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Editors

Hunter-Gatherers in a Changing World

Chapter 12
Persistence of Infant Care Patterns Among Aka Foragers

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Abstract Early research found commonalities across hunter-gatherer communities in regards to infant care. Infants were held frequently, spent most of the day and night in skin-to-skin contact, breastfed on demand, received intimate caregiving, and experienced low levels of distress. These shared infant care practices are assumed to have deep evolutionary roots and together serve as a defining characteristic of hunter-gatherer life. Yet, the degree to which hunter-gatherers are experiencing social, economic, and environmental change may have created conditions that alter these defining characteristics. In this chapter we explore infant care among the Aka foragers in the Central African Republic. We utilize naturalistic behavioral observations collected over almost 20 years to examine whether care patterns have persisted or changed over the course of a generational timespan. The Aka discussed in this chapter remain a mobile foraging population, but they have also experienced change at multiple levels. Whether or how these changes influence infant care has not yet been examined. Results indicate that Aka infant care patterns have persisted. Although some significant changes were noted, not all caregiving showed a decline, some increased and some changes were only limited to one age category. Additionally, the vast majority of caregiving practices remained constant across the periods. Cross-cultural data presented also support this finding. Aka infant care patterns are comparable to other hunter-gatherer populations and the frequency of care and interactions match or exceed most farming and Euro-American patterns. We argue that Aka infant care patterns have persisted because they are vertically transmitted and highly-conserved. Moreover, Aka infant care is indicative of a much larger cultural pattern of trust, intimacy and sharing, not immediately affected by outside influences.

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V. Reyes-García, A. Pyhälä (eds.), *Hunter-Gatherers in a Changing World*,
DOI 10.1007/978-3-319-42271-8_12

12.1 Introduction

Research on hunter-gatherer childcare practices, particularly infant care, discovered patterns that appear to be common across hunter-gatherer communities (for review see Hewlett and Lamb 2005; Konner 2005, 2016). Hunter-gatherer infants are in physical contact most of the day, receive quick and intimate attention from caregivers, experience high frequency of allomaternal care, breastfeed on demand, and infrequently fuss or cry. These shared care practices and behaviors are assumed to have deep evolutionary roots and together serve as a defining characteristic of hunter-gatherer life. Additionally, hunter-gatherer caregiving practices are vertically transmitted (i.e., from parent to child), and are thus hypothesized to be relatively stable across generations (Hewlett and Cavalli-Sforza 1986). Yet, the degree and pace to which hunter-gatherers are experiencing social, economic, and environmental change may have created conditions that alter this characteristic of hunter-gatherer life.

Here we explore whether Aka forager infant care patterns have persisted or changed over a generational timespan. The Aka, a Central African foraging population, discussed in this chapter remain mobile, but families spend more time close to the neighboring horticultural village. Logging concessions to the south have disrupted landscape usage, educational opportunities have begun to change, and access to medical care from missionaries has increased. To examine the potential impact of these changes on child care practice we analyze detailed quantitative data from naturalistic behavioral observations on infant care collected over almost 20 years. We center our analyses on attributes that have defined hunter-gatherer infant care. Additionally, we utilize available published data from other hunter-gatherer, farmer and Euro-American studies as a comparison to examine whether Aka care practices fall within the range of hunter-gatherer care patterns or whether they are going through a transition to more "farmer-like" or others' patterns of infant care (see Hewlett et al. 1998). Lastly, as the largest sample of hunter-gatherer infants in any study to-date, we are able to present a needed overview of hunter-gatherer infant care and infant behavior across almost two decades offering insights into the lives of Aka infants and caregivers.

12.2 Hunter-Gatherer Infant Care

Interest in hunter-gatherer infancy and caregiving owes much to the initial research from the Harvard Kalahari Research Group from the 1960s and 1970s. Their studies reported many of the features noted above and considered them to be indicative of hunter-gatherer infant care. !Kung infants were described as in almost constant physical contact with caregivers, primarily their mothers (Konner 1976). Passive physical contact with caregivers was on average under 80 % during the first several

weeks of life (Konner 1976, Table 10.3). Between 10 and 20 weeks, contact rose to approximately 90% and then declined for the remainder of children's first year (Konner 1976, 2016). !Kung infants breastfed 4.06 times per hour, for an average nursing time of 7.83 min per hour (Konner and Worthman 1980). Additionally, although !Kung infants' crying pattern in early infancy matched the cross-cultural pattern (i.e., the frequency of events), the duration of the events were shorter than found in a Dutch sample, indicating that !Kung infants cried less during the day than did Dutch infants (Barr et al. 1991). Low levels of distress among hunter-gatherer infants were attributed to rapid and sensitive responses by caregivers to infant signals (Barr et al. 1991; Konner 1972). Konner (1977) suggested that !Kung infants, unlike many infants in the West, do not need to proceed to higher and longer levels of arousal to capture the attention of and care from their caregivers, which explained lower levels of crying.

