuscata*) have a significant amount of male interaction with infants and juveniles and gibbons (Hylobatidae) have very extensive male-infant contact and carrying. Orangutan (*Pongo pygmaeus*) infants and juveniles, in contrast, rarely encounter adult males except for the occasional sexual tryst with their mothers. Most monkey and ape infants have males around most of the time, sometimes affording protection, but without significant direct interaction.

Overall, however, the model withstands scrutiny in the light of current data. Old world monkeys and apes have an exceptionally intimate placental juxtaposition of maternal and fetal circulations (hemochorial placenta), singleton births, continuous physical contact for the first weeks or months (possibly important to the formation of the relationship; Maestripieri 2001), and continuous proximity until weaning. Nursing is frequent (at least three times per hour) to continual and night nursing universal. Weaning occurs at one-fourth to one-third of the age at first ovarian cycling, with variation due in part to the presence or absence of alloparental care. Separation leads to protest of varying degrees of severity in many but not all species and isolation rearing produces seriously dysfunctional behavior in all species in which it has been studied.

The HGC Model. Humans, like Old World monkeys and apes, are catarrhines, but can only be included in the complex if the M-I relationship in the human EEAs conforms to it, since departures are very evident in other ecological settings. The question of whether the M-I relationship in the EEAs can be subsumed under the general catarrhine model hinges in turn on the validity of the HGC model already discussed. This model includes, but goes substantially beyond, infancy. Table 2.5 lists the main features of the HGC model as it was proposed in the 1970s and 1980s in sources already cited.

Each feature of the model was derived from observations of the !Kung, supported by descriptive accounts of other hunter-gatherers in the older ethnographic literature. The generalizations were presented as hypotheses for further study, in the hope that others would do serious research on hunter-gatherer childhood. This hope was realized, and the recent studies have been excellent. Features 5, 8, and 11 have two asterisks, signifying an important challenge coming from this new research. Feature 6 has one asterisk, signifying too little information in other studies to generalize. Some results of those studies will now be considered.

Table 2.5 Features of !Kung Infancy and Childhood: The Original HGC Model

-
1. Prolonged close physical contact with mother
 2. High indulgence of dependent needs and demands
 3. Frequent nursing (four times/hour) throughout waking hours
 4. Mother and infant sleep on same bed or mat; night nursing
 5. Weaning after age three and four-year birth spacing**
 6. Strong separation and stranger protest until late ages*
 7. Dense social context that seems to reduce pressure on mother
 8. Nonmaternal care much less than maternal care until second year**
 9. Paternal care much less than maternal care but more than most cultures
 10. Transition to multiaged, mixed-gender child play group
 11. Minimal childhood responsibility for subsistence or baby care**
 12. Minimal restrictions on childhood or adolescent sexuality
-

*Too little information in other studies to generalize.

**Signifies an important challenge coming from the new research.

HUNTER-GATHERER CHILDHOOD: RECENT SCIENTIFIC STUDIES

Hadza. The Hadza of northern Tanzania live among rocky hills near Lake Eyasi, and were about 95 percent dependent on hunting and gathering at the time of scientific study (Blurton Jones 1993; Kaare and Woodburn 1999; Woodburn 1968a). Compared to the !Kung, the Hadza environment is climatically milder and more productive of game and plant foods. Their nutrition was adequate and their population growing slowly but steadily. Researchers agree that Hadza infancy and childhood conform in some ways to the HGC model (Blurton Jones 1990, 1993; Blurton Jones et al. 1989; Marlowe, Chapter 8 in this volume):

The Hadza child's first year of life appears not to differ greatly from that of the !Kung infant. The mother is the principal caretaker. The baby spends most of its time riding on the mother's side or back. Suckling is frequent, and often, but by no means always, "on demand." . . . The baby is likely to be surrounded by relatives, old, adult, and young, and receives attention from them and is carried by them. . . . Face-to-face interactions described in Western cultures (and in !Kung) can be seen between the Hadza mother and infant and other people and the infant. (Blurton Jones 1993:316)

Quantitative studies have confirmed these descriptions (Marlowe, Chapter 8 in this volume, Table 8.1). Mothers account for by far the largest percentage of time in interactions with infants during their first year of life, and continue to predominate over other individuals through the third year. During 30-minute focal follow observations of infants, mothers

interacted with them in 78 percent of minutes, fathers and older sisters in 18 percent each, older brothers in 8 percent, maternal grandmothers in 9 percent, and others in 29 percent. (Since any number or combination of people could interact with the infant during a given minute, the percentages do not add up to 100.) During the first four years, using the same observational method, mothers interacted in 43 percent of minutes, fathers and older sisters in 17 percent, older brothers in 9 percent, maternal grandmothers in 10 percent, and others in 41 percent.

These findings resemble those of the recent analysis of !Kung response to infant crying (Kruger and Konner 2002). Since caregiver response was nonexclusive, several different people could and often did respond to a crying bout, but the mother predominated and was involved in the great majority of bouts. Similarly, the Hadza data show maternal primacy in the context of multiple caregiving. Looking at a different, more exclusive Hadza measure—who if anyone was holding the child during instantaneous hourly scan observations—only “about 30 percent of all holding of children (≤ 4 years old) is by someone other than mother” (Marlowe, Chapter 8 in this volume, p. XXX).

Given the theoretical emphasis on grandmothers (e.g., Hawkes et al. 1998), it is surprising to find fathers interacting with infants substantially more of the time. This disparity is heightened when fathers are genetically related rather than being stepfathers, a relatively common role among the Hadza due to a substantial divorce rate (Marlowe, Chapter 8 in this volume). Where there is no genetic father, the maternal grandmother plays a larger role. [Other analyses showed that fathers communicated with, played with, and nurtured their genetic children more than they did their stepchildren, and that paternal care was inversely correlated with the mating opportunities available to the father, as measured by the number of fertile or single younger women in the camp (Marlowe 1999a, 1999b).

Later childhood also shows significant parallels to the !Kung:

Hadza children lack none of the charm and imagination of !Kung children. They have a robust humor and a pride in life that we find attractive and impressive. . . . Between the ages of 3 and 8, Hadza children seldom accompany their mothers on gathering excursions. Children over 8 may accompany their mothers, but do not always do so. . . . The children, usually in sizable mixed-age groups, may spend some hours out of camp. Sometimes they are at a favorite play site or at the water hole. (Blurton Jones 1993:316)

Sexual play is permitted in childhood and has often been observed. In adolescence, premarital sex is “routine and expected” (Frank Marlowe, personal communication, 2004), with marriage occurring around age 17 for girls and 20 for boys.

