

Childhood

ORIGINS, EVOLUTION, AND IMPLICATIONS

Edited by Courtney L. Meehan and Alyssa N. Crittenden

SCHOOL FOR ADVANCED RESEARCH PRESS • SANTA FE

UNIVERSITY OF NEW MEXICO PRESS • ALBUQUERQUE

© 2016 by the School for Advanced Research
Chapter 6: Hunter-Gatherer Infancy and
Childhood in the Context of Human
Evolution © 2016 by Melvin Konner

All rights reserved. Published 2016

Printed in the United States of America

21 20 19 18 17 16 1 2 3 4 5 6

Library of Congress
Cataloging-in-Publication Data
CIP TK

Cover illustration: TK <comment>[!Designer:
add cover illustration caption/credit!]

Hunter-Gatherer Infancy and Childhood in the Context of Human Evolution

MELVIN KONNER

Introduction

From initial research among the !Kung San (Ju/'hoansi), then hunter-gatherers of northwestern Botswana, and reviews of older ethnographic literature using the Human Relations Area Files (HRAF) and other sources, some generalizations about hunter-gatherer childhood have been suggested (Konner 1977, 1981; Konner and Worthman 1980). Features of !Kung infancy and childhood were representative of hunter-gatherers as described by classic ethnographers, which I have called the Hunter-Gatherer Childhood (HGC) model (Konner 2005, 2010). Viewed in the range of the infant and juvenile care of higher primates, the hypothesized HGC model was a species-specific derivation of a characteristic catarrhine (Old World monkey and ape) pattern. Early research on hunter-gatherer childhoods also addressed specific developmental theories. For example, the intensity of the hunter-gatherer mother-infant bond was viewed as supporting John Bowlby's theory of attachment in ontogeny and phylogeny.

At the time, it was common to use Bowlby's phrase "the environment of evolutionary adaptedness" (EEA) (Bowlby 1971) to refer to both what could be learned from extant or recent hunter-gatherers, and what could be reconstructed from archeological and paleontological data. Today, the known variability among hunter-gatherer adaptations (Bird and Bliege Bird 1997; Kelly 1995; Kent 1996; Lee and Daly 1999) requires us to recognize environments of evolutionary adaptedness (EEAs). However, it is still possible to make generalizations about hunter-gatherer subsistence ecology and social organization (Marlowe 2005a, 2010).

The HGC model proposed generalizations about infancy and early

childhood; hereafter referred to simply as childhood. But subsequent systematic research on infants and children among the Agta, Efe, Hadza, Aka, Ache, and other hunter-gatherer groups challenged some of these claims (Konner 2005, 2010). At least as much as the !Kung research and unlike classic ethnography, these studies were methodologically sophisticated and focused on infancy and childhood. Meanwhile, 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, 1999a); hunter-gatherer patterns of infant and child development and care should be facultative adaptations. I call this the Childhood as Facultative Adaptation (CFA) model (Konner 2005). Questioning whether hunter-gatherer childhood is in any meaningful sense a general adaptation, CFA challenges the HGC model and the claim that hunter-gatherer infancy and childhood support specific theories of behavioral ontogeny.

This chapter includes a partial summary, major update, and complete revision, motivated by and contextualized in a different theoretical context, of a previous review (Konner 2005). It considers what was actually said about HGC in the 1970s and 1980s based on !Kung research and classic ethnography, against the higher primate comparative background, and makes additional reference to more recent analyses of !Kung data. It goes on to consider newer challenges to the HGC model and asks whether the model has any further value. The elements of the model were as follows:

- Prolonged close physical intimacy with the mother
- Exceptionally indulgent response to infant needs and demands
- Highly frequent breastfeeding (four times an hour) during the waking hours
- Sleeping immediately beside the mother, with night nursing on demand
- Weaning around age three, with four-year interbirth intervals **
- Marked protest against separation and strangers into toddlerhood *
- Dense social context that relieves stress on mother
- Much less nonmaternal than maternal care during the first year **
- Much less father than mother involvement, yet more than in most cultures

Gradual shift to a mixed-sex, multi-aged play group
Little childhood responsibility for subsistence or infant care **
Few restrictions on childhood or adolescent sexuality

These generalizations were presented as hypotheses, in the hope that others would do serious research on hunter-gatherer childhood. This hope was realized (Hewlett and Lamb 2005). Features in the list above with two asterisks signify items for which important challenges have come from new research. Separation and stranger protest has one asterisk to signify that there is too little information in other studies to generalize. The results of those studies are considered below.

!Kung Infancy and Childhood

Classic ethnographers described !Kung infants as physically extremely close with their mothers and highly indulged. They suggested that !Kung childhood, and even adolescence, were largely carefree and emphasized the play group as a socializing context. Physical punishment was said to be rare. Later quantitative observations supported these descriptive accounts.

BREASTFEEDING

!Kung infants were breastfed whenever they cried as well as other times. Dawn-to-dusk observations showed breastfeeding a few minutes at a time, several times an hour (Konner and Worthman 1980). This was later confirmed in forty-five infants observed with a higher-resolution procedure (fifteen-minute sessions made up of five-second time blocks). Although observations had not begun during breastfeeding, the proportion of fifteen-minute periods without breastfeeding was less than 25 percent for children up to age eighty weeks old. Separately, seventeen mother-infant pairs (infants aged twelve to 139 weeks, mean = 63.9, s.e. = 9.9) were observed for six hours in three two-hour sessions on different days, with breastfeeding bout lengths noted to the nearest thirty seconds (Konner and Worthman 1980). Resulting measures were: bouts per hour, mean = 4.06; total nursing per hour, mean = 7.83 minutes; bout length, mean = 1.92 minutes; average time between bouts, mean = 13.9 minutes; and

longest time between bouts, mean = 55.16 minutes. The child's age strongly predicted the interval between bouts ($r = .71$, two-tail $p < .005$) but not total breastfeeding time or bout length.

WEANING AND BIRTH SPACING

Modal weaning age in traditional !Kung bands was three to four years (Konner 1977). Weaning was gradual, typically during the next pregnancy, and completed well before the birth of the subsequent child. Absent a pregnancy, children could breastfeed past age five. Supplementing with varied foods, initially pre-masticated, began around six months. Weaning did not typically include punishment, but weaning conflict could be marked (Shostak 1981). Still, some children were weaned with little difficulty.

SLEEPING DISTANCE AND NIGHT FEEDING

Direct observations were not made at night, but interviews revealed that it was universal for !Kung infants to sleep with their mothers at least until weaning. Of twenty-one mothers nursing infants up to age three years, twenty reported waking to breastfeed at least once each night. All said that their infants also breastfed without waking them up, from two to "many" times or "all night." Highly frequent daytime nursing supplemented by night nursing produces hormonal changes that help prolong birth spacing (Konner and Worthman 1980; Stern et al. 1986).

PHYSICAL CONTACT

The !Kung had very high levels of skin-to-skin contact in infancy, mainly 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" (Konner 1972:290). Quantitative data based on spot observations "indicate a gradual decline in passive physical contact 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). Passive physical contact with anyone peaked at about 90 percent between age ten and twenty weeks, and declined to about 42 percent by around eighteen months.