In the decades that followed, the patterns described for the !Kung were found to not be unique (for review see Konner 2005, 2016). Although cultural variation in infant care practice exists among hunter-gatherers, commonalities are widespread and key care practices appeared to be a pan-hunter-gatherer characteristic (see Hewlett and Lamb 2005; Konner 2016).

Our (BH and CM) studies on the Aka supported much of what was seen among the !Kung, but also emphasized the importance of allomaternal care (Hewlett 1992; Hewlett and Lamb 2005; Meehan 2005, 2009; Meehan et al. 2013). Hewlett's research in the 1980s on infant care reported that Aka 1–4 month olds, "were held essentially all the time in both settings [camp and forest], while older infants were held about half the time in the camp and more than 90% of the time on the net hunt" (Hewlett 1992: 77–79). Even beyond early infancy, children (6–32 months old) were only separated from their mothers (not even including other caregivers) on average 2.9 times per day, with approximately 80% of the mother-infant separations lasting ≤10 min (Meehan and Hawks 2013).

Reports from other groups were similar. Efe infants are involved in social interaction (either touched or engaged with) 97% of the time in early infancy (Tronick 1995). Similar to the !Kung, Efe caregivers' interaction with infants decreased over the first year, but remain high, with 1 year old children engaged in some type of social interaction approximately 65–70% of the day (Tronick 1995). Despite the decline in social interactions, at 1 year of age Efe infants are still near caregivers 100% of the time (Ivey 2000). Crittenden and Marlowe's (2008) study on Hadza infant care showed the common steady decline in care over the first year, but also noted a high average holding frequency in early infancy (Crittenden and Marlowe 2008). Combined, these hunter-gatherer studies have situated care practices within a larger cross-cultural and evolutionary perspective and have had a profound influence on our understanding of infants' needs (e.g., McKenna et al. 1997; Sellen 2016), and the evolution of childhood (e.g., Hrdy 1999; Konner 2010; Meehan and Crittenden 2016).

12.3 Aka Foragers: Stability and Change at the Regional and Local Level

As the chapters in this volume express, change for many hunter-gatherer communities has been rapid and frequently disruptive to local environments, economic lifeways and cultural traditions. The experiences of the Aka are no exception to this worrisome pattern. The demarcation of reserves or parks, the intensification of logging and mineral extraction, the bush meat trade, and "emerging" diseases all impact Congo Basin foragers (Hewlett 2014). Foragers also face political marginalization and discrimination within their countries, often, "placed in a structurally subordinate position" (Ichikawa 2014: 328). Yet, the foragers of the Congo Basin, remain the largest, most diverse and active hunter-gatherers in the world (Hewlett 2014; Bahuchet 2014). Characteristics, such as an emphasis on egalitarianism, respect for the autonomy of others and sharing, whether food, possessions, or child care, have been maintained even in the face of these changes (Hewlett 2014).

The Aka continue to hunt and gather and frequently move their camps—families spend portions of each year residing in the forest as well as living on the periphery of the forest. However, despite continued mobility, there is an observable increase in the number of camps and length of occupancy in camps on the outskirts of horticultural villages. During the mid-1990s to the early 2000s, Aka camps in the study area were sporadic along the approximately 45–60 min walk to the end of the fields and the start of the forest. By 2009–2013, the density of camps in village fields had increased. Although most huts continue be built in the traditional style (a dome-shaped construction of branches covered by leaves), many village camps now have one or two more permanent wattle and daub structures. Yet, camp size still ranges from approximately 10–35 individuals (Hewlett 2014). Although varying across season and location, this range with an average in the mid-twenties has remained relatively stable over the years (see Hewlett 1992; Meehan 2005; Meehan et al. 2013). These small and intimate social units form the foundation of infants' early social environments.

The Aka have also experienced changes to subsistence patterns and diet. They continue to net hunt, but the frequency has declined, in association with an increase in gun and snare usage. Additionally some Aka (particularly those who are establishing longer-term camps near villages) have taken up farming at some level. As long as ethnographers have interacted with these populations, domesticated crops have constituted a regular portion of their diet (Bahuchet 1988), but given subsistence changes, the proportion of domesticated plants to their diet has likely increased in recent years.

The past 20 years have also bore witness to rapid changes beyond residence, mobility and diet. In the 1990s and early 2000s a village health clinic serviced the village and Aka populations. However, due to structural and financial issues, care was seldom available to the Aka. In the intervening years, between 2002 and 2009, a Catholic mission hospital was completed and now operates in addition to the community health services. Aka frequent the Mission hospital, but individuals often

carry labor debts as a result of services provided. The few free services offered to the Aka, i.e., leprosy medication, are limited in outreach as the Aka are not sedentary and frequently leave the area prior to completing the medication cycle.

The number of community or mission schools for the Aka has increased and attracts students. Parents express a strong desire for their children to gain an education, citing the changing times as a primary motivation (Hewlett 2013). Mission schools offer meals to the children as a way to entice the student and their parents to remain in one location. However, while systematic data have not been collected, families typically depart for the forest throughout the year regardless of school attendance.