However, there are also departures from the !Kung case and the HGC model:

Hadza are weaned a good deal younger than !Kung, at around 2.5 years old. Soon after they are 2 years old, Hadza children begin to be left behind when the mother gathers, although they may be suckled before the mother leaves camp and as soon as she returns. (p. 316)

After infancy, the most striking difference is the amount of subsistence work that Hadza children do (Blurton Jones et al. 1989, 1994b, 1997). Children play a lot, but "more often they are gathering food, independently of the women. . . . Returns . . . are substantial. . . . In the foraging groups, even 3-year-olds try their hand at digging or picking up baobab pods and processing them" (Blurton Jones 1993:316) In addition,

unlike !Kung children, Hadza children appear to be given many errands and to perform useful tasks, bidden and unbidden. Such tasks cost the children time and energy, and sometimes expose them to the hazards of the bush. Children of either sex may be asked to hold a protesting toddler when the mother leaves camp to forage. . . . Children commonly are sent to fetch water and sometimes firewood. . . . Even toddlers are sent to carry things from one house to another. (pp. 316–317)

Finally, regarding the degree of indulgence of infants and children, Hadza researchers are of two opinions. According to Blurton Jones, "the Hadza are strikingly different" from the !Kung in the amount of punitive, prohibitive, and directive parenting. For example, "[M]others break off suckling bouts, evoking protest from the infant. One also often hears crying and observes parents ignoring a crying infant" (p. 316). Also,

We see Hadza parents use physical punishment, and we see and hear them shout prohibitions and commands at children. . . . This bleak picture should not be exaggerated, and quantitative analysis may also redress the balance. Hadza children are active and cheerful most of the time and are welcomed in their home. Even among these people, who seldom publicly show affection or warmth, parents can be heard to speak warmly of and to their child. But the overall picture is certainly not the developmental psychologist's dream presented by the !Kung. (pp. 317–318)

However, describing more recent research, Marlowe writes, "Hadza children are allowed to do as they like most of the time. . . . Children throw tantrums and pick up sticks and hit adults, who do little more than fend off the blows and laugh" (Marlowe, Chapter 8 in this volume, p. XXX). He quotes two early ethnographers as saying that parents are dotting and punishment absent and adds, "I too found children received

considerable affection and were rarely punished. I only saw one spanking during a year of observation of men and children," a spanking delivered by a stepfather.

A strong focus on adaptive explanations in subsequent publications has produced debate about the reasons for the differences in ultimate cause terms (Blurton Jones et al. 1994b, 1997). While these debates are interesting and may ultimately be resolved, with the exception of Marlowe's work they have taken priority over the projected quantitative analysis of infant and child behavior itself, making it difficult to assess the Hadza's conformity to some aspects of the HGC model. Still, it is possible to estimate the degree of conformity; with the exception of weaning age and interbirth interval, the correspondences are quite good.

Efe. The Efe are small-stature (Pygmy) hunter-gatherers of the Ituri tropical rain forest of the northeastern Democratic Republic of the Congo, formerly Zaire (Bailey 1991a; Peacock 1991). They spend a great deal of time in the forest, but "the majority of their caloric intake comes from cultivated foods acquired from the Balese" (Tronick et al. 1987:97), for which they trade hunted game. They are seminomadic, living in small camps of 6 to 50 people comprising several extended families.

Excellent research on Efe infancy began in the 1980s. An initial publication was conceptualized as a direct contrast between the Efe and the !Kung and as a challenge to what the authors called the CCC or continuous care and contact model, which they proposed to replace with the "caretaker-child strategy model" (Tronick et al. 1987). The contrast was striking and began with birth, ideally solitary in the !Kung in the higher parities but a group affair among Efe. Mothers may not be the first to hold the newborn, and as the newborn is passed among the women present, several attempt to nurse it whether or not they are lactating. One of them, or even a woman from another camp, is recruited to nurse the infant until the mother's milk comes in.

However, the mother also nurses the infant in this period, despite the belief that colostrum is valueless. Her contact with the infant begins a few hours after the birth:

For the first few days of life the newborn is kept in or around the hut and is almost always in physical contact with the mother or another person. A mother does not resume her normal work schedule until four to five days postpartum. When regular tasks are resumed, the infant may accompany her mother on long out-of-camp trips. If this occurs, child-care responsibilities are generally shared by individuals at the work site. When the mother's work requires a short out-of-camp trip, she often leaves the infant in the care of another. Almost all females attempt to comfort a distressed or fussy infant. Comfort includes allowing the infant to suckle and often occurs in the

mother's presence. But if unsuccessful the infant is returned to her mother.
(p. 99)

Multiple caregiving continues, with individuals other than the mother accounting for 39 percent of physical contact at three weeks, increasing to 60 percent at 18 weeks. Infants passed from hand to hand 3.7, 5.6, and 8.3 times per hour at 3, 7, and 18 weeks, respectively. Each infant was cared for by from 5 to 24 different people (mean = 14.2), and eight out of ten infants were sometimes nursed by women other than their mothers (5 of 7, 2 of 8, and 6 of 9 at 3, 7, and 18 weeks). This multiple care is highly indulgent: "Most interactions with infants appear positive and playful. But if infants do fuss or cry, they are responded to quickly" (p. 100). Attempts to comfort an infant within ten seconds of fussing occurred 85 percent of the time in the first seven weeks and 75 percent at 18 weeks. Multiple caregiving, although high, is very variable; the proportion of time with someone other than the mother ranges from 0 to about 65 percent at three weeks and about 20 to 80 percent at the later ages.

Since the oldest infants in this initial report had not entered the main phase of attachment development, a subsequent report, also presented as undermining the CCC model, is of interest (Tronick et al. 1992). It focused on "social contact"—time that the infant was not engaged in a solitary activity. (Social contact estimates include overlapping contact, as when both the mother and others were in contact simultaneously.) Mothers were in social contact with infants about 50 percent of the time at five months (range = 36-70 percent) and about 21 percent at 36 months (14-40 percent), characterized in the text as a decline with a significant linear trend. However, the peak of maternal contact shown in the accompanying figure is 63 percent, occurring at age eight months. (The data were not tested for a curvilinear trend.)

More important is the difference between their Figures 1 and 2, reprinted here as Figures 2.3a and 2.3b. The first shows the total time in social contact with mothers, children, adults, and fathers, and with the exception of fathers, nonmaternal contact is high at all ages. The second compares mother and father contact with the *average* child and the *average* adult. The average adult never spends more than a small fraction of the mother's time in social contact, and is in contact less than the father is at all ages except eight months.

The average child begins to rival the mother for contact time only at three years. All three nonmother categories show their lowest ratio to mother contact at eight months of age, when the mother is in social contact over an order of magnitude more than the average child, average adult, or father.