NONPHYSICAL INTERACTIONS

Traditional societies with more physical contact and breastfeeding could, in theory, have low levels of nonphysical communication, while Western cultures compensate with vocal and visual communication. Guatemalan and Boston US data (Klein et al. 1977) were compared with data on interaction among the !Kung collected with a very similar method. In the data collected in the US from Boston, Massachusetts, professional-class infants had more verbal interaction than working-class infants (Tulkin 1973; Tulkin and Konner 1973), but Guatemalan infants had much less verbal stimulation than did even the Boston working class: 4 percent versus 10 percent of five-second blocks. !Kung levels of infant vocalization, caregiver vocalization, and reciprocal vocalization resembled those of the Boston working class (Konner 1977).

OVERALL INDULGENCE

In wide cross-cultural comparisons, the !Kung ranked extremely high in indulgence, with punishment, especially physical punishment, rare in infancy and early childhood and uncommon in later childhood. There was a prompt and reliable response to crying !Kung infants (Konner 1972), with a 78 percent rate of response between eight and twelve months old (Konner 1977). !Kung infants displayed the cross-culturally common “normal crying curve” with a peak in the first three months and had the same number of crying bouts as Dutch infants. Bouts were shorter and total crying duration about half that in the Dutch sample (Barr et al. 1991). The difference in cry/fret duration appeared to be due to differences in caregiving, including physical contact and responsiveness to crying.

NONMATERNAL CARE (EXCLUDING RELATIONS WITH
THE FATHER AND WITH OTHER CHILDREN)

An early publication noted that other caregivers frequently engaged with infants (Konner 1972); 20–25 percent of physical contact was with individuals other than the mother (Konner 1975). Nonmaternal caregivers respond to approximately half of infant crying bouts, although many of these responses occur in tandem with mothers (Kruger and Konner 2010). Despite investment

from nonmaternal caregivers, !Kung mothers accounted for 75–80 percent of all physical contact that infants received (Konner 1975) and were primary responders to infant crying bouts (Kruger and Konner 2010). However, strong maternal dependency did not persist into childhood (Blurton Jones and Konner 1973). Between ages two and five years old, !Kung children roamed a greater distance from their mothers than did London children and received less nurturing.

Nancy Howell's recent reanalysis of life history and anthropometric data on the !Kung from the 1960s (N. Howell 2010) clearly shows that nonmaternal care is vital to child survival. Nuclear families with two or more children run an energy deficit and must be provisioned by others, not necessarily relatives, and indicate no special role for grandmothers. Howell concludes that !Kung adults operate with a rule of thumb approximated by "feed the thinnest child."

FATHER CARE AND INVOLVEMENT

An early paper stated that !Kung fathers "account for a greater proportion of vocalizations to infants during the first three months (10 percent) than do American fathers" (Konner 1976b:114). The point of comparison was a study in Boston, Massachusetts, (Rebelsky and Hanks 1971) that measured fathers' vocalizations to three-month-olds at thirty-seven seconds per twenty-four hours. We emphasized both !Kung fathers' lesser involvement compared with mothers, and their greater involvement compared with Western fathers of that era: "Since [!Kung] 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" (Katz and Konner 1981; West and Konner 1976:167); further, "The !Kung are classified as 'high' on closeness of fathers to infants and young children in a sample of eighty independent nonindustrial societies (Barry and Paxson 1971)—they represent the upper end of the range of direct male care . . . seen in the ethnographic record."

!Kung father participation (father score divided by combined parental score) was 2.3 percent for younger infants and 6.3 percent for older infants. However, considering only the observations in which the father was present, the corresponding figures for physical contact are 26 percent for younger

infants and 35 percent for older infants, and for face-to-face contact they are 45 percent and 28 percent. In the study of two- to six-year-olds, the father was present in 30 percent of observations of !Kung children, versus 19 percent in London (Blurton Jones and Konner 1973).

RELATIONS WITH CHILDREN

During the second year of a child's life, toddlers began actively to play with other, mainly older, children (Konner 1975). Given hunter-gatherer band size, peer groups—children the same age and sex—were demographically unlikely and were not observed. Play groups consisted of both sexes and a range of ages. Possible adaptive functions of mixed-age play groups were suggested, including facilitating relationships in two- to five-year-olds (bypassing the oft-noted Western developmental “stage” of parallel play), socializing younger children, providing practice-caregiving to older children, and diffusing a mother's childcare burden.

“CAREFREE” CHILDHOOD

Extensive studies of older children by Draper and others (Draper 1972, 1976; Marshall 1976) showed that children were neither assigned tasks of economic importance, nor were they expected to feed themselves by foraging, although they sometimes did. Draper showed that the assignment of responsibility to children depends on subsistence ecology: children in more settled !Kung groups were given more tasks, while traditional !Kung children were almost responsibility-free. Still, although “the principal concern of the group is always play . . . this may and typically does include . . . play at subsistence,” which “may produce food. . . . It invariably includes also, though incidentally, protection and care and teaching of infants and children by older children” (Konner 1975:111).

Hunter-Gatherer Childhood: Recent Scientific Studies

This section considers recent quantitative and qualitative studies of hunter-gatherer infancy and childhood, offering information on most or all claims in the HGC model. This includes the Hadza, Efe, Aka, Ache, and Agta, and (less comprehensively) the Bofi, Martu, and Toba.

HADZA

The Hadza inhabit the rocky hills near Lake Eyasi in northern Tanzania and were about 95 percent hunting and gathering when studied (Blurton Jones 1993; Kaare and Woodburn 1999; Marlowe 2010; Woodburn 1968a). The environment is climatically milder and produces more game and plant foods than that of the !Kung environment. Nutrition is adequate and the population continues to grow slowly. Hadza infancy and childhood have been well described (Blurton Jones 1989, 1993; Blurton Jones et al. 1989; Marlowe 2005b, 2010), and in some ways conform to the HGC model. According to the descriptions, during the first year of life, Hadza mothers were primary caregivers. The infant was carried the majority of the time in a sling and breastfed frequently. Hadza infants routinely interacted with other caregivers of all ages (Blurton Jones 1993; Crittenden and Marlowe 2008; Marlowe 2005b).

Mothers, by far, accounted for most interactions with infants during their first year and predominately through their third year. During thirty-minute focal follow observations of infants, mothers interacted with them 78 percent of the time (43 percent over the first four years). Fathers and older sisters each interacted with infants 18 (17) percent of the time, older brothers 8 (9) percent, maternal grandmothers 9 (10) percent, and others 29 (41) percent (Marlowe 2005b). As in the recent analysis of !Kung response to infant crying (Kruger and Konner 2010), several people often responded to a crying bout, but the mother predominated: “about 30 percent of all holding of children (\leq four years old) is by someone other than mother” (Marlowe 2005b:185). Later research confirmed maternal predominance (69 percent of holding), as well as important roles for fathers (7.1 percent) and maternal grandmothers (3.7 percent). It also showed that the strongest predictor of nonmaternal care is relatedness, confirming the kin selection hypothesis (Crittenden and Marlowe 2008). Thus, the Hadza show maternal primacy in the context of multiple caregiving.

Given the theoretical emphasis on grandmothers (e.g., Hawkes et al. 1998; see also Meehan, Helfrecht, and Malcom, chapter 9, this volume), it is surprising to find fathers interacting with infants substantially more (or at least equally, controlling for residency in camp) (Crittenden and Marlowe 2008). Fathers did more when they were genetically related rather than stepfathers, a common role due to the divorce rate (Marlowe 2005b, 2010). Absent a genetic father, the maternal grandmother’s role grew, and grandmothers played an

important role in food provisioning (Hawkes, O'Connell, and Blurton Jones 1997). Fathers communicated with, played with, and nurtured genetic children more than stepchildren, and paternal care was inversely correlated with a father's mating opportunities as measured by the number of single, younger women in the camp (Marlowe 1999).