Gold and diamond mines operate close to the horticultural village, attracting both young village and Aka men. Engagement in mine labor by village men is now widespread and increasing inroads into Aka communities are occurring. The logging industry exploits regional forests and although they are not extracting timber near the study area their impact is felt. Improved roads have increased urban hunters entrée into forest lands, facilitating the bush meat trade (Wilkie et al. 2011; Ichikawa 2014), and resulted in the Aka noting a decline in hunting success. Moreover, the area of focus is on the border of the Republic of Congo (ROC). ROC police and military patrols, which are placed there to protect lumber concessions, have somewhat impeded Aka traditional movement back and forth across the border.

Given the list of changes we presented, it is important to note that the time period represented marks neither a start date nor a completion to changes in Aka society. Logging industry presence in the forest and its impact on hunting success was noted by BH in the 1980s. The impact of mission schools on residence patterns was discussed by the Aka and their neighbors, the Ngandu, in the early 2000s (see Hewlett 2013). However, the 20 year time span discussed in this chapter represents a period in which change has perhaps been at its most rapid pace.

12.4 Persistence or Change in Infant Care: Cultural Transmission of Care Patterns

Hunter-gatherer childcare patterns have been argued to be learned young and vertically transmitted (i.e., parent-to-child). As such, change is hypothesized to be relatively conservative—caregiving patterns are likely to be maintained across generations (Hewlett and Cavalli-Sforza 1986). Yet Hewlett and Cavalli-Sforza note that this conservation may be in part maintained due the homogeneity of the habitat and lack of schools, features that have been altered for the Aka in recent years. They argue that when social and physical environments change rapidly, horizontal and oblique transmission are more likely—information derived from parents may be outdated and individuals will turn to their peers or others for new methods and information, accelerating change.

12.5 Methods

12.5.1 Child Observation Procedure

Quantitative behavioral observations were conducted using a focal-child sampling technique (Altmann 1974) during three time periods [Time Period (TP) I – 1994–1996; TP II – 2000–2002; TP III – 2009–2013]. Researchers observed one focal child at a time and recorded the infant's and their caregivers' behaviors. Observations occurred in multi-hour segments, were spread over several days, and spanned all daylight hours (6am–6pm). Every 45 min of observations, however, were followed by a 15-min observer break, resulting observations occurring for 9 of the 12 daylight hours. Directed by a recording, the researcher starts to observe at the top of the minute, record observations during 0:00:20–29 s, resume observation at 0:00:30 s, record during 0:00:50–59 s, etc. Thus, observation units are 30-s (see Meehan 2005; Meehan et al. 2013).

12.5.2 Participants

In TP I quantitative behavioral observation data were collected on 20 3- to 4-month-old and 20 9- to 10-month old Aka infants. In TP II data were collected on 15 8- to 12-months-old Aka infants. In TP III data were collected on children between birth and 4 years, but are here limited to 26 infants between 2 weeks – <6 months and 13 infants between 6–12 months. Due to maternal post-partum recovery practices, infants less than 2 weeks are not included in the analyses. The upper limit of 12-months for TP III was chosen for comparative purposes with the first two samples. In total, 94 2-week to 12-month old infants are represented across the three time periods. Infants were observed for approximately 846 h. Table 12.1 provides a

Table 12.1 Sample summary across age and time periods

	Early infancy (2 weeks–<6 months)			Late infancy (6–12 months)		
	Time period I	Time period II[a]	Time period III	Time period I	Time period II	Time period III
N	20	–	26	20	15	13
Age[b]	–	–	2.99	–	9.9	9.3
Range	3–4 months	–	2 weeks–5 months	9–10 months	8–12 months	6–12 months
Sex[c]	.65	–	.35	.45	.47	.92

[a]Data were not collected on younger infants during the 2000–2002 field season
[b]Mean age in months. Infant age was determined to a 2 month range (3–4 and 9–10 months) during Time period I
[c]Proportion of male infants

basic summary of the sample of infants by each time period. Note that in late infancy, TP III is comprised of 92 % boys (12/13). Hence, it is impossible for us to determine if any behavioral differences found in late infancy between TP III and TP I or TP II are due to cohort or sex.

12.5.3 Focal Behaviors and the Social Environment

We focus on five caregiver behaviors (*maternal breastfeeding, maternal and non-maternal physical affection, non-physical affection, holding,* and *physical contact with infants*), two features of infants' social environments (*proximity to caregivers* and *time alone*), and three infant behaviors (*crying, fussing,* and *the composite variable of fussing and crying, termed fuss/cry*). *Breastfeeding* is defined as when infants were actively nursing and is limited to maternal nursing. *Physical affection* is caregivers displaying positive affect to the child (e.g., nuzzling or kissing). *Non-physical affection* includes positive affection through verbal or other non-physical displays (e.g., smiling at infant). *Holding* refers to times when the infant was held in a sling, arms, or lap. *Physical contact* is a composite variable comprised of holding and touching and data is limited to TP II and TP III. As infants are cared for by a wide network of caregivers (Hewlett 1992; Meehan 2005; Meehan et al. 2013), physical and non-physical affection, holding and physical contact encompasses all caregivers' contact with infants, not only the mother.