The authors conclude that "the developmental course of the Efe infants' and toddlers' social relationships does not conform to the patterning of

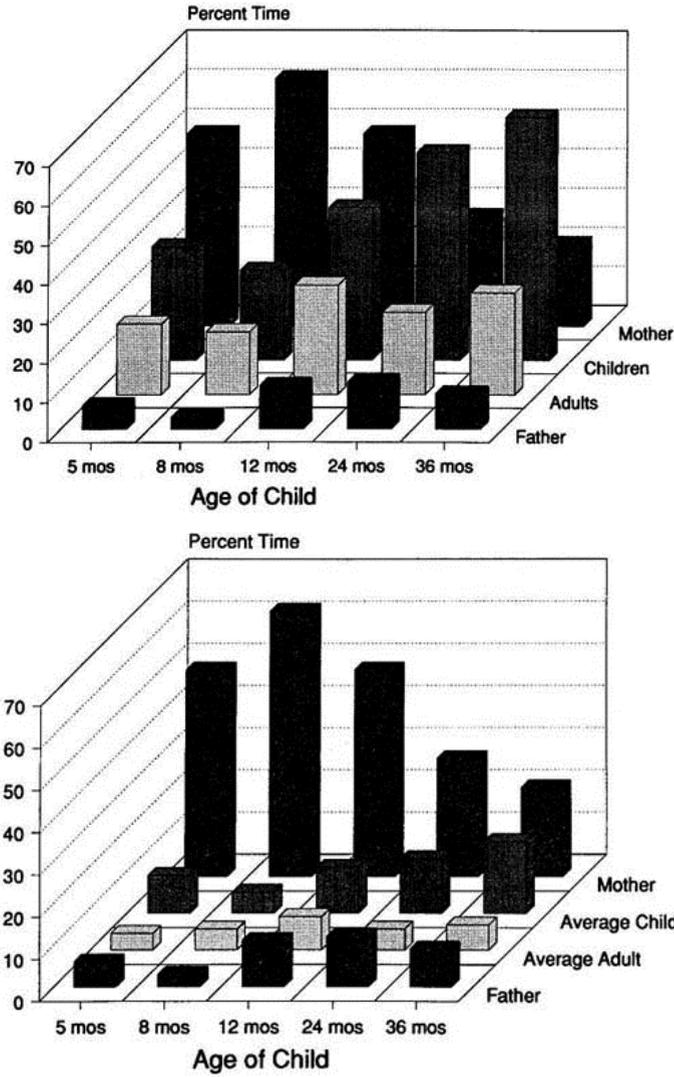


Figure 2.3. Percentage of time mother, father, other adults, and children are in social contact with Efe infants and toddlers. (a) Mother and father compared to sums of all other adults and all children. (b) Mother and father compared to averages of all other adults and all children. Maternal primacy is very striking in Figure 3b. From Tronick: *Dev Psychol*, Volume 28(4): 568–577, 1992, Figures 1 and 2.

relationships predicted by CCC models" (p. 573) without discussing these comparisons. However, they appropriately emphasize the density of social contact these infants experience:

Efe infants and toddlers spend almost all of their time in social contact with other individuals, and although the amount of social contact declines with age, 3-year-olds still spend most of their time in physical and social contact with other people. . . . Efe infants and toddlers are almost never alone in the sense of being out of sight or hearing of other people. (pp. 573-4)

Such descriptions are qualitatively reminiscent of published accounts of social context among the !Kung, although Efe maternal contact is certainly lower.

Fathers contributed much less than all other adults or all children, but more than the average other adult at most ages. The distribution of care across individuals other than parents was not reported, but this could mean that the father is the second most important caregiver (although certainly not a close second).

Another study filled this gap (Morelli and Tronick 1992), focusing on ages one, two, and three years. Unfortunately, the comparison was only with other men and boys, not with all other adults and children, but the results are still instructive. The *average* time the child spent in social activity with all other men was more than half of that with the father at all ages, and this appeared to be mainly one man at each age. The average time with boys was greater than the time with father at one year and the disparity increased markedly thereafter. The authors conclude that "the role Efe fathers played in the lives of their children relative to other males did not appear to be particularly special or unique" (p. 49).

Infants' social contact with children tripled over the first three years, reaching 29 percent at 5 months and 62 percent at 3 years, whereas contact with adults did not change significantly (Tronick et al. 1992). At the earlier age, contact with the average child was about 9 percent, declining to 5 percent at eight months and then rising to 18 percent at three years-at which point contact with the average child was twice that with the father and almost equal to that with the mother. In an average hour, five-month-olds encountered from 0 to 4 children, three-year-olds from 1 to 6. Although the paper used the terms "child" and "peer" interchangeably, the demographics make same-age peers even less likely than for the !Kung, and it appears from the context that infants and toddlers interact with children of all ages.

A subsequent report on the same data set focused on testing kin selection hypotheses (Ivey 2000). This analysis confirmed the major role played by nonmaternal care, referring to the Efe as "the most extreme example of

alloparenting in a foraging population," (pp. 857-858) and demonstrates that women predominate very markedly among caregivers except in childhood, when there is no significant sex difference. The analysis strongly confirmed kin selection theory, showing a very large predominance of relatives in every category compared with unrelated controls matched for age, sex, and availability. The report also underscored the indulgence of care, stating that "Efe one-year-olds are in close proximity to a caregiver 100% of observed time and spend an average of 85% of time in direct care" (p. 859).

Most interesting, perhaps, is the stratification of female nonmaternal caregivers by reproductive status (Figure 4, p. 861). About 11 percent of the female allocare is provided by reproductive women, 22 percent by prereproductive females (girls), 29 percent by postreproductive women, and the largest portion, 38 percent, by nonreproductive women. This is significant because the Efe have an average completed fertility of 2.6, the lowest ever measured for a natural population (Ellison et al. 1986). But the distribution of births per woman is bimodal, with a high proportion of women infertile due to pelvic inflammatory disease. Given the high proportion of allocare by nonreproductive female relatives, it is reasonable to hypothesize that very low fertility makes the exceptionally high level of allocare advantageous (Hewlett 1991a). The multiple breast-feeding observed may also be an adaptation by kin groups to high infertility, since the women who are effective reproducers would by this cultural adaptation reduce the likelihood of suppressing fertility with highly frequent nursing.

Efe girls were expected to help their mothers in food-gathering and in tasks within the camp (Peacock 1985). If the patterns described for Ituri culture generally (Turnbull 1962, 1965) apply to the Efe, children were subject to occasional physical punishment but left to play most of the time. Boys were circumcised at age 11 or 12, a painful and sometimes traumatic experience, but girls at first menstruation are subject to a lengthy and positive celebration. Attempts to restrict sexual activity in adolescence are not very serious unless they involve liaisons with Bantu men in nearby villages, and sexual activity is not unusual (Peacock 1985).

Aka. The Aka are small-stature (Pygmy) hunter-gatherers of the tropical forest of the southwestern Central African Republic and northern People's Republic of the Congo (Bahuchet 1999). Their environment, the tropical rain forest of the western Congo basin, is varied but rich, and at the time of the infancy study they were predominantly foraging for a living, spending 56 percent of their time hunting, 27 percent gathering, and 17 percent in village work for nearby agriculturalists. However, their diet was mainly farm-produced food, for which they traded hunted game.