Weaning time for the Hadza was earlier than for the !Kung and occurred around age 2.5 years (Blurton Jones 1993). The fertility rate was higher than for the !Kung, but this was mainly because of a more extended reproductive period for women (Blurton Jones et al. 1992). Once weaned, Hadza children stayed in camp in mixed-age and mixed-sex play groups, typically under the supervision of one adolescent or adult camp member or unsupervised. Unlike the !Kung, they often did chores for the household, such as water collection, sending messages back and forth between adults, and childcare, in addition to foraging for themselves and other children left in their care (Blurton Jones 1993; Crittenden, chapter 7, this volume; Crittenden et al. 2013; Marlowe 2010). Hadza children ages three to seventeen successfully foraged mainly for fruit (64 percent of their yield), but also birds (16 percent), tubers (9 percent), small mammals (3 percent), and drupes and legumes (1 percent). Girls made more trips and brought back more calories than boys (who ate more of the proceeds along the way), and yield increased with age (Crittenden et al. 2013). Of thirty-four children who foraged at least once, a slight majority collected less than 25 percent of their daily caloric needs, but seven met 25–50 percent of their daily needs, five met 51–75 percent, and four met or exceeded their daily requirements. Two of the girls produced large surpluses that helped feed their disabled parents. Alyssa Crittenden and her colleagues rightly call attention to the fact that children may be contributors as well as dependents, giving rise to the concept of children as “embodied capital” (Crittenden et al. 2013:303).

Finally, the Hadza were seen as “strikingly different” from the !Kung in the amount of punitive, prohibitive, and directive parenting: “We see Hadza parents use physical punishment, and we see and hear them shout prohibitions and commands at children” (Blurton Jones 1993:317). Alyssa Crittenden endorses this view (pers. comm., 2012). Despite this, Hadza children are cherished and parents often speak very fondly of their children (Blurton Jones 1993). Mothers and fathers were described as sensitive to fussing and crying, although mothers were more effective: “children received considerable affection and were rarely punished” (Marlowe 2005b:179).

EFE

The Efe are small-stature hunter-gatherers of the Ituri tropical rain forest in northeastern Democratic Republic of the Congo, formerly Zaire (Bailey 1991; 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, Morelli, and Winn 1987:97), for which they trade hunted game. They are seminomadic, living in small camps of six to fifty people made up of several extended families.

Sophisticated research on Efe infancy began in the 1980s. An initial paper proposed a contrast between the Efe and !Kung, challenging what the authors called the Continuous Care and Contact (CCC) model, as opposed to the Caretaker-Child Strategy (CCS) model (Tronick, Morelli, and Winn 1987; Tronick, Morelli, and Ivey 1992). The contrast between the !Kung and Efe was striking and began with birth. Ideally, the birth of a child is a solitary event among the !Kung, but a group affair for the Efe. Among the Efe, other women typically breastfed the infant until the mother’s milk came in, but mothers also nursed the infants during this period. Mother-infant contact began within hours after birth, with the infant remaining in nearly constant close contact with the mother or another person. This nearly constant close contact continued through toddlerhood until the age of three years. When the mother resumed work postpartum, the infant either accompanied her or was left in camp with an allomother.

Multiple care, which is highly indulgent, is common for the Efe, with individuals other than the mother accounting for 39 percent of physical contact with three week old infants and 60 percent at eighteen weeks old. Infants were cared for by five to twenty-four different people (mean = 14.2). Multiple caregiving, although high, is quite variable; the proportion of time an infant spends with someone other than the mother ranges from none to about 65 percent at three weeks old and about 20–80 percent later. The authors conclude, “the developmental course of the Efe infants’ and toddlers’ social relationships does not conform to the patterning of relationships predicted by CCC models” (Tronick, Morelli, and Ivey 1992:573). Later, Ivey (2000) confirmed the major role played by nonmaternal caregivers, referring to the Efe as “the most extreme example of alloparenting in a foraging population” (Ivey 2000:857–858) and showed that women strongly predominate. Children between ages four and twelve spend about 4 percent of their time caring for

infants, increasing after age twelve to about 8–10 percent, although they are in proximity to infants much more than that (Ivey, Morelli, and Tronick 2005). Also, “the ubiquitous mixed-age and -sex play group of children among foragers” (Ivey Henry, Morelli, and Tronick 2005:210) is the context in which much care occurs. As with the Hadza, genetic relatedness strongly predicts nonmaternal care (Ivey 2000).

Fathers contributed much less than the sum of other adults or children, but more than the *average* other adult at most ages. This may mean that the father is the second most important caregiver after the mother (although not a close second). In another study on Efe children at ages one, two, and three years, Morelli and Tronick (1992) compared the father with other men and boys, but not with all other adults and children. The time that a child spent with an average other man was more than half of that spent with the father. The time spent with an average boy was greater than the time spent with the father at one year, after which the disparity increased markedly. Thus, “the role Efe fathers played in the lives of their children relative to other males did not appear to be particularly special or unique” (Morelli and Tronick 1992:49).

Infants’ social contact with other children tripled over the first three years, reaching 29 percent at five months and 62 percent at three years, whereas contact with adults did not change (Tronick, Morelli, and Ivey 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. Contact with the *average* child at three years was twice that with the father and almost equal to that with the mother. In an average hour, five-month-olds encountered from none to four children, three-year-olds from one to six.

AKA

The Aka are small-stature hunter-gatherers of the tropical forest in southwestern Central African Republic and northern People’s Republic of the Congo (Bahuchet 1999). Their tropical rain forest environment is varied and rich. At the time of Hewlett’s (1991b) study, they were predominantly foraging for a living, spending 56 percent of their time hunting, 27 percent gathering, and 17 percent working for nearby agriculturalists. Their diet, however, was mainly farm produce for which they traded hunted game. Infertility was infrequent and total completed fertility was 5.5, with an interbirth interval

(IBI) of 3.6 years. Infant mortality was approximately 20 percent in the first year. Camps consisted of twenty to thirty-five people (half younger than fifteen) in one to fifteen nuclear families. People moved, aggregated, and dispersed depending on food availability. According to Hewlett's classic monograph, Aka infancy is indulgent and "lacks negation and violence. . . . Seldom does one hear a parent tell an infant not to touch this or that or not to do something" (Hewlett 1991b:35). Either parent hitting an infant is said to be grounds for divorce. Furthermore, 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. . . . Unlike their village neighbors, Aka infants are carried in a sling on the side rather than on the back, which allows for more face-to-face interaction with the caregiver" (Hewlett 1991b:32–33).

Allomaternal care among the Aka is also important and has been carefully studied (Hewlett 1991b; Meehan 2005a, 2009; Meehan, Helfrecht, and Malcom, chapter 9, this volume). Hewlett (1991b) found that, "While in the camp setting" (i.e., not during transport), "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 an average day (Hewlett 1991b:34). Outside the camp, however, the mother holds the infant nearly 90 percent of the time.