The infants' social environment is conservatively defined. *Proximity* to caregivers is defined as an infant within a forearm's distance to a caregiver. Whether the infant was *alone* was only coded during TP I, but was cautiously inferred for TP II and III. In TP I, an infant alone was defined as the percent of observations where a caregiver was not within view or was ≥5 meters away from a caregiver. In TP II and III, we calculated the percentage of observations where no caregivers were interacting or near the focal infants and when the mother was not within view. Therefore, if an infant was in a hut by himself and the mother was just outside but not visible, he was considered alone. This likely overestimates the percent of time infants were alone in the latter two time periods, but given the infrequent occurrence of Aka infants being alone, these variables are similar and we argue highly comparable. Again, given the importance of allomothers, we considered all caregivers when examining proximity and time spent alone.

Crying refers to when a child was significantly agitated and/or upset. In TP II and TP III the child also needed to have visible tears to be coded as crying. Despite this difference, crying was coded at all periods when the child was visibly upset beyond low-level fussing. *Fussing* is when the infant was awake and manifesting signs of agitation or was upset—whined, moaned or whimpered, but did not cry. The composite variable *fuss/cry* is the combination of the two.

12.5.4 Data Analysis

Analyses were done in R. Data were converted to a proportion by summing the number of observation periods in which the behavior was observed, and dividing by the total number of observation periods. The total number of observation periods was 1080 for 91 infants and was either 1078 or 1079 for the remaining three infants.

Our data were proportions of binary observations, which would typically be analyzed using a binomial error distribution (e.g., logistic regression). However, the observations exhibited considerable autocorrelation (e.g., an infant crying during observation t was usually also crying during observation t+1), which means our observations were not independent, contrary to the assumptions of this model. In addition, we only had the actual sequence of observations for some infants; for most, we only had the counts of observed behaviors and total number of observations. Thus, we could not adjust for autocorrelation. We therefore tested for cohort differences in the proportions of each behavior using a non-parametric permutation test (Hothorn et al. 2008). We also computed 95 % confidence intervals using a basic nonparametric bootstrap (Harrell et al. 2014). Although sex differences in infant care have not been previously found in Aka studies (e.g., Hewlett et al. 1998), below we note where there are two possible confounds due to sex.

12.5.5 Cross-Cultural Comparisons

Cross-cultural comparisons from published infant care studies among European/Americans, farmers and other forager groups are presented (see Table 12.2 and Fig. 12.1a–c). Euro-American (Hewlett and Lamb 2002) and Ngandu (Hewlett et al. 1998; Hewlett and Lamb 2002; Meehan 2009) data were collected via the same methodology and are thus more easily comparable. The other examples, however, should be cautiously compared. Variation in methodology, age categories, and definitions make direct comparison difficult. Moreover, the cross-cultural comparisons do not represent all infant and caregiver behavioral studies; rather they are limited to those which are most comparable. Nevertheless, the available cross-cultural examples help contextualize our results.

12.5.6 Limitations

There are limitations to this study. We did not track specific individuals and/or families across the timespan. Thus we are not specifically testing whether one generation of caregivers are interacting in a different manner than the previous generation. Also changes within Aka society are not linked to a specific date, from which we can examine care patterns prior to and after. Environmental and social change are not

Table 12.2 Cross-cultural comparisons of caregiver behavior, social environment and infant behavior[a]

				Early infancy			Late infancy		
Population category		Population	Variable	Mean %	Range in %	Source	Mean %	Range in %	Source
Forager									
	Caregiver behavior	Baka[b]	Nursing	14.9	–	Hirasawa (2005)	14.9	–	Hirasawa (2005)
			Physical contact	80.0	–	Hirasawa (2005)	80.0	–	Hirasawa (2005)
	Infant behavior	!Kung	Fuss/Cry[c]	5.8	5.3–6.2	Barr et al. (1991)	2.8	–	Barr et al. (1991)
		Baka[b]	Crying	2.9	–	Hirasawa (2005)	2.9	–	Hirasawa (2005)
			Fussing	1.8	–	Hirasawa (2005)	1.8	–	Hirasawa (2005)
			Fuss/Cry	4.7	–	Hirasawa (2005)		–	
		Efe[d]	Fuss/Cry	8.0	7.0–9.0	Morelli et al. (2014)	80.0	7.0–9.0	Morelli et al. (2014)
Farmer									
	Caregiver behavior	Bombong[b]	Nursing	10.2		Hirasawa (2005)	10.2	–	Hirasawa (2005)
			Physical contact	62.2	–	Hirasawa (2005)	62.2	–	Hirasawa (2005)
		Guatemalan[e]	Physical contact	23.75	19.5–28.0	Klein et al. (1977)			
		Ngandu	Nursing[f]	12.6	–	Hewlett et al. (1998)	8.7	–	Meehan (2009)
			Holding	54.2	–	Data obtained from Hewlett	54.5	–	Data obtained from Hewlett
		Ye'Kwana[g]	Nursing	8.3	–	Hames (1988)	3.9	–	Hames (1988)
			Physical contact	54.0	–	Hames (1988)	39.0	–	Hames (1988)