Infertility was infrequent and the total completed fertility (mean number of live births reported by postmenopausal women) was 5.5, compared

with 4.7 for the !Kung. The birth interval was about 3.6 years, compared with about 4 for the !Kung. Infant mortality was the same as the !Kung, about 20 percent in the first year. Camps consisted of 20 to 35 people (half younger than 15) in one to 15 nuclear families, and people moved, aggregated, and dispersed according to food availability. Women played an important role in net hunting, a crucial subsistence method (Noss and Hewlett 2000). The general character of infancy and childhood is familiar, and the classic monograph describes it in detail:

Aka infancy is indulgent: Infants are held almost constantly, they have skin-to-skin contact most of the day . . . and they are nursed on demand and attended to immediately if they fuss or cry. Aka parents interact with and stimulate their infants throughout the day. They talk to, play with, show affection to, and transmit subsistence skills to their infants. . . . I was rather surprised to find parents teaching their eight- to-twelve-month-old infants how to use small pointed digging sticks, throw small spears, use miniature axes with sharp metal blades, and carry small baskets. . . . Unlike their village neighbors, Aka infants are carried in a sling on the side rather than on the back, which allow for more face-to-face interaction with the caregiver. (Hewlett 1991b:32-33)

There are also divergences from the !Kung and the HGC model. Because women, including nursing mothers, participate actively in net hunting, a baby may be set down on the forest floor and left crying while the mother completes the kill. (This contrasts with the Ache, who rarely set their infants down on the forest floor for any reason.)

Nonmaternal caregivers play a major role.

While in the camp setting, Aka one- to-four-month-olds are held by their mothers less than 40 percent of the time, are transferred to other caregivers an average of 7.3 times per hour, and have seven different caregivers on average that hold the infant during the day. (p. 34)

Outside the camp, however, the mother holds the infant nearly 90 percent of the time and the transfers occur only twice an hour:

Besides being indulgent and intimate, Aka infancy also lacks negation and violence. . . . Seldom does one hear a parent tell an infant not to touch this or that or not to do something. . . . Violence or corporal punishment for an infant that misbehaves seldom occurs." (p. 35)

Indeed, hitting an infant by either parent is said by the Aka to be potential grounds for divorce.

What is most distinctive about Aka infancy is the involvement and intimacy of fathers (Hewlett 1988, 1991b). "Aka fathers do more infant

caregiving than fathers in any other known society" (p. 169) is the conclusion, cited approvingly in a policy report on fathers for the Society for Research in Child Development (Engle and Breaux 1998), which calls Aka men "the most nurturant fathers yet observed" (p. 5). However, the highest number reported for Aka father involvement is 22 percent, which is the percentage of all infant holding done by the father during the first four months—a time when the mother accounts for 51 percent and others account for 27 percent (Hewlett 1991b:79, Table 15).

Nevertheless, since "others" are numerous, the father has an excellent opportunity to take a strong second place in the infant's heart. On the net hunt in the same age range, fathers hold infants 6.5 percent of the time, compared with mothers' 87.3 percent. Expressed differently, on trips to the bush over the first 18 months and discounting the contributions of others, fathers held infants only 8 percent, declining to 3 percent, as much as mothers did. But in camp, fathers held the infant 43 percent as much as mothers in the first 4 months, 25 percent as much in the 8-12 month period, and 45 percent as much between 13 and 18 months. Neither any other single nonmaternal caregiver nor even all nonmaternal caregivers put together rival the father as a secondary attendant.

Still, these data also show the mother to be the overwhelmingly important caregiver during infancy, accounting for 87-96 percent of holding during net hunts and, in the forest camps while not hunting, doing 51 percent of the holding in the first four months, 87.5 percent in the 8- to 12-month period, and 57.3 percent between 13 and 18 months. As with the Efe, it is of theoretical interest that the mother's role jumps so markedly during the period of infancy when attachments are known to become very strong (Ainsworth et al. 1974; Belsky 1999; van IJzendoorn and Sagi 1999). It is thus not surprising that infants exhibit far fewer attachment behaviors toward fathers than toward mothers during this age period. Fathers receive 15.5 percent of such behaviors, others (in total) 22.2 percent, and mothers 58.8 percent. Fathers, then, receive about a fourth as many attachment behaviors as mothers at this age, although this rises to 58.4 percent of the mother's amount in the second year. Providing further support for attachment theory is the fact that over the whole age range the behavior "fuss for" was coded for mothers almost eight times as often as for fathers, even though less than a fifth of the instances of fussing for mother ended in nursing.

Weaning is a crucial transition, and "usually begins at age three or four when the mother becomes pregnant again":

The child . . . is not able to walk fast enough to keep up with the net hunt . . . so the four to five year old frequently stays behind in camp with one or two other children and an adult. . . . The children play, explore and

practice subsistence skills and seldom venture more than fifty meters from camp. . . . In camp the majority of a child's time is spent within a multiage play group, but always in the company of adults. (pp. 36–37)

The transition from the intimate parent-infant bond to the play group is very gradual (Hewlett 2004, personal communication). Unlike the !Kung, the Aka multiage play group may be same-sex. When they can keep up, children follow their parents on net hunts. They may or may not help in the hunt, at their own discretion. "Instruction is still primarily by observation and imitation, but verbal instructions are also given."

Beginning around age 11 or 12, the sexes segregate, as in the great majority of all cultures (Schlegel and Barry 1991). Girls collect water, nuts, or fruit together, while boys hunt small game. Adolescents may sleep and eat with their parents but often do not, traveling to visit relatives and explore the region. Initiation includes circumcision for boys and filing the incisor teeth to a point in both sexes. There is not a great deal of ritual attached to these events, but they are painful, require courage and fortitude, and give the successful initiate a sense of having left childhood behind. Premarital sexual freedom exists, but apparently is not acted on to the same extent as it is among the !Kung (Barry Hewlett, personal communication, 2004).

Ache. The Ache (Guayaki) of Eastern Paraguay foraged for a living in a dense, subtropical, broadleaf, evergreen forest (Hill and Hurtado 1999). Although settled on a Catholic mission, they were full-time hunters until the 1970s, and in the 1980s were studied by a team of scientists interested in demography, subsistence ecology, life history, and child development. At this time they obtained 20–25 percent of their food from foraging in the nearby forest, and their patterns of life before settlement were reconstructed. According to a report focused on infant development, "women alternate between walking and carrying their young children, brief periods of vegetable, fruit, and larval food collection, and resting on the ground. Women spend very little time in direct food acquisition and in activities incompatible with childcare. Instead, they focus their attention on child supervision when not walking from one campsite to another. . . . Children younger than three years of age rarely venture more than a meter from their mother and spend some 80-100 percent of the time in tactile contact with them" (Kaplan and Dove 1987).

Ache are more nomadic than other well-studied hunter-gatherers, and when in the forest men provide 87 percent of subsistence (by energy intake) and spend twice as much time as women in the food quest. They thus approximate the popular notion of women deferring subsistence activities in favor of childcare, which is not true of most hunter-gatherers. As for indulgence, "Ache children of less than 4 years of age are spoiled by

American standards (they are almost never chastised and win most conflicts with parents simply by crying and whining)" (Kaplan and Dove 1987:197). Still they are helpful and obedient when older.