Provisioning of food to the young supplements breastfeeding, eventually enabling weaning, and here too Aka nonmaternal care is critical. Aka weaning usually takes place around three or four when the mother becomes pregnant again (Hewlett 1991b:36–37), although supplementation of food and water begins before weaning (Meehan and Roulette 2013). A study of Aka in the Republic of Congo followed twenty-two children between ages two and four, finding that "even though mothers were the single highest contributor to child feeding, combined allomaternal contributions (i.e., contributions by fathers, grandmothers, aunts, siblings, and cousins) to child feeding was higher than that of mothers" (Jung and Fouts 2011:285). Elderly female relatives provided not much less food than mothers did, and they provided more than fathers, as did adult female relatives (under age forty-five) and juvenile relatives (Fouts and Brookshire 2009). Furthermore, adult female relatives increased the amount of food they gave to a child with an infant sibling, confirming the

importance of cooperative breeding in the wake of weaning in the human species (Kaplan et al. 2000).

Additionally, Aka infants display attachment behaviors to an average of five to six caregivers (including mothers) (Meehan and Hawks 2013). Infants are unlikely to fuss or cry when their mothers leave them with an allomother or upon her return, and fussing is negatively related to allomaternal sensitivity. However, these separations average about three per day, with 80 percent lasting less than ten minutes, 55 percent less than five minutes, and only 11 percent over an hour. Mothers hold infants about three times as much as the allomaternal total in the first six months, five times as much in the key period of 6.5 to eleven months, and three times as much from twelve to thirty-two months. Regarding the child's attachment behaviors as classically defined, mothers receive almost 75 percent of attachment behaviors from 6.5 to eleven months, and more than 60 percent thereafter. Given that an average of five allomothers are in the attachment-related category for each infant, no one allomother nor all of them together rivals the mother in time spent with the infant, time holding, or receiving attachment behaviors.

Most distinctive about Aka infancy is the intimacy of fathers (Hewlett 1988, 1991b), as "Aka fathers do more infant caregiving than fathers in any other known society" (Hewlett 1991b:169). However, the highest number reported for Aka father involvement is 22 percent—the percentage of all infant holding done by the father during the first four months, while the mother accounted for 51 percent, and others, 27 percent (Hewlett 1991b:79, table 15). The mother remained the overwhelmingly important caregiver during infancy, accounting for 87–96 percent of holding during net hunts. When in the forest camps while not hunting, mothers accounted for 51 percent of the holding in the first four months, 87.5 percent in the eight to twelve month period, and 57.3 percent between thirteen and eighteen months. Fathers received 15.5 percent of attachment behaviors, others (totaled) 22.2 percent, and mothers 58.8 percent. Fathers, then, received about a fourth as many attachment behaviors as mothers at this age, rising to 58.4 percent of the mother's tally in the second year (see also Meehan and Hawks 2013). Over the whole age range the behavior "fuss for" was coded for mothers almost eight times as often as for fathers, even though fewer than one in five instances of fussing for mother ended in nursing (Hewlett 1991b).

Fathers' contributions among the Aka, however, are not always easy to interpret. A detailed analysis of nonmaternal care for a small sample of

infants and toddlers showed that mothers' working energy expenditure (EE) was decreased by 28 percent due to nonmaternal care (Meehan, Quinlan, and Malcom 2013), which roughly corresponds to the estimate that a fourth of care is done by nonmothers (Meehan 2005a). However, the EE reduction is not due to fathers, who actually increase mothers' EE (as do juveniles). Instead, the mothers' EE reduction can mainly be attributed to grandmothers, who were likely to be involved since the sample consisted of *young* mothers. In direct care, as measured by physical contact, grandmothers provide more care and substitute for mothers in a roughly equal exchange. By contrast, the frequency of fathers' direct care reduced mothers' physical contact, yielding a net reduction for the child.

Unlike the !Kung or Hadza, the Aka multi-age play group could be same-sex. When they could keep up, children followed their parents on net hunts. They might or might not help in the hunt. From around age eleven or twelve the sexes segregated, as in most cultures (Schlegel and Barry 1991). Girls collected water, nuts, or fruit together, while boys hunted small game. As in all hunter-gatherer groups, children inevitably experienced loss of loved ones through untimely death, and they were deeply affected (Hewlett 2005, 2013). Adolescents may sleep and eat with their parents but often traveled to visit relatives and explore the region. Initiation included circumcision for boys and filing the incisor teeth to a point in both sexes. There is not much ritual attached to these events, but they are painful, require courage and fortitude, and give the initiate a sense of having left childhood behind.

ACHE

The Ache (Guayaki) of eastern Paraguay traditionally foraged in a dense, subtropical, broadleaf, evergreen forest (Hill and Hurtado 1996, 1999). Although settled on a Catholic mission, they had been full-time hunters until the 1970s, and in the 1980s were studied with a focus on demography, subsistence ecology, life history, and child development. At that time, they obtained 20–25 percent of their food from foraging, and their patterns of life before settlement were reconstructed: “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).

The Ache were traditionally nomadic; men provided 87 percent of subsistence (by energy intake) and spent twice as much time as women in the food quest. The women deferred subsistence work for childcare, which is not true of most hunter-gatherers. As for indulgence, “Ache children of less than four 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). However, they were helpful and obedient when older.

Quantitative research confirmed these accounts (Hill and Hurtado 1996): Ache infants, much like the !Kung, spent the first year of life in almost constant contact with their mothers—even sleeping in their laps at night. Infants under one year of age spent over 90 percent of daylight hours in direct physical contact with their mother or father (Hill and Hurtado 1996). This contact seems needed to keep infants alive in a hostile environment characterized by predator pressure, and “high-quality childcare overrides other competing needs” (Hill and Hurtado 1996:220). Mothers collect less food than other women, despite having more mouths to feed.

The pattern of breastfeeding partly conforms to the HGC model in nursing frequency, but not in weaning age or birth spacing. Ache infants nurse on demand until their mother is pregnant with the subsequent child. The mean interval between nursing bouts was about thirty minutes, with the mean nursing bout length declining from more than ten minutes to about two minutes over the infants’ first eighteen months. This pattern, which may have emerged after reservation settlement, could have led to shorter birth spacing. However, within the small sample studied there was no relationship between nursing measures and birth interval. Furthermore, birth spacing even in the pre-contact period was shorter than that of the !Kung. 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. Median age at weaning was twenty-five months. Weaning was described as an “extremely unpleasant experience for mothers (and apparently for their children), with children screaming, hitting, and throwing tantrums for several weeks” (Hill and Hurtado 1996:220–221).

Extensive provisioning of food occurred among the Ache, mainly in the form of hunted meat provided by men. The father played a major role, but a couple with children required supplementation by others, mainly men other than the father (Hill and Hurtado 2009). Grandmothers contributed little to supplementation in the Ache, unlike the Hadza and the Aka where both

grandmothers and fathers contribute in various ways. The Ache pattern may reflect the high degree of dependency on meat in a setting where women did little or no hunting.

After infancy, younger children tended to stay in camp playing with objects, pets, and each other, and seeking maternal attention. Transportation in the forest depended on a sling that kept infants in contact with their mothers, their heads resting on her chest. At around eighteen months they began 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 years they might ride "piggyback" on their fathers, grandparents, or other adults. After age five they were weaned from the back and encouraged or forced to walk on forest trips, a crisis in their lives just as it is for !Kung children.

Subsistence learning also began by age five, intensifying in middle childhood. Children learned about edible fruits, stinging plants and animals, and vines with thorns. As they spent time following women, boys and girls became skilled foragers for fruit, insect larvae, and small animals. By age eight they had learned the crucial, difficult, and subtle art of tracking adults in the forest. "There is no segregation of play or foraging parties by sex, and children spend most of their time within fifty meters of the adult women in mixed age-sex groups" (Hill and Hurtado 1996:223).

