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REVIEW

Learning prosociality: insights from young forager and subsistence farmer children's food sharing with mothers and others

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Abstract

This paper examines the ecosocial basis of prosociality as reflected in early food-sharing behaviors of children in traditional hunter-gatherer and subsistence farming communities. The body of work on children's prosociality focuses predominantly on processes investigated in families with Western lifestyles (e.g., urban, middle-class), who are overrepresented in developmental research and theory but underrepresented globally. From this perspective, mothers are singularly influential in young children's prosocial acts. We critique this view and use the ecocultural model of Keller and Kärtner (2013) to illustrate that mothers' role relative to others varies in systematic ways across communities related to environmental, ecosocial, and cultural contexts. We describe work on the social experiences of Efe forager infants and young children where Efe mothers share children's care and a broad set of early child relationships is typical. We then compare the critical prosocial act of food sharing with one- to three-year-old Efe foragers and Lese subsistence farmers of DR Congo. These neighboring tropical communities address the shared threat of high nutritional uncertainty in distinct ways. Efe and Lese children's food sharing includes many others besides mothers. However, food-sharing frequency and social partners involved differ. Notable is that Efe focal children received more offers of food from more different adults and children whereas Lese focal children did so from more different siblings. Ecosocial (e.g., subsistence, residence patterns) and cultural contexts are considered in accounting for Efe and Lese children's food-sharing experiences. Current views substantially underestimate the social networks of children's prosocial learning.

Keywords Children · Prosocial · Food sharing · Hunter-gatherers · Social networks · Farmers

Introduction

Helping. Comforting. Sharing. Acts of cooperation such as these are essential elements of human social relationships and hallmarks of human sociality (Apicella et al. 2012). We are not the only species to engage in cooperative behaviors. But, we cooperate at very high levels (Melis and Semmann 2010) and with mates, kin, and unrelated people (Gurven and Jaeggi 2015), earning us the reputation of "ultra-cooperative" (Tomasello 2014).

Why a person gives away valuable resources (e.g., material, psychological) to another has been a puzzle to science because sharing frequently appears "voluntarily" and yet often incurs at some personal cost. One body of research has examined cooperation as an evolutionary strategy that reduces individual and shared risks presented by the physical, biological, and social environment. This work suggests that cooperative behaviors smooth unpredictable variation in access to foods among forager and other human groups. For example, sharing food and other resources reduces the costs of rearing offspring over an extended period of dependency during development, as well as mitigating productivity loss related to illness, injury, and recovery (e.g., Kaplan et al. 2009; Gurven and Jaeggi 2015). Along related lines, research has also considered how a complex array of ecological and social factors (i.e., ecosocial contexts) as well as cultural factors influences these and other patterns of cooperation,

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including community expectations and practices that are important to how people relate with others and the relationships they develop (e.g., Gurven 2004; Jaeggi et al. 2010; Amici 2015; Tomasello and Gonzalez-Cabrera 2017).

As a result of these different lines of inquiries, we have a wide-ranging understanding of the complex interplay of factors associated with cooperation—a behavior critical to individual and group functioning (e.g., Boyd and Richerson 2009). This stimulates questions regarding how young children learn to cooperate and to act in other prosocial ways. Inquiries motivated by these questions focus, by and large, on US children in nuclear families with middle-class incomes, most often of European descent. Mothers have been identified by theorists and researchers as playing a primary, sometimes near-exclusive role in young children's prosocial development. This focus may be justified for mothers in such families. However, this may be a special case globally speaking; even young children may learn to act in prosocial ways from many others besides their mothers (Eisenberg et al. 2015). The present paper considers this possibility by examining prosociality from an ecocultural lens, as outlined in the following.