These characterizations were confirmed by subsequent research (Hill and Hurtado 1996). This quantitative ethnography contained explicit descriptions of Ache infancy and childhood reminiscent of the !Kung:

Traditionally Ache infants spent the first year of their life in close proximity to their mother, suckling at will and sleeping in their mother's lap at night. Indeed, scan sampling and focal infant follows suggest that in the forest, infants under one year of age spend about 93% of daylight time in tactile contact with their mother or father, and they are never set down on the ground or left alone for more than a few seconds. (p. 219)

This closeness seems related to the difficulty of keeping infants alive in a hostile environment, and this research confirmed earlier reports that "high-quality childcare overrides other competing needs" (p. 220). Consequently mothers collect less food than other women, even though mothers have more dependents to feed.

After about one year of age Ache children still spend 40% of their daylight time in their mother's arms or lap, but they sit or stand on the ground next to their mothers 48% of the day. It is not until about three years of age that Ache children begin to spend significant amounts of time more than one meter from their mother. Even still, Ache children between three and four years of age spend 76% of their daylight time less than one meter away from their mother and are monitored almost constantly. (p. 220)

The pattern of breast-feeding partly conforms to the HGC model in nursing frequency, but not in weaning age or birth spacing:

Ache children generally continue nursing on demand until their mother is pregnant with her next child . . . although they may begin eating some solid foods such as armadillo fat or insect larvae . . . as early as 6–12 months. . . . Because Ache mothers wear little clothing and carry or sleep with children resting on their bare chest, nursing is frequent throughout the day and night. Weaning is an extremely unpleasant experience . . . with children screaming, hitting, and throwing tantrums for several weeks. . . . Some mothers who became pregnant very soon after the birth of a child simply continued to breast-feed all the way through their next pregnancy, and then, if the interbirth interval was too short (i.e., less than two years), would simply kill the newborn child and continue nursing the first. (pp. 220–221)

The median age at weaning was calculated as 25 months, but this may be shorter than it had been: "Unfortunately we have no way at present to determine the age at weaning in the precontact situation" (p. 221).

Although nursing is described as frequent, it was measured as less frequent than that of the !Kung. The mean interval between nursing bouts was about 30 minutes, with an average bout length declining from more than ten to about two minutes over the first 18 months (pp. 310, 338). This pattern, which may have developed after reservation settlement, could help explain a possible shortening of birth spacing. However, within the small sample studied there was no relationship between nursing measures and birth interval. Furthermore, birth spacing even in the precontact period was shorter than that of the !Kung, and the investigators believe that Ache demographic history was characterized by rapid growth followed by sudden declines, in contrast to the very slow, steady growth of the !Kung population.

After infancy, younger children tend to stay in camp playing with objects, pets, and each other, and seeking maternal attention. Transportation in the forest depends on a sling that keeps infants in contact with their mothers, their heads resting on her chest. Around 18 months they begin to ride on top of the mother's carrying basket, clinging to her head and ducking to avoid branches and vines. Between three and five they may ride "piggyback" on their fathers, grandparents, or other adults. After age five they are weaned from the back and encouraged or made to walk on forest trips, a crisis in their lives as it was for the !Kung.

Children scream, cry, hit their parents, and try everything they can think of to get adults to continue carrying them. Often, they simply sit and refuse to walk, prompting older band members to leave them behind. This tactic leads to a dangerous game of "chicken" in which parents and children both hope the other will give in before the child is too far behind and may become lost. We observed one small boy to be lost for about half an hour during a parent-child transportation conflict. When the boy was finally located it was unclear whether he or his parents were more frightened. A small child cannot survive long in the Paraguayan forest, and if not found within one day is unlikely to survive. In any case, the boy's tactic paid off temporarily, since he was carried for the remainder of the day. (p. 222)

Learning about the forest and about subsistence has already begun by this time, but it intensifies in middle childhood. Children acquire knowledge of edible fruits, stinging plants and animals, and vines with thorns, and as they accumulate time foraging with women, both boys and girls become skilled foragers for fruit, insect larvae, and small animals. By age eight they learn the crucial, difficult, and subtle art of tracking adults in the forest. They spend considerable time in the trees, "collecting fruits for themselves or knocking down fruits for the adult women to collect below. There is no segregation of play or foraging parties by sex, and children spend most of their time within 50 m of the adult women in mixed age-sex groups" (p. 223).

At around age ten boys and girls begin to be independent, sometimes sleeping at a relative's fire or traveling with another band for a time. God-parentlike relationships become important at this time. Boys carry bows and arrows, although they do not learn to make them, and girls baby-sit, run errands, and draw water. Girls may produce as much food as adult women by age 12, but do not carry a burden-basket until they are married; boys exceed girls in food production by age 16, but do not reach adult male levels until their mid-20s. Still, the pubertal transformation is often dramatic, with girls preceding boys as in most human populations.

When a girl has her first menstruation, at an average age of 15.3 years, she experiences an initiation and purification ritual, along with "all men who have had sex with her. . . . Every woman we interviewed who had reached menarche before contact reported that she had engaged in sexual intercourse with at least one adult man prior to menarche. . . . 85% of the women . . . had also been married before menarche" (pp. 224–225). Still, the teen years are a time of playfulness, especially for boys:

Both boys and girls begin experimenting with sex around twelve years of age . . . in a manner very similar to that described for the !Kung (Shostak 1981). Boys . . . spend most of their teen years visiting other camps and trying to form friendships and alliances with their same-sex age mates and older men. It is quite common to see these boys intimately joking, tickling, and touching each other or the adult men who have chosen to befriend them. (p. 224)

As in many higher primates, including most human hunter-gatherers, such "play" forms coalitions vital to survival and reproduction.

As for girls, "despite their precocious sexual activity . . . girls are generally reluctant and sexually reserved with most males most of the time. Indeed the best description of their behavior would be aggressively flirtatious but sexually coy to the point of causing frustration." Boys accuse girls of being "stingy with their genitals," and "the major activity of girls at this time is walking around in small groups laughing and giggling and carrying on in any manner that will attract attention. They frequently spend much of the day visiting from hearth to hearth and are fed abundantly wherever they go" (p. 225).

Agta. The Agta dwell in diverse habitats widely distributed over the rugged Sierra Madre mountain range that parallels the eastern coast of the main island of the northern Philippines (Griffin and Griffin 1999; Griffin and Estioko-Griffin 1985). The main habitat is a semiseasonal tropical rain forest crossed by many streams, rivers, and waterfalls. The Agta, like the Aka and Efe, depend on neighboring agricultural people for the bulk of their plant foods as well as for other consumer goods, which they get in

trade for hunted game. They are seminomadic, widely distributed in small camp groups. Agta men are full-time hunters and fishermen, but the unique feature of the Agta adaptation is that women hunt to a degree unknown in any other hunter-gatherer group, killing up to half of the hunted game (Estioko-Griffin 1985; Estioko-Griffin and Griffin 1981; Griffin et al. 1992). Since hunting has been viewed by many theorists as incompatible with infant and childcare, the Agta are an important test of the HGC model.