At around ten years of age boys and girls began to be independent, sometimes sleeping at a relative's fire or traveling with another band for a time. Godparent-like relationships became important. Boys carried bows and arrows (but did not learn to make them), and girls babysat, ran errands, and drew water. Girls might produce as much food as adult women by age twelve, but did not carry a burden-basket until they were married. Boys exceeded girls in food production by sixteen, but did not reach adult male levels until their mid-twenties, by which time they were producing a surplus to help support couples with children.

AGTA

The Agta occupy habitats in the rugged Sierra Madre mountain range on the main island of the northern Philippines (Griffin and Estioko-Griffin 1985); a semi-seasonal tropical rain forest crossed by many streams, rivers, and waterfalls. Like the Aka and Efe, they depended on neighboring agricultural people for the bulk of their plant foods and other consumer goods, which they

got in trade for hunted game. They were seminomadic and widely distributed in small camp groups. Agta men were full-time hunters and fishermen, but women hunted to a degree unknown in any other human group, killing up to half of the hunted game (Estioko-Griffin 1985; Estioko-Griffin and Griffin 1981). Since hunting is often viewed as incompatible with infant and childcare, the Agta are a key 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 that of the !Kung; Agta birth spacing, which was determined retrospectively for women over forty-five, was slightly over three years when the last child lived until the birth of the next sibling, (Goodman et al. 1985). Infants remained in almost constant contact with their mothers for the first few weeks, yet also routinely interacted with fathers, grandmothers, and other kin. Infants were carried by their mothers in a sling for the first year and nursed on demand. During this time, women were “engaged in collection of forest materials, and some sporadically hunt[ed] and kill[ed] game while transporting the baby” (Griffin and Griffin 1992:301). This account highlights the fact that mothers did some of their hunting without interrupting continuous physical contact.

Weaning was gradual, but weaning age can be roughly estimated from the following: “Sometime when the child is roughly between age twenty to twenty-eight months, it nurses less and less. . . . This gradual decrease in nursing seems to run about three to six months” (Thomas Headland 2004, pers. comm.). Since the criterion for the !Kung was complete weaning, we can estimate the earliest completed weaning age for Agta at twenty-three months. Also, “small children are almost never nursed after twenty-eight to thirty months.” From this, a reasonable estimate of weaning age would be midway between twenty-three and twenty-nine months, or twenty-six months, but this is a slightly earlier age than stated in a previously 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).

Quantitative data, based on spot observations of children under age eight, were quite consistent with maternal primacy. Within the residential cluster, mothers of children from birth to eight years are caregivers slightly more than 50 percent of the time. Care from grandmothers and elder sisters come in at a modest 7.5 percent and 10.4 percent respectively, and fathers follow with only

4.4 percent (Early and Headland 1998:303). However, 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).

Fathers "are most often seen carrying toddlers and older children on subsistence trips and on residential moves" (Early and Headland 1998:306); they were "never observed" in pacification play with a fussing or crying baby (Early and Headland 1998:307). There is considerable individual variation, however. Of seven fathers of infants under age two, the ratio of observations of paternal ("babysitting") to maternal caregiving was two-thirds in one case, more than half in another, and zero in two others. However, all four with infants under age one 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" (Early and Headland 1998:317). Fathers' limited role is more remarkable given Agta women's time spent hunting.

"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" (Early and Headland 1998:302). As with the !Kung, this play included care of younger children by older ones, but Agta children also contributed to subsistence. All Agta fished beginning in early childhood and were adept at it by adolescence. Both sexes began hunting after puberty (Estioko-Griffin and Griffin 1981).

BOFI

Bofi foragers live in the southwest Central African Republic, part of the Congo Basin rainforest (H. Fouts 2004; Fouts, Hewlett, and Lamb 2001; Fouts and Lamb 2005). Although sometimes considered part of the same cultural group as the Aka, they speak a distinct language, that of the nearby Bofi farmers. Bofi forager subsistence consists mainly of gathering and net hunting, in which all take part. The foragers have gender and age egalitarianism, sharing within and among families. The IBI was three to five years and completed fertility was 5.5 births per woman. As with other hunter-gatherers, mortality was very

high in infancy (20 percent in the first year) and childhood (40 percent before age fifteen) (Fouts and Lamb 2005).

Much like the other groups discussed in this chapter, parenting was characterized by close physical proximity. Parents were permissive and indulgent by Western standards and children were rarely directed or punished. As children grew, but prior to weaning, they might be left in camp from time to time although, if a child protested, he or she would be carried by the parent on the outing (Fouts and Lamb 2005:314).

Weaning occurred at approximately thirty-five months (Fouts, Hewlett, and Lamb 2001, 2005, 2012; Fouts and Lamb 2005). Thus, there were typical hunting and gathering patterns of nursing and very late weaning, but weaning appeared to be more child-directed and less stressful than among some other hunter-gatherers (Fouts and Lamb 2005).

Father involvement was studied in both Bofi foragers and Aka living in Congo (not the Central African Republic Aka described originally by Hewlett) (H. Fouts 2008). It was comparable in both groups (slightly more than in the !Kung) but much less than in Hewlett's study. For the Bofi, there was significantly less father involvement when a postmenopausal female relative was in the camp. Bofi children's touch interactions with toddlers resemble play, not physical care (Jung and Fouts 2011). A study of cultural and social learning in foragers (Bofi and Aka) and farmers in children four to twelve years old showed that play took up 31 percent of their day (as measured by focal follows), and idleness ("laying around") took up another 38 percent. "Forager play is relatively equally divided between solitary play, social play, and work play (children imitating/emulating adult tasks)" (Hewlett et al. 2011:1173), and is considered an important learning context, although it appears that more is learned from parents when children are at younger ages.

MARTU

The Martu (Mardu) live in the northwest part of Australia's Western Desert. After an exile in the mid-twentieth century, many returned to their traditional lands to live in small outstations where they continued to forage regularly (Bliege Bird and Bird 2008; Scelza 2009). Infants and young children were seen as the "center of attention" in the family and frequently given affection by parents, siblings, and other kin (Tonkinson 1991:83). Infants did not cry for extended periods without being consoled, were breastfed on demand,

and weaned themselves because mothers could “see no point in deliberately or traumatically ending the practice” (Tonkinson 1991:83). Because the traditional system was often polygynous, “if an older wife no longer has young children of her own, she shares fully in the rearing of her co-wife’s children and is as much a mother to them. . . . Most children grow up with at least two ‘real’ mothers to whom they have emotional ties, as well as many other ‘mothers’ toward whom they feel varying degrees of attachment” (Tonkinson 1991:99). Generally, Australian aboriginal infants rarely or never slept alone (A. Hamilton 1981).

Despite considerable assimilation, Martu infants are “held 23.7 percent of the time; for the youngest age set (zero to six months) this number rises to 74.3 percent. Martu babies are not held as often as those among more traditional hunter-gatherers, due at least in part to the introduction of strollers and cribs (although the latter are still rarely used). Still, there is a much higher level of physical contact directed toward Martu babies than has been reported for American babies” (Tulkin and Kagan 1972). Babies become more active and more independent as they grow, and begin playing and walking around. There is little crying after the first six months. However, “Mothers spend more time caring for their children than any other caretaker. Grandmothers also spend a great deal of time caring, more than fathers, siblings, or grandfathers” (Scelza 2009:451).