(continued)

Table 12.2 (continued)

				Early infancy			Late infancy		
Population category		Population	Variable	Mean %	Range in %	Source	Mean %	Range in %	Source
	Social environment	Ngandu	Alone[h]	7.7	4.8–10.6	Hewlett et al. (1998)	7.9	6.1–9.8	Hewlett et al. (1998)
			Proximity	65.3		Hewlett et al. (1998)	63.4	–	Hewlett et al. (1998)
	Infant behavior	Ngandu	Crying	3.8	–	Hewlett and Lamb (2002)	–	–	
		Ngandu	Fussing	9.5	–	Hewlett and Lamb (2002)	–	–	
		Ngandu	Fuss/Cry	12.4	–	Hewlett et al. (1998)	6.8	–	Hewlett et al. (1998)
Euro-American									
	Caregiver behavior	American – Washington, DC	Holding	33.0	22–44	Hewlett and Lamb (2002)		–	–
	Social environment	American – Washington, DC	Proximity	58.0		Hewlett and Lamb (2002)		–	–
	Infant behavior	American – Washington, DC	Crying	1.8		Hewlett and Lamb (2002)		–	–

		American – Washington, DC	Fussing	6.3		Hewlett and Lamb (2002)		–	–
		American – Washington, DC	Fuss/Cry	8.1		Hewlett and Lamb (2002)			
		Dutch[i]	Fuss/Cry	10.0	8.3–12	Barr et al. (1991)		5.3	Barr et al. (1991)

[a]These examples represent the best-available known comparative numbers due to clarity of definitions and/or age categories. However, due to variation in methodology, age categories, and definitions, several of the numbers above needed to be calculated from published results. We note where we calculated the range or mean percent from published accounts. Where ranges were published, we calculated the mean of the range and when published sources provided ranges or means for all of infancy, we present that mean in both the early and late categories. Table 12.2 and Fig. 12.1a–c are meant as a tool to help contextualize our results from the Aka, but examples should be cautiously compared

[b]Baka and Bombong data represent infants between 1–13 months. No division between early and late infancy was made in the publication (Hirawasa 2005). We present the mean percentage for the 1–13 month old infants in both the early and late infancy categories

[c]!Kung infants are reported to cry or fret 3.7 min/waking hour between 0–3 months and 3.2 min/waking hour between 4–6 months (6.2 and 5.33 % respectively). The average of that range is reported mean in early infancy

[d]The reported range included infants and toddlers. We present the mean of that range in both early and late infancy

[e]Guatemalan infants at 8 months. Range represents the mean physical contact for boy and girls

[f]Represents infants between 3–4 months old

[g]The Ye'Kwana physical contact figure is an "omnibus" category of engagement (holding, general caregiving and nursing), which may potentially overestimate the percentage of physical contact, but represent behaviors where the infant was likely in physical contact with a caregiver. Note that samples sizes for the Ye'Kwana data are very small (early infancy n=5; late infancy n=2)

[h]The Ngandu time alone data were separated into time alone while awake and time alone while asleep in the original publication. We present a mean percentage of these times

[i]Dutch infants cried or fretted 7.2 min/waking hour at 0–3 months and 5.0 min/waking hour at 4–6 months (12 % and 8.3 % respectively). We calculated the mean of those percentages and report a mean fuss/cry of 10 % in early infancy for Dutch infants. Older Dutch infants cried or fret just under 3.2 min/waking hour (5.3 %)

new phenomenan in this Aka community or something that has abruptly come about in the last two decades (see Bahuchet and Guillaume 1982; Moise 2014). Additionally, due to sample size or lack of information in one time period or another, we cannot control for variables that affect infant care and their environments (e.g., maternal work patterns, camp composition, the presence/absence of particular caregivers, etc.) (Meehan et al. 2013).

12.6 Results

12.6.1 Caregiver Behavior

In early infancy (2 weeks to<6 months), for which two time periods are generally represented (TP I and TP III), there is no significant difference in the percent of maternal nursing from TP I to TP III. Physical affection also showed no significant change, with the mean declining<1 % from 4.2 % in TP I to 3.6 % in TP III. Non-physical affection, in contrast, significantly increased from <1 % in TP I to 3.2 % in TP III. However, we found that sex was a significant predictor of non-physical affection in early infancy, with girls receiving more non-physical affection than boys (P=<0.01), making it difficult to determine whether the difference is due to cohort or sex. Infant holding significantly declines from 95.7 % to 82.7 % (over an hour difference) across the time periods. Infant physical contact, where only TP III is represented, illustrates that infants are in physical contact 91.4 % during the last time period.