Their population was found to be declining due to a high death rate, especially in infancy and childhood (Headland 1989). Crude birth rate was slightly higher than the that of the !Kung; Agta birth spacing (determined retrospectively for women over 45), when the last child lived until the birth of the next sibling, was slightly over three years (Goodman et al. 1985). An overall summary of infant and childcare was as follows:

The baby remains against the body of the mother nearly constantly in its first weeks, but is also in contact with the father, siblings if any, and other kin that may drop in to visit, nap, or play. . . . Babies sleep by mothers' breasts, between mother and father. . . . Grandparents may take in toddlers and older children on a "drop-in" basis or in the case of the parents overnight departure for hunting and fishing. During the first 12 months an infant is usually carried in a sling at the mother's back, side, or front. . . . Nursed on demand, it is returned to the back for sleeping after suckling. Women are quite comfortable thus engaged in collection of forest materials, and *some sporadically hunt and kill game while transporting the baby*. As the baby grows in its first year, it is increasingly handled by others, albeit in brief episodes. . . . An infant under 1 year may be passed among several adults and youths, being returned to its mother if it becomes fussy. (Griffin and Griffin 1992:301)

The italics are added to emphasize the remarkable fact that even some hunting by mothers does not interrupt continuous physical contact. Data on carrying, based on spot observations throughout the day, underscored this: "Infants are carried in a cloth sling much of the time before exploratory crawling and first walking begins. Carrying does not cease then; usually a toddler is carried frequently by the mother" (p. 305). Except for the women's hunting, this could be a description of !Kung infant care. The same can be said about the growth of independence:

Children are left in camp by mothers at increasingly frequent and lengthy intervals. Late in the first year an infant may be left for an hour or two sisters or mother's mother or father are acceptable caregivers. . . . One sister sporadically nursed her sister's infant as well as her own, permitting the young mother time outside the camp. More frequently, however, babies are carried by mothers until the age of two or slightly more. (p. 302)

Weaning is gradual, but weaning age can be roughly estimated from the following information (T. Headland 2004, personal communication): "Sometime when the child is roughly between age 20 to 28 months, it nurses less and less. . . . This gradual decrease in nursing seems to run about 3 to 6 months." Since the criterion for the !Kung in the early studies was complete weaning, it is appropriate to estimate the earliest *completed* weaning age for Agta at 23 months. Also, "small children are almost never nursed after 28 to 30 months." From this description a reasonable estimate of weaning age would be midway between 23 and 29 months, or 26 months, but this is lower than an earlier published estimate of Agta weaning age: "With the appearance of the child's molar at about two and a quarter years, the nursing often continues but with less intensity (Early and Headland 1998:92-93)."

Multiple caregiving, as observed by descriptive ethnographers, was substantial:

The infant is eagerly passed from person to person until all in attendance have had an opportunity to snuggle, nuzzle, sniff, and admire the newborn. . . . A child's first experience, then, involves a community of relatives and friends. Thereafter he enjoys constant cuddling, carrying, loving sniffing, and affectionate genital stimulation. (Peterson 1978:16, cited by Hewlett (1991a:13)

However, quantitative data, based on spot observations of children under eight years old, were quite consistent with maternal primacy:

Within the residential cluster, mothers of children from age [0] to 8 years are caregivers slightly more than 50% of the time. Grandmothers and elder sisters come in at a modest 7.5 and 10.4%, and fathers follow with only 4.4%. (p. 303)

Fathers do not often carry infants while in camp, but "are most often seen carrying toddlers and older children on subsistence trips and on residential moves" (p. 306). Fathers, in contrast to mothers, were "never observed" in pacification play with a fussing or crying baby (p. 307). There is considerable individual variation, however. Of seven fathers of infants under two years of age, the ratio of observations of maternal to paternal caregiving ("baby-sitting") was two-thirds in one case, more than half in another, and zero in two others. However, all four who had infants under *one* year of age had father-to-mother ratios between about one-sixth and zero. Overall, "The Agta fathers are not particularly active with children when compared with the !Kung, the Aka, and even the Ache" (p. 317). The muted role for fathers is made more remarkable by the fact that Agta women do so much hunting.

The transition to a multiage child group is familiar: "Play groups are not age or gender segregated, but made up of most children in [the] local group. . . . Teen-aged girls bring toddlers on their hips to observe or join play" (p. 302). As in the !Kung, this play includes care of younger children by older ones, but it also includes a contribution to subsistence. All Agta fish beginning in early childhood and are adept at it by adolescence. Both sexes begin hunting after puberty (Estioko-Griffin and Griffin 1981). Regarding premarital sex,

Premarital female chastity is not an ideal of much currency. . . . Although some data are difficult to collect concerning sex, almost certainly girls are able to engage in sexual activity with relative ease; promiscuity is not favored in any circumstance. Males may have as little or great difficulty in engaging in sex as females. (Estioko-Griffin and Griffin 1981:138)

SUMMARY OF THE NEWER EVIDENCE

New quantitative studies have focused on infancy and childhood in at least five hunter-gatherer cultures: the Hadza, the Efe, the Aka, the Ache, and the Agta. Each of these groups has been described as departing from the HGC model as originally presented based on studies of the !Kung and reviews of older literature on other hunter-gatherers. We can now place these departures in context with a systematic comparison.

Table 2.6 shows the findings of recent studies regarding key features of the HGC model. It suggests a high level of support for most of the original

Table 2.6 The Hunter-Gatherer Childhood (HGC) Model in Five Cultures^a

	Frequent nursing	Weaning age/BI (months)	Sleeping with mother	Physical contact, all	Overall indulgence	Nonmaternal care	Father involvement	Maternal primacy	Multiage child group	Carefree childhood	Premarital sex
!Kung	+++	42/48	+++	+++	+++	++	++	+++	+++	+++	+++
Hadza	+++	30/??	+++	+++	+	++	++	++	+++	+	+++
Efe	+++	??/38	++	+++	+++	+++	+	++	++	++	++
Aka	+++	42/48	+++	+++	+++	+++	+++	++	+++	++	++
Ache	+++	25/37	+++	+++	++ ¹	+	++	+++	+++	+++	+++
Agta	+++	27/36	+++	+++	+++	++	+	+++	+++	+	+++

^aThe !Kung compared with five other recently studied hunter-gatherers on 11 aspects of infant and child care included in the HGC model. From published data and descriptions supplemented by personal communications. For explanation and references, see text.

generalizations. Hunter-gatherers have frequent nursing, mother-infant cosleeping, high physical contact, high overall indulgence (possibly excepting the Hadza), substantial to high nonmaternal care and father involvement, maternal primacy, transition to a multiage child group, a relatively carefree childhood (except the Hadza), low restriction of premarital sex, and strong adolescent initiation rites. Only the Aka match the !Kung in age at weaning and interbirth interval, but the other three cultures have weaning ages over two years and interbirth intervals over three years. This is at the upper end of the range for preindustrial cultures and sustains the generalization that hunter-gatherers have relatively late weaning and long birth spacing.