Fathers did not stand out in this data set, but half of the infants did not have fathers present in the community. Also, “one reason for the conspicuous lack of paternal care might be the age restrictions of this study. Although no scans were done on children over the age of three, it was very common to see fathers with children between the ages of three and six” (Scelza 2009:452–453). Siblings’ care was “focused mainly on holding, watching, and playing with babies,” rather than more intensive care. “The small effect of siblings overall in these analyses may be partly circumstantial, as 40 percent of the babies in the sample were first-borns and another 30 percent did not have a sibling over the age of five” (Scelza 2009:453).

Regarding the development of participation in the food quest, “children above the age of five often search for and pursue game animals. But they focus their efforts in different resource patches than adults” (Bird and Bliege Bird 2005:132). Children were expected to help collect plant foods and grubs, but did not really fend for themselves, and were not encouraged to accompany adults on hunting trips until their mid-teens (Scelza 2010). Among the Martu

and also the Meriam aborigines, women tend to hunt small game such as lizards, fish, and shellfish, reliable and low-risk efforts that help ensure steady offspring provisioning, while men's strategies vary between low- and high-risk hunting depending on ecological conditions and available alloparental support (Coddington, Bliege Bird, and Bird 2011).

TOBA

The Toba (Valeggia 2009; Valeggia and Ellison 2004, 2009) are former hunter-gatherers of the Gran Chaco region of Argentina, traditionally seminomadic, equestrian, and warlike, practicing occasional horticulture. Women's gathering was and is important, as were the men's activities of hunting, fishing, and honey collecting. They were organized in bands (groups of extended families). Monogamy was the most prevalent mating pattern. Until the 1930s, they relied on foraging, but disruptions to their lifestyle and habitat destruction forced settlement. The Toba were studied in two settings: first, a remote, rural area of the Western Chaco 500 kilometers west of the city of Formosa; and second, the peri-urban village of Naqom, located eleven kilometers northwest of Formosa.

In the rural setting (Valeggia 2009), many Toba did substantial foraging, obtaining 25–50 percent of subsistence from gathered foods and hunted game, with fishing and honey collecting prominent. During the lush months of October through February, wild food is abundant so some families moved to temporary camps near the wetlands where they fished. Very few men, but about half of nulliparous and postreproductive women reported engaging in childcare. In a study of twenty-four families with at least one infant, all-day spot observations noted who was caring for the infant at fifteen-minute intervals. Adult men (including fathers) held infants less than 2 percent of the time, while the mother was the main caregiver in 60 percent of the observations. Older sisters and maternal grandmothers contributed most to alloparental care, followed by aunts and female cousins. However, *ad lib* observations suggested that young, related girls did most of the nonmaternal care. "During the fruit-gathering season, mothers usually take their nursing infants with them, but they also take along older daughters, young sisters, or nieces that carry the baby when they are actively gathering fruits in the forest. Weaned children (approximately two to four years old) usually join older children's groups and roam around the community with them, only going to their mothers when they are sleepy or hungry" (Valeggia 2009:106). Total fertility was 6.7 births per woman (Valeggia and

Ellison 2004) and the median IBI in this population was 28.5 months (mean 33.2). “Toba women still practice on demand, exclusive breastfeeding for an extended period of time” (Lanza, Burke, and Valeggia 2008:32).

The peri-urban center’s 2,300 inhabitants relied mainly on men’s wage labor for subsistence (Valeggia and Ellison 2004). Women cared for children and did household chores and basket weaving. Fewer than 5 percent of women had paid jobs, but some went to the city once a week to sell their weavings or wild herbs and attend government sponsored pre- and postnatal care programs. Mothers spent 34 percent of their waking time caring for infants and were the primary caregiver 77 percent of the time.

Infants were breastfed for two to three years, or until the second trimester of the next pregnancy. Co-sleeping and nighttime nursing were universal. Exclusive breastfeeding lasted 5.7 months, with 10 percent of mothers introducing cow’s milk (from powder) at or before age three months. At four to six months some soft solid foods were introduced. For the first eighteen months, infants were nursed an average of 2.9 times per hour for about two minutes each time. Mean interbout interval was five to nine minutes, with no significant change predicted by infant age. Mothers spent an average of 49 percent of the day in infant and childcare, 19 percent chatting with relatives and friends, and the remainder in household work, mainly washing and cooking.

Nonmaternal care averaged 22 percent (increasing from 17 percent in the first three months to 42 percent after eighteen months) and was almost exclusively provided by kin (Valeggia 2009). In contrast to the rural Toba, fathers were the main nonmaternal caregivers, increasingly so as infants aged. Grandmothers and aunts provided additional care at all infant ages, with girls helping after around fifteen months. However, “it is possible that weaned children receive more allomothering care than nursing infants. In fact, the most frequent sight in Toba villages is the multi-age sets of children playing in common areas (streets, plazas) and going from household to household. . . . These multi-age sets include toddlers usually carried by older siblings” (Valeggia 2009:110).

Summary of the Newer Evidence

New quantitative studies have focused on infancy and childhood in at least eight hunter-gatherer cultures: Hadza, Efe, Aka, Ache, Agta, Bofi, Martu, and Toba. Each of these groups has been described as departing from the HGC

Table 6.1. The Hunter-Gatherer Childhood Model in Nine Cultures

	Frequent nursing	Weaning age/interbirth interval, mos.	Sleeping with mother	Physical contact, all	Overall indulgence	Nonmaternal care	Father involvement	Maternal primacy	Multi-age child group	Assigned chores	Self-provisioning
!Kung	+++	42/48	+++	+++	+++	++	++	+++	+++	-	+
Hadza	+++	30/38	+++	+++	+	++	++	++	+++	++	+++
Efe	+++	30/38	++	+++	+++	+++	+	++	++	+	+
Aka	+++	42/48	+++	+++	+++	+++	+++	++	+++	+	+
Ache	+++	25/37	+++	+++	++ ¹	+	+	+++	+++	-	+
Agta	+++	27/36	+++	+++	+++	++	+	+++	+++	++	?
Bofi	+++	35/48	++	+++	+++	++	++	+++	+++	-	+
Martu	++	“several years”	++	++	+++	+++	+	+++	++	?	+++
Toba	+++	30/36	+++	+++	++	++	++	+++	+++	+	+++

Note: The !Kung are compared with eight other recently studied hunter-gatherers on eleven aspects of infant and childcare included in the HGC model.

model as it was originally presented based on studies of the !Kung and reviews of older literature on other hunter-gatherers.

Table 6.1 shows the findings of recent studies regarding key features of the HGC model. They suggest a high level of support for most of the original generalizations. Hunter-gatherers exhibit frequent nursing, mother-infant co-sleeping, high physical contact, high overall indulgence (questionable only

for the Hadza), substantial to high nonmaternal care and father involvement, maternal primacy, transition to a multi-age child group, and a childhood *relatively* free of assigned chores (questionable for the Hadza and Martu). Only the Aka match the !Kung in weaning age and IBI, but all have weaning ages over two years and IBI over thirty-three months. All are in the upper half of the range for nonindustrial cultures (Sellen 2001).

Meeting the Challenges

Divergences from the HCG model have been observed in four main areas: weaning and birth spacing, maternal primacy, overall indulgence, and responsibility in childhood.