In late infancy (6–12 months), the mean percent of daytime nursing is approximately 13.0 % in TP I, drops to 10.1 % in TP II, then increasing almost 5 % in TP III, although these changes are not statistically significant. Physical and non-physical affection remained similar (a maximum of<1 and 1.2 % difference, respectively) across all time periods. Holding shows no significant change over time. For the latter two time periods, physical contact also shows no change, with infants being held or touched by caregivers approximately 80 % of the day in late infancy.

12.6.2 Social Environment

The social environment in early infancy appears similar across TP I and TP III. However, there is a trend suggesting a small decline in the amount of time that infants are in proximity to caregivers in early infancy across the two time periods for which we have data on early infancy [TP I (97.3 %) and TP III (94.5 %)]. Nevertheless, the amount of time that infants are alone is <1 % in both time periods, demonstrating that Aka infants are essentially never alone, regardless of the time period (see Fig. 12.1b).

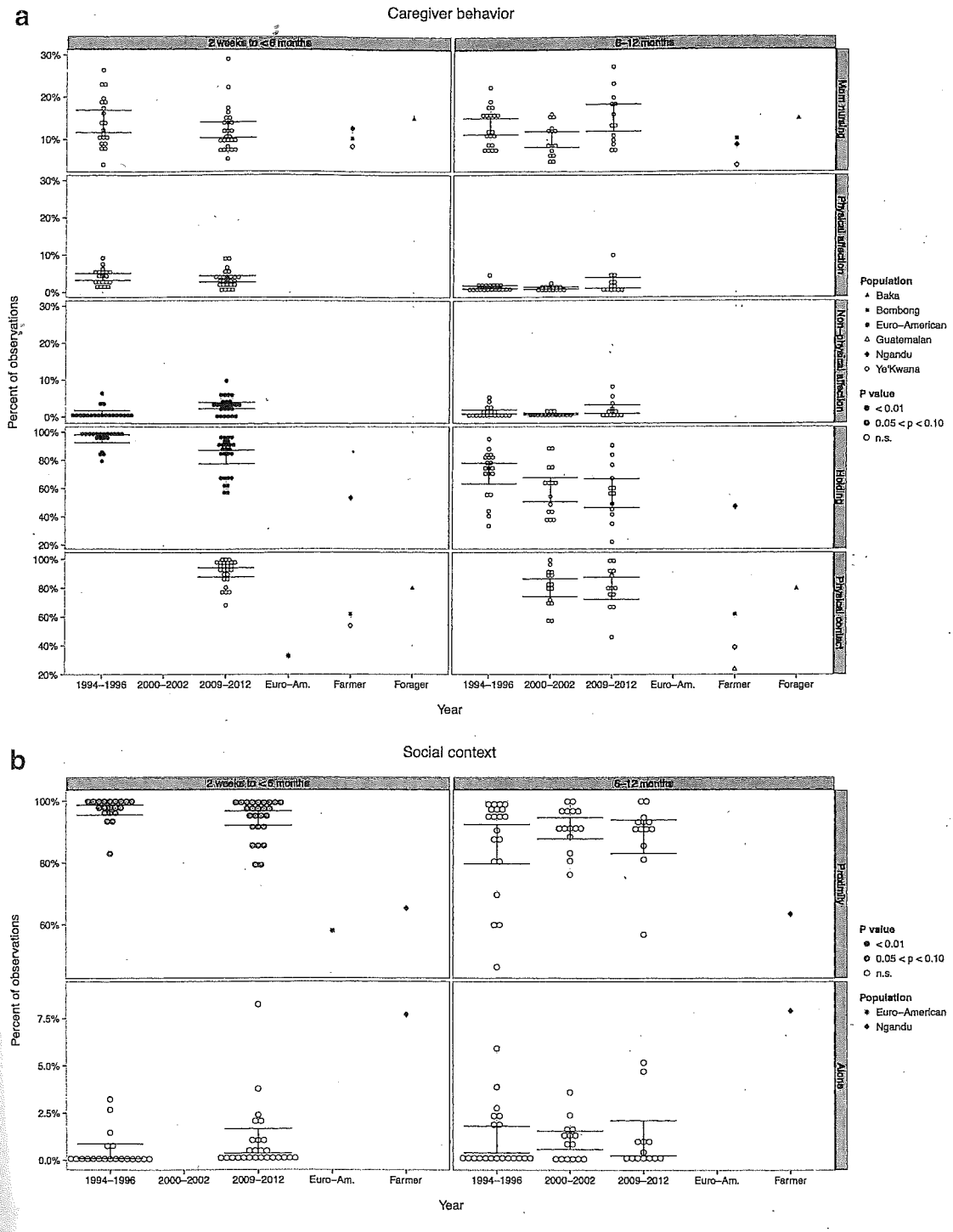

Fig. 12.1 (**a**) Aka infant care, (**b**) Social environment, and (**c**) Infant behavior in early and late infancy across three time periods (with cross-cultural examples provided). For the Aka, each dot represents one infant. Bars are bootstrapped 95 % confidence intervals for the mean. For other populations, each dot represents the mean value