To place these generalizations in a broader phylogenetic context, the care of infants and juveniles in Old World monkeys and apes is characterized by (proportionately) somewhat later weaning age and interbirth interval, variable and species-specific importance of nonmaternal care, minimal father involvement except in gibbons, the absence of postweaning provisioning (the basis of a relatively carefree childhood), mixed-sex play groups that may be same-age groups in strongly seasonal breeders, and the absence of initiation rites. Other features of HGC are present in most higher primates, including frequent nursing, late weaning, mother-infant cosleeping, high overall indulgence, maternal primacy, and adolescent sexuality. The wide distribution of these features in monkeys and apes suggests that they are common features of the catarrhines and may have been present in the common ancestor, which lived between 30 and 40 million years ago (Martin 1990:692).

DISCUSSION: MEETING THE CHALLENGES

It remains for us to consider the theoretical implications of the divergences observed in four main areas: weaning and birth spacing; maternal primacy; overall indulgence; and responsibility in childhood. Finally, we will discuss the relative importance of the discordance hypothesis in relation to the HGC model and the childhood as facultative adaptation hypothesis in relation to the CFA model.

Weaning and Birth Spacing. Perhaps the strongest challenge to the !Kung-based HGC model is provided by data on weaning and birth spacing in the Hadza, the Efe, the Ache, and the Agta. Respectively, they have weaning ages of 30, 30, 25, and 27 months, and interbirth intervals of 38 (Frank Marlowe, personal communication, 2004), 38, 37, and 36 months. Among the Aka the process is essentially superimposable on that of the !Kung, with about 42 months of nursing and 48 months between births. The

Hadza and the Ache clearly have shorter interbirth intervals, higher completed fertilities (TFR) per female reproductive life, and faster-growing populations than the !Kung. The Agta would be faster-growing but for high mortality. The !Kung model for Paleolithic population growth, that of mainly stable and gradual growth of about half a percent a year (Howell 1979), may have applied to some populations but is unlikely to have applied to all or even most. Indeed, the Ache life tables have suggested a model of Paleolithic demography that entails rapid increases alternating with crashes (Hill and Hurtado 1996). This, if true, presents a serious challenge not only to current ideas about hunter-gatherer demography, but also to life history theory, which predicts greater population stability in long-lived, slowly developing species (Charnov 1993; Pianka 1970, 1988; Stearns 1992).

However, it may be significant that prospective measures of Ache weaning were made during the reservation period, and the possibility that weaning was later and birth intervals longer in the forest period is acknowledged (Hill and Hurtado 1996). Given the forest-period birth spacing of just over three years, and the fact that "Ache children generally continue nursing on demand until their mother is pregnant with her next child" (p. 221) as among the !Kung, it is likely that traditional Ache weaning age was around 30 months, or 2.5 years. Indeed, the observation that Ache mothers, "if the interbirth interval was too short (i.e., less than two years), would simply kill the newborn child and continue nursing the first" (pp. 220–221) strongly suggests a traditional desired weaning age of substantially more than two years.

The Hadza have a weaning age of 30 months in a setting that is far closer to their traditional way of life, and this is less likely to be an artifact of cultural change. So far, however, it appears to be a lower limit of hunter-gatherer weaning age. The Efe interbirth interval of 38 months occurs against a background of exceptionally high infertility in the population. This could explain shorter interbirth intervals in the fertile women, achieved in part through multiple caregiving, including nursing by other women.

Overall, however, these six populations have a lower limit of weaning age that is high by developing-world standards and extremely high by Western standards. Even if most hunter-gatherers were more like the Hadza, the Efe, the Ache, and the Agta than like the !Kung and the Aka, Paleolithic weaning would still have been relatively late and interbirth interval relatively long. Against the background of ape patterns, however, this would represent a significant evolutionary shortening, and a departure from the catarrhine mother-infant complex. It has long been known that a key difference between parenting in human and other primates is the fact that only humans provision young with food after weaning (Lancaster and

Lancaster 1983). Provisioning evidently shortened nursing and birth spacing, but less so in the EEAs than in subsequent human adaptations.

Maternal Primacy. One of the most contested claims that came out of the !Kung literature has been the argument that hunter-gatherer maternal care supports the Bowlby approach to the development of attachment, which includes a hypothesis of monotropy-attachment behaviors focused on a single caregiver (Belsky 1999; Bowlby 1970–1980; Bretherton 1992; Sroufe et al. 1999; Sroufe and Waters 1977). Both the Efe and Aka studies have been cited as undermining this claim, but the challenge is now easily met. First, the claim of maternal primacy in the !Kung literature was never as strong as it was made out to be. Second, to the (substantial) extent that maternal primacy was emphasized, there is little in the new hunter-gatherer infancy research to undermine it.

The first of these statements is supported by the review on pp. xxx–yyy above, so let us focus here on the second, with an emphasis on maternal primacy, deferring discussion of the more abstract concept of attachment monotropy to the end of the section. With the exception of weaning age, still very late by Western standards, the Ache experience is virtually superimposable on that of the !Kung. The Hadza represent more of a departure, since they wean earlier and separate more frequently than the !Kung, but there is nothing in the Hadza literature inconsistent with a hypothesis of maternal primacy. Indeed, quantitative analysis strongly supports the hypothesis (Marlowe, Chapter 8 in this volume, Table 8.1).

The Aka seem at first glance to represent more of a challenge. They have the highest level of father involvement and intimacy not only among hunter-gatherers but throughout the cross-cultural range, and this observation represents a very important addition to our understanding of social development, because of both the quantity and quality of the care. Still, even in forest camps where their involvement was highest, fathers held infants less than half as much as mothers at all ages, with a decline to 25 percent during the 8- to 12-month period when attachment is developing. Nonparental involvement in care was very high by hunter-gatherer standards, yet mothers held their infants 87 percent of the time on net hunts and more than half the time in the forest camps, rising to 87 percent during the 8- to 12-month period. Because there were numerous nonparental caregivers, the average nonparent did not approach the father in involvement, suggesting that only the father had an opportunity to become a significant additional attachment object, and his involvement was a distant second to the mother's. The nature of the attachment to the father should be studied, and will no doubt be interesting, since secondary attachments certainly exist, but the Aka father's role does not challenge the claim of maternal primacy.

The Efe studies have been cited as strongly undermining both the !Kung model and the maternal primacy hypothesis. There is good evidence of multiple caregiving among the Efe—substantially more than among the !Kung—but no evidence that any individual could rival the mother's primacy. Mothers accounted for about half the social contact with infants during the first half-year, rising to 63 percent at eight months. More important, there was no time in infancy when the father, the average nonparent adult, or the average child accounted for more than a fraction of the mother's social contact. Efe multiple caregiving is impressive, but does not represent a challenge to maternal primacy.