WEANING AND BIRTH SPACING

One strong challenge comes from age of weaning and IBI (see table 6.1). These are, respectively (in months): Hadza thirty and thirty-eight (Blurton Jones 1993; Frank Marlowe, pers. comm. 2004); Efe thirty and thirty-eight; Aka forty-two and forty-eight; Ache twenty-five and thirty-seven; Agta twenty-seven and thirty-six; and Bofi thirty-five and forty-eight. Mean IBI is thirty-three months for rural and thirty-six for peri-urban Toba (data are insufficient to estimate these measures for Martu). Among the Aka, the process closely resembles that of the !Kung, with about forty-two months of nursing and forty-eight months between births. For the Bofi, the estimates are thirty-five and forty-eight months. The Hadza and Efe, and even more so the Ache and Agta, clearly have younger weaning ages and shorter IBI.

However, prospective measures of Ache weaning were made during the reservation period, and the possibility that weaning was later and IBI 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” (Hill and Hurtado 1996:221), it is likely that traditional Ache weaning age was around thirty months. 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” (Hill and Hurtado 1996:220–221) strongly suggests a traditional desired weaning age of more than two years. The Hadza have a weaning age of thirty months in a

setting far closer to their traditional way of life. The Efe IBI of thirty-eight months occurs against a background of exceptionally high infertility in the population. This could explain shorter IBIs in the fertile women, achieved in part through multiple caregiving, including nursing.

Overall, however, these seven 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 rather than the !Kung and the Aka, Paleolithic weaning would likely have been late and IBI long. Against the background of ape patterns, however, this would represent a significant evolutionary shortening, a departure from the catarrhine mother–infant complex. A key difference between human parenting and parenting in other primates is the fact that only humans substantially provision young with food after weaning (Lancaster and Lancaster 1983a). 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 of the HGC model has been 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. 1991; Sroufe and Waters 1977). Both the Efe and Aka studies have been cited as undermining this claim, but this challenge is easily met. First, the claim of maternal primacy in the !Kung was never as strong as it was made out to be; the importance of multiple caregivers there and among other hunter-gatherers was always clear. Second, to the extent that maternal primacy was emphasized, there is little in later research to undermine it.

The first of these statements is supported above, so we can focus here on the second, with an emphasis on maternal primacy, deferring discussion of attachment monotropy (see also Meehan, Helfrecht, and Malcom, chapter 9, this volume). With the exception of weaning age, the Ache experience is virtually superimposable on that of the !Kung. The Hadza represent more of a departure, since mothers wean earlier and separate more frequently from their children than the !Kung do, but there is nothing in the Hadza literature inconsistent with maternal primacy and quantitative analysis strongly supports it (Crittenden and Marlowe 2008; Marlowe 2005b).

The Aka seem more of a challenge. They have the highest level of father involvement of any culture, and this represents a very important addition to our understanding of social development. Still, even in forest camps where their involvement was highest, fathers held infants less than half as much as mothers held children at all ages, with a decline to 25 percent during the eight- to twelve-month period during which attachment is intensifying. 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 eight- to twelve-month period (Hewlett 1991b). Because there were numerous nonparental caregivers, the average nonparent did not approach the father's involvement, which was a distant second to the mother's (Hewlett 1991b; see also Meehan, Quinlan, and Malcom 2013). In a detailed study of attachment behaviors, 75 percent were directed toward the mother in the key period of 6.5 to eleven months, and more than 60 percent thereafter. Since the remaining 25–40 percent of attachment behaviors was distributed over an average of five allomothers, none of them was likely to rival the mother as the main attachment figure (Meehan and Hawks 2013).

The Efe studies have been cited as strongly undermining both the !Kung model and the maternal primacy hypothesis. There is extensive 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. There was no time in infancy during which the father, the average nonparent adult, or the average child accounted for more than a fraction of the mother's social contact, even when they collectively accounted for half the care. Furthermore, it was shown that fussier infants had fewer allomaternal caregivers and spent more time with their mothers (Tronick, Morelli, and Winn 1989; Winn, Tronick, and Morelli 1989).

Finally, all the above comparisons rely on daytime observations. 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 1976a, 1981, 2010; Konner and Super 1987; McKenna et al. 1993; McKenna, Ball, and Gettler 2007). Ache, Hadza, Aka, and Agta mothers slept with their infants, with ample opportunity for night nursing. Even for the peri-urban Toba, co-sleeping and night nursing were universal. Efe infants

are reported to sleep with others at times, but descriptions suggest maternal co-sleeping on the vast majority of nights throughout infancy.

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 (Cassidy 2008). However, many studies show that multiple caregiving does not prevent the development of attachment to the mother or other primary caregiver (Van IJzendoorn and Sagi 2008). For the Nayaka, foragers of south India, Nurit Bird-David has emphasized the embeddedness of the mother–infant or mother–child pair in a dense social world in which feeding and giving imbue all of life (Bird-David 1990, 2005, 2008). This could be said of many hunter-gatherer groups, including the !Kung: “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” (Konner 1977:318; see also Kruger and Konner 2010). Exclusive maternal care is nonexistent, and was never claimed, but maternal primacy is a general feature of hunter-gatherer childhood. Yet maternal primacy does not mitigate the importance of helpers who may enhance, not dilute, the mother–infant bond. Compared to our ape relatives, human hunter-gatherers have increased offspring productivity due to cooperative breeding. Finally, in a broader cross-cultural context, many aspects of infant and childcare are clearly facultative, departing from the HGC model within the human adaptive spectrum (Lancy 2008; LeVine, Miller, and West 1988; Whiting and Whiting 1975).

RESPONSIBILITY IN CHILDHOOD

Here, the newer studies present their strongest challenge. Hadza and Martu children forage for themselves very extensively, and the contrast between Hadza and !Kung has been explicitly addressed (Blurton Jones, Hawkes, and Draper 1994b). While !Kung children do make a contribution to subsistence, it is very small compared with the Hadza, who live by hunting and gathering in a rich environment that is closer to our EEAs than that of the !Kung. Hadza children's foraging is substantial and increases with age (Crittenden et al. 2013), and an “embodied capital” hypothesis has been proposed to suggest that this success may have enabled the prolongation of immaturity in the human

past (Kaplan et al. 2000). Those 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 (Blurton Jones, Hawkes, and Draper 1994b). Other recent studies have confirmed the importance of child foraging in some other hunter-gatherers. Both Aka and Bofi children do some foraging for themselves, Agta children of both sexes fish, and Martu children capture small game.

The universal importance of play (see contributions by Crittenden, chapter 7, this volume, and Lancy, chapter 8, this volume) has also been noted. Among the Baka, now-settled former hunter-gatherers of Cameroon, a study of 269 play sessions revealed a child community operating in parallel to adult life, both imitating adult activities and carrying out play versions of them (Kamei 2005), although there were also some more formal, usually noncompetitive games, as among the !Kung (Marshall 1960, 1976; Sbrzesny 1976). Bofi and Aka children also spend most of their time at play or idle, and play is clearly an important mechanism of enculturation (Hewlett et al. 2011). Among the Ache and Hiwi (partly assimilated hunter-gatherers of southwestern Venezuela), children under ten do almost no foraging, except for larvae collected by Ache (especially girls). There is a sharp rise during adolescence, especially in hunting, in both groups. However, there are also increases in gathering, with Ache boys (honey) and Hiwi girls (palm fiber) achieving about half their peak levels. Peak hunting is delayed until the late thirties in both groups, and peak gathering for Hiwi of both sexes much later (Hill and Hurtado 2009).