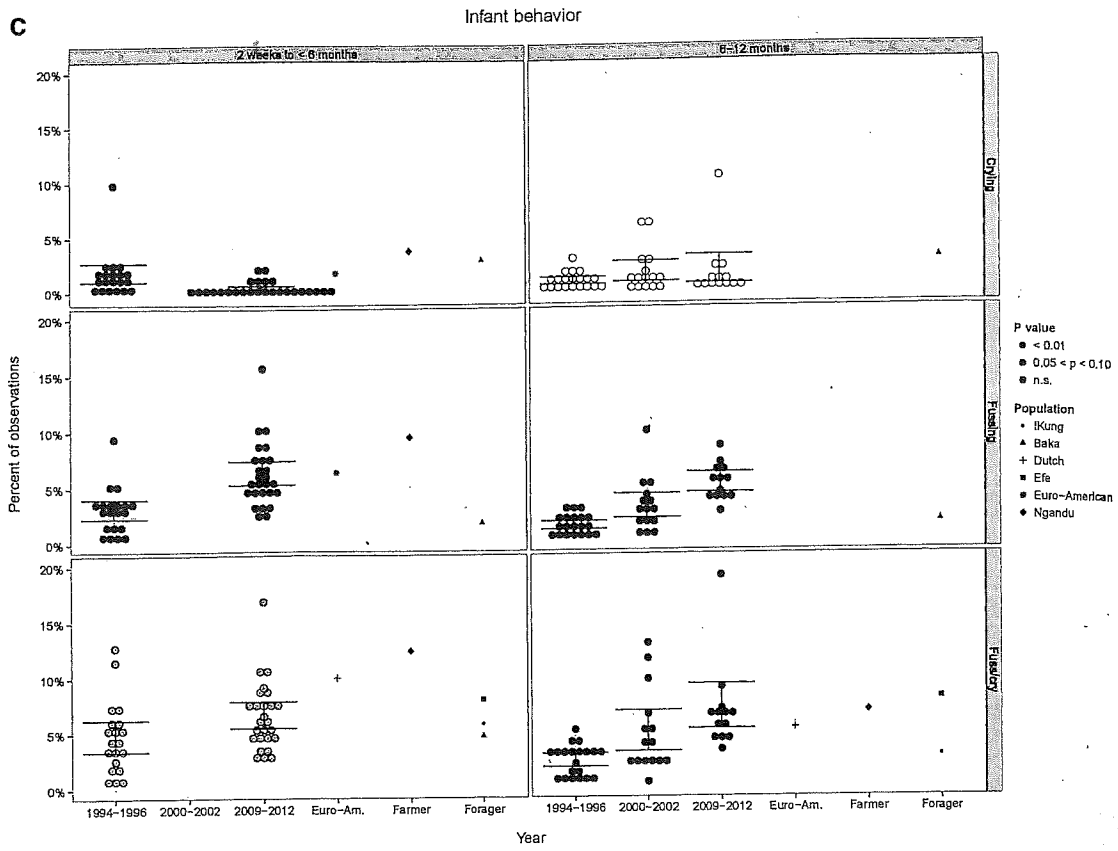

Fig. 12.1 a–c (continued)

Proximity to caregivers for older infants is consistent over the three time periods—the means range from 86.5 % of the day in proximity in TP I to 91.3 % in TP II, to 89.3 % in TP III. Similar to early infancy, Aka older infants are in essence never alone. Someone is available to the infant approximately 99 % of the day in all three time periods (see Fig. 12.1b).

12.6.3 Infant Behavior

In early infancy we see a highly significant decrease in the percent of crying across daylight hours across TP I and TP III. Infants in TP I cried 1.7 % of the day, compared to 0.4 % of the day in TP II. Infant fussing, however, showed a highly significant reverse pattern. Infants fussed half as frequently in TP I (3.1 %) compared to infants in TP III (6.2 %). Here, again, we found a significant sex difference, where young female infants fussed more than young male infants (P=<0.01). Again, whether the difference is due to cohort or sex is not known. The composite variable of fuss/cry, driven by the frequency of fussing, showed a trend toward increasing across the two time periods, an increase of 1.9 % (a difference of ~10 min) from TP I to TP III (see Fig. 12.1c).

There was no significant change in the mean percent of crying in late infancy. Infants cried 0.9% in TP I, 1.7% in TP II, and 1.6% in TP III, a less than 1% change. Infant fussing significantly increased across the time periods, from 1.5% in TP I to 5.2% in TP III. Finally, the composite variable fuss/cry showed a 4.4% statistically significant increase across the time periods. This increase is, again, driven by fussing behavior or low-level agitation. Six to twelve month old infants in TP II fussed and cried, on average, for an additional 13 min, and on average just over 24 more min in TP III, with the caveat that TP III comprised 92% boys (across all older infants, there were no significant sex differences in infant behavior, however) (see Fig. 12.1c).

There were also some notable differences in the variation of variables. There was notably little inter-individual variation in proportions of time alone, crying, physical and non-physical affection, and fussing. There was considerably more variation in proximity, physical contact and especially holding.