Finally, all the above comparisons rely on observations during the day. Proximity, nursing, and other aspects of parenting during the night have been repeatedly emphasized as important aspects of hunter-gatherer and other traditional childcare (Konner 1977, 1981; Konner and Super 1987; McKenna et al. 1993). Ache, Hadza, Aka, and Agta mothers slept with their infants, with ample opportunity for night nursing. Efe infants are reported to sleep with others at times, but quantitative data are not presented on this question, and descriptions suggest maternal cosleeping and night nursing on the great majority of nights throughout infancy. The data on cosleeping therefore also support maternal primacy.

The theoretical question of attachment monotropy is far more difficult. Bowlby's claim was that the infant will tend to focus on one primary caregiver, usually but not necessarily the mother, even in the context of multiple caregiving and beyond what would be predicted by the distribution of contact time and care across caregivers (Cassidy 1999). Despite the fact that this focus could be on an adoptive mother, a father, a grandparent, an aunt, or an orphanage attendant, the monotropy claim was viewed as an attempt to tie mothers to home, and was strongly and repeatedly challenged. In addition, the monotropy idea challenged prevailing psychological models such as learning theory and social cognition, which predicted a distribution of attachment proportional to contact and care.

However, many studies show that multiple caregiving does not prevent the development of attachment to the mother or other primary caregiver. This has been found repeatedly for high-quality day care (Caldwell et al. 1970; Kagan et al. 1978; McKim et al. 1999; NICHD 1997), general cross-cultural settings (van IJzendoorn and Sagi 1999), African multiple care settings (Ainsworth 1967; Leiderman and Leiderman 1977), and, most strikingly, in the Israeli kibbutz, where the amount of nonmaternal care is very high in both amount and continuity (Sagi et al. 1995). The quality of the attachment may be affected (Russell 1999; Sagi et al. 1994), but the focus on the mother is not prevented.

Monotropy in infant attachment would require special nervous system adaptations that seem implausible. But we have ample evidence from

romantic attachments that an unreasonable focus on one individual, independent of objective behavioral input, is well within the capability of the human nervous system. Brain research is gradually taking the mystery out of monotropic attachments, in the realm of imprinting in birds (Bock and Braun 1999; Horn 1991), pair-bonding in mammals (Insel 1997, 2000), mother-infant separation in primates (Rilling et al. 2002), and romantic attachment in humans (Bartels and Zeki 2000; Marazziti et al. 1999). In due course brain imaging may take the mystery out of putative monotropy in human infant attachment as well, but for the time being it remains an open question.

As for maternal primacy in hunter-gatherers, it is strongly supported by the !Kung studies and consistently evident in older ethnographies, and it is also found in recent scientific studies, including those presented as exceptions to this rule. Most notably, perhaps, it is very evident in the Agta, the only hunter-gatherer culture on record where women do half the hunting. If maternal primacy were facultative, it seems likely that the Agta would depart from it. They do not, nor do any other hunter-gatherers studied so far. Exclusive maternal care is nonexistent, and was never claimed, but maternal primacy is a general feature of hunter-gatherer childhood. It may be that maternal primacy affords an opportunity for attachment that gives the mother a unique place in the hierarchy of infant attachments.

Responsibility in Childhood. Here the Hadza present their strongest challenge. Hadza children forage for themselves very extensively, and the contrast with the !Kung case has been explicitly addressed (Blurton Jones et al. 1994b). While !Kung children do make a contribution to subsistence, it is very small compared with the Hadza. Since the Hadza live overwhelmingly by hunting and gathering in a rich environment that is if anything closer to our EEAs than that of the !Kung, they raise a clear possibility that in many such past environments children were expected to contribute substantially to subsistence. Investigators familiar with both cultures suggest that it is less safe for !Kung children to forage, because they can be more frequently out of the line of sight to their parents or the village-camp, and !Kung parents are anxious about this risk. The Hadza environment of relatively bare rocky hillsides makes it more difficult to get lost. There is also a difference in the amount of baby and childcare assigned to older children in the two cultures. The !Kung multiaged child group occupies and supervises young children and even toddlers, but there is little or no formal assignment of baby care to older children. Agta children of both sexes fish during childhood. It seems likely that the level of responsibility assigned to children is a facultative adaptation among hunter-gatherers.

CONCLUSION

The CFA model has merit—most human behavioral adaptations are facultative—but the demise of the HGC model has been greatly exaggerated. Facultative adaptation is always an option for natural selection, and it would be expected to apply to infant and childcare in the human EEAs. But natural selection operating in any species must contend with constraints derived from phylogenetic history, and in the case of the HGC model there are deep homologies with parallel patterns in Old World monkeys and apes, suggesting the possibility that the common ancestor had already evolved these patterns between 30 and 40 million years ago.

Excellent recent studies have challenged some aspects of the model. The Ache keep their infants and toddlers off the forest floor and wean them at age two, but otherwise bear a strong resemblance to the !Kung in their patterns of care. The Efe have more multiple caregiving and the Aka have more paternal care, but the difference between them and the !Kung is less than has been suggested. Multiple caregiving and father involvement were always described as greater in the !Kung than in most cultures, and both were part of the HGC model as originally proposed. Moreover, maternal primacy is high in both the Efe and the Aka, making them only weak challenges to models of infant emotional development that center on attachment to a primary caregiver.

The Hadza comprise the greatest challenge to the model. They not only have earlier weaning than the !Kung, as do the Ache, but they were reported have significantly lower indulgence in infancy. Recently, however, more detailed studies of parent-infant interaction have suggested that this difference too has been overemphasized (Marlowe, chapter 8 this volume). The data on task assignment and specifically on foraging in childhood are excellent, and they clearly show a marked contrast to the !Kung. Although !Kung children do forage to some extent, it is not strongly expected of them and their productivity is much lower. This difference is of great interest, and it is clear that child foraging is a facultative human adaptation. It is also likely that weaning age is partly facultative, varying between two and four years of age, probably in response to the quality and predictability of the foraging environment, the availability of suitable weaning foods, and the presence of infertile women who aid in infant care.

Although of much poorer quality, the descriptive data in older ethnographies should not be discounted. There is no reason to believe that anthropologists who studied hunter-gatherers had a bias that would lead them to find conformity to features of the HGC model. Their accounts support most aspects of the model.

But even without them, the high-quality recent studies allow some generalizations. Hunter-gatherer childhood was characterized by close

physical contact, maternal primacy in a dense social context, indulgent and responsive infant care, frequent nursing, weaning between two and four years of age, high overall indulgence, multiaged child groups, variable responsibility in childhood, and relatively weak control of adolescent sexuality. These appear to be durable features of the model. Departures from them since the end of the hunting-gathering era constitute a discordance and may have psychological and biological consequences that merit further study.

NOTES

1. In making these comparisons Textor relied on the following previous studies: Whiting and Child (1953) for pain, overall indulgence and toilet training; Barry, Bacon, and Child (1967) for anxiety in childhood; Brown (1963) for initiation rites; and Harley (1963) for peer groups.

2. In addition to sources mentioned in note 1, Textor relied on Westbrook (1963) for attitudes toward premarital sex and on Ayres (1954) for desire for children.