Among the Mikea of Madagascar and the Meriam of Torres Strait, conditions were even more favorable to children's foraging than for the Hadza. Due to low predator pressure and other factors, child foragers have very high acquisition rates. Mikea children make a contribution to the household food economy and average 536 net kilocalories per hour for girls and 504 net kilocalories per hour for boys when digging tubers (Tucker and Young 2005:150). Tucker and Young suggest that Mikea children are not attempting to forage efficiently, but that "foraging is an extension of play that occurs outside camp" (Tucker and Young 2005:168). Two clam species and one conch species made up 90 percent of the catch of Meriam children, while adults collected quite different species, disdaining the ones children easily catch (Bird and Bliege Bird 2000). Bird and Bliege Bird argue that the common archeological finding of shell piles or middens needs to be rethought in terms of the range of species collected by children and child-adult differences in where and how shells are discarded.

In view of the importance of shellfish collecting in human evolution, going back at least 164,000 years (Marean et al. 2007), the rapid spread of *Homo sapiens* from Africa to Australia (probably largely along coastlines), and the importance of omega-3 fatty acids for brain growth, it is possible that children's shellfish collection played a key role in our species' success.

Thus, the amount of foraging children do for themselves is a facultative adaptation among hunter-gatherers, calorically very significant in a number of groups. But even serious foraging is often playful (see Crittenden, chapter 7, this volume). It is usually not assigned although it may be expected, and play of all kinds, including but not limited to imitations of adult subsistence activities, is universal. Because play typically occurs in multi-age groups, some of the care and even feeding of younger children is effectively distributed to them. Children play a role, often informal but very valuable, in foraging and in cooperative breeding, and these contributions help explain human success (K. Kramer 2005a, 2011).

There is also a difference in the amount of infant care and childcare assigned to older children when comparing !Kung to other cultures. The !Kung multi-aged child group occupies and supervises young children and even toddlers, but there is little or no formal assignment of infant care to older children. The rural Toba do assign infant care to older girls, although the multi-age child group is also important.

Direct Comparisons

The validity of the HGC model is confirmed by direct comparisons, whether between more traditional and more settled hunter-gatherers within the same culture, or between a hunter-gatherer and a farming culture in adjacent ecological settings. Among the !Kung, as hunting and gathering were increasingly replaced by pastoral and horticultural subsistence, children were assigned and did more work, wandered farther from home, interacted more with peers, and showed more male-female differences in behavior (Draper 1976; Draper and Cashdan 1988). Several studies have now compared hunter-gatherer infant and child experience with that of farmers in adjacent ecological settings using the same methods. These consistently find that the hunter-gatherer groups conform more closely to the HGC model than do their farming neighbors. This has been true for the Baka (Hirasawa 2005), Aka (Hewlett et al. 2000a; Hewlett 1998; Hewlett 2013; Meehan 2009), Bofi

(Fouts, Hewlett, and Lamb 2005), and in an extended four-way analysis of the latter two groups and their farming neighbors (Fouts, Hewlett, and Lamb 2012). Such controlled comparisons confirm findings in broader statistical cross-cultural surveys, both old and new, using the HRAF. Hunter-gatherers are more likely to have indulgent care in infancy including intensive, frequent, and prolonged breastfeeding, high levels of physical contact, direct father involvement, a playful childhood *relatively* unburdened by assigned chores and responsibilities, and an adolescence characterized by sexual freedom, autonomy, and exploration in an atmosphere of adult tolerance. All these characteristics are also consistent with the catarrhine higher primate phylogenetic background.

Conclusion

Facultative adaptation is always an option; it certainly applies to infant and childcare in the whole cross-cultural range, and should also apply to infant and childcare in the human EEAs. But natural selection in any species must contend with constraints derived from phylogenetic history. In the case of the HGC model, there are deep homologies with parallel patterns in Old World monkeys and apes, suggesting that the common ancestor had already evolved some of these patterns between thirty and forty million years ago. Excellent recent studies have challenged some aspects of the HGC 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 Aka and the Efe have more multiple caregiving and the Aka have more paternal care, but when compared to the !Kung, the differences are less than have been suggested. Multiple caregiving and father involvement are greater in the !Kung than in many, perhaps most cultures, and both were part of the original HGC model. Moreover, maternal primacy is high in both the Efe and the Aka.

The Hadza not only exhibit earlier weaning than the !Kung (as do the Ache), but were reported to have significantly lower indulgence in infancy. Recently, however, more detailed studies of parent–infant interaction have suggested that this difference may have been overemphasized (Marlowe 2005b, 2010). The data on task assignment and foraging in childhood show a marked contrast to the !Kung. Although !Kung children forage, including hunting small game, it is not strongly expected of them and their productivity

is much lower; it is clear that child foraging is a facultative adaptation. It is also likely that weaning age is partly facultative, varying between two and 3.5 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 poorer quality, the descriptive data in older ethnographies should not be discounted. There is no reason to believe that classical ethnographers who studied hunter-gatherers had a bias that would lead them to the HGC model, yet their accounts support most aspects of it.

But even without the older data, 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 3.5 years of age, high overall indulgence, multi-aged child play groups, paternal care that is variable but higher than the cross-cultural average, and variable responsibility in childhood. These appear to be durable features of the model, and core features are similar to the general catarrhine pattern.

Nevertheless, crucial departures from the great ape background were made during our evolution, notably provisioning of the pregnant mother, the mother–infant pair, and weaning by a variety of helpers, as well as many other aspects of allomaternal care, including paternal, grandmaternal, other adult, and sibling care. Given the importance of these derived human traits, together with the well-known facultative changes in infant and childcare *after* the hunting-gathering era, it is tempting to conclude that hunter-gatherer infant and childcare is also strongly facultative. It clearly is in some ways. But the robustness of the Hunter-Gatherer Childhood (HGC) model suggests that a core of ancestral traits shared with other catarrhines has persisted during the transformations of hominin evolution. This includes close physical contact throughout infancy, co-sleeping with mothers, highly frequent nursing, a dense social context, late weaning (compared to other humans) and long IBI, a transition to a mixed-age play group, opportunities for social (including sexual) play throughout development, and a low burden of assigned work compared with other kinds of cultures. To this we can add the ancestral trait of self-feeding by foraging in childhood, but with the provisos that (1) in humans the techniques of extraction and the variety of foods have expanded the learned repertoire of children's and adults' subsistence activities, and (2) the extent of children's contributions to subsistence is variable in hunter-gatherers.

Two more derived traits of hunter-gatherer childhood must be mentioned. First, we added a new, neurologically based, universal, developmental stage—language acquisition—between age one and three—which maps on to time at weaning in hunter-gatherer populations. Language acquisition facilitated development of a wider circle of social relations and helped recruit postweaning allomaternal care. Second, the period from weaning to sexual maturity is much longer in humans than in great apes (Bogin 1999b, 2006; Gurven and Walker 2006), even after accounting for life span differences; this serves enculturation. Cultural learning is unique to humans and involves teaching and collaborative learning (Kruger 2010; Kruger and Tomasello 1996; Tomasello, Kruger, and Rattner 1993) among hunter-gatherers as well as among other human groups (Hewlett et al. 2011). Pedagogy is part of the function of strong adolescent initiation rites. In any case, the unique shape of human childhood can best be understood against the background of hunter-gatherer infant and childcare patterns, both ancestral and derived (Konner 2010).