12.7 Discussion

12.7.1 Persistence and/or Change in Infant Care

Despite some variation across time periods, caregiver behaviors towards infants and infants' social environments have remained fairly similar across the almost 20 year time frame of this study. We found a significant increase in non-physical affection over time, but only in early infancy. There was also a reverse pattern, where there was a significant decrease in holding but, again, only in early infancy. Although only representing one TP in early infancy, physical contact (holding and touching) was over 90% of the day, indicating that while holding may be lower in early infancy, Aka infants are still in almost constant physical contact with caregivers. Additionally, Aka caregivers almost never leave infants alone—a characteristic and care feature that shows virtually no change over the entire time span represented. Given the relatively few changes and that the preponderance of caregiving behaviors showed no difference, we suggest that Aka caregiver behavior and Aka infant's social environments have remained similar across time.

Alternatively, infant crying and fussing behavior suggest several changes, although, again, not all in the same direction, nor across all time periods. Crying decreased across time periods in early infancy and showed a minor increase in late infancy. Infant fussing and fuss/cry, however, showed much larger increases across time periods. For instance, in early infancy while there is only a $<2\%$ increase in infant fuss/cry frequencies from TP I to TP III, Aka fussing and crying in late infancy more than doubled from TP I to TP III.

Although we found some statistically significant changes in Aka infant and caregiver over time, as noted above, our data cannot determine if these changes are due to social and cultural changes over time, or to unrelated changes in unmeasured factors, such as camp composition.

12.7.2 *Cross-Cultural Comparison*

Cross-cultural data provides additional evidence suggesting the few significant changes observed do not represent a major shift in Aka care patterns. These data do not indicate that Aka caregivers are taking on more "farmer-like" or industrialized care patterns. The mean percent of time that infants are in physical contact in early infancy exceeds or comes close to matching other published hunter-gatherer accounts. Additionally, Aka infants in TP III (the TP with the lowest percent of holding) are still held more than farmer infants and, on average, are in proximity to their caregivers anywhere from 2 to 3 hrs more per day in comparison to their Ngandu peers. In contrast to farmer patterns (Hames 1988; Hewlett et al. 1998), Aka infants, in early or late infancy and across all time periods, are engaged with most of the day. Aka nursing frequencies in early infancy are comparable to other forager and farming populations, suggesting that nursing frequency in early infancy is driven primarily by infant need. In later infancy, the lowest mean percent in TP II almost matches the highest rate for farmer patterns. The other TPs exceed farmer nursing rates by several percentage points. This may indicate a greater continued emphasis on frequent breastfeeding in late infancy among foragers compared to other groups even after complementary feedings become routine.

In terms of infant behaviors, young Aka infants cry approximately 50% less frequently in early infancy than do Ngandu infants in the same age range, but these same Aka infants show a very similar pattern to the Euro-American population. The composite of fussing and crying shows that even at the high point, in early infancy, Aka infants seem to fuss and cry at similar frequencies than other foragers, but less often than Ngandu and Euro-American infants. In late infancy, when there is the significant increase in infant fussing and crying, Aka infant fussing and crying in the latter TP matches the mean percentage of Ngandu infants. Yet, in comparison to other hunter-gatherers, this level of fussing and crying does not seem decidedly unusual, suggesting it is difficult to determine a unique forager pattern of fussing and crying. Therefore, it is unlikely that the additional average 24 min per day of fussing and crying seen in late infancy in the last time period, compared to the first period, is due to change in care patterns.

12.8 Conclusion

Change in the Congo Basin has occurred for millennia and will continue, albeit perhaps it occurs now at a faster pace than in the past. Aka residence and subsistence patterns, and parental workloads and camp composition will likely be altered in the future. Over time we may begin to see more effects of such change on Aka culture as a whole and on infant care in particular. However, to date, infant care practices seem to be resistant to change. We argue that these patterns persist because, as mentioned earlier, other features of Aka life such as egalitarianism, sharing, and

autonomy remain important. Neighboring farmers may experience greater material comforts, more access to education and Western medical care, but the differences are not so great as to provide reproductive advantages. Thus, we argue that vertical and other forms of transmission (i.e., conformist and concerted) that conserve cultural variants persist because infant care practices remain adaptive in the described contexts of change. As others have argued, infant care is symptomatic of egalitarianism and much broader cultural patterns among hunter-gatherers (Lewis 2014). Aka infant care practices in this region, and hunter-gatherer infant care in general, is indicative of a much larger cultural pattern of trust, intimacy, and sharing that is not immediately affected by outside influences.

Acknowledgements Material is based upon work supported by the NICHD (awarded to B. Hewlett) and the Leakey Foundation and the National Science Foundation (BCS-9055213) (awarded to C. Meehan). We thank Axel Schölmeric and Hillary Fouts for assistance with the NICHD databases. We offer special thanks to the Aka families who participated and the research teams in 1994–1996 and 2009–2013. We thank our research assistants and the Central African Republic Research Ministry.

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