- We survey existing research on young children's prosociality. We reason that the singular focus on mothers is tied to dominant discourse on parenting informed by attachment theory;
- We discuss a view of children's prosocial learning based on the ecocultural model articulated by Keller and Kärtner (2013). We use their characterization of "family lifestyles" distinguished by ecosocial contexts to reframe the socializing role of mothers relative to others;
- We consider the relation between family lifestyles and children's care, and we present on young Efe forager children's care experiences to illustrate this relation;
- We examine the immensely important prosocial act of food sharing and compare the food exchange events of young children in two small-scale societies—Efe forager and Lese Dese subsistence farmers. Families from these two communities dwell in the same locale and, thus, face similar environment threats. What differs is the ecosocial contexts in which they are embedded. For this reason, we are able to take a closer look at the different ways ecosocial contexts support children's learning to share food;
- We use these observations of Efe and Lese Dese children to reflect on their opportunities to develop multiple attachments to individual people and, perhaps, to the group as a whole. Social networks and the nature of relationships within them are important for these children to survive the social and nutritional threats they encounter on a regular basis.

Classic views on the development of young children's prosociality

It is widely understood that prosociality, and the processes that underlie it, develop in the context of culturally-mediated "affiliative and affectively rich social and communicative interactions" (Brownell 2016, p. 223). This begins to take place in the first days of a child's life (and before), aided by perceptual biases that direct a child's attention to social information (Slater and Quinn 2001; Farroni et al. 2005; Vouloumanos and Werker 2007; Marx and Nagy 2015), and by other nascent abilities that help a child connect socially with others and maintain their involvement with them (Reis 2000; Lee et al. 2009; Shai and Fonagy 2014). It is only a few months before children show signs of prosocial proclivities in their concern for others (Hay et al. 1981). And, in the second year of life, children act on these concerns (e.g., Vaish et al. 2009); are helpful (e.g., Warneken and Tomasello 2007); and share (e.g., Brownell et al. 2013).

As children grow older, they are more likely to act prosocially, in general. But, some children are more prosocial than others, and a child's prosocial proclivities may be similar across situations and over time. Schachner et al. (2018) distinguished 18-month-olds, 4.5-year-olds, and 6-year-olds on occurrence of prosocial acts (e.g., moderate prosocial responder). Children were true to their designation, regardless of age, in the incidence of prosocial acts across various prosocial tasks. That is, children classified as low prosocial more consistently had low rates of prosocial responding across tasks, and so on (see Newton et al. (2016) for similar findings in their study of 18-month-olds). Further, prosocial designation was stable from 4.5 to 6.5 years of age. Taken together, the study suggests that a child's prosocial orientation (i.e., prosocial disposition) develops early and stabilizes in childhood.

Children's prosocial tendencies are associated with their well-being. This comes as no surprise because prosocial responding is expected of children in many contexts and is an important part of what it means to be socially competent (Eisenberg et al. 2015). Compared to children with lower ratings of prosociality, children with higher ratings are seen by adults as more socially skilled; are more likely to have positive relationships with their peers (e.g., more friends, more support from peers); are less likely to be the target of aggression; and are less likely to be aggressive towards others (Brown and Brown 2015). In addition, these children are more likely to have a positive sense of themselves (more so for older than younger children) (see Eisenberg et al. (2006) for a review of relevant research), which is tied to qualities such as how capable and valuable a child feels and how willing a child is to persist in the face of difficulty (e.g., Harter 2015).

All in all, this research suggests that individual differences in prosocial tendencies are evident early in life, are

psychologically meaningful, and are apparently stable. For these and other reasons, scholars and practitioners are especially interested in why young children differ in their prosociality (e.g., Beier et al. 2018). A child's social experiences are likely to provide insights into her or his prosocial proclivities as prosocial acts are inherently relational. Many researchers draw attention to specific relationships involved in the socialization of prosocial behavior, and the mother–child relationship dominates much of this research (for a review of the literature, see Hasting et al. 2014; see also Brownell 2016; Spinrad and Gal 2018). This bias in favor of mothers reflects, in part, the unparalleled contribution attachment theory has made to research on the subject, privileging child-centered maternal care and elucidating the role of this care in children's healthy psychological development (Sroufe 2016). As Shaver and colleagues point out, attachment theory is "at its core, a theory of prosocial behavior" (Shaver et al. 2016, p. 878).

Children's attachment relationship to mothers

Attachment refers to a special, emotional, and long-lasting tie children develop with their primary caregiver—most often their mother. All children develop an attachment relationship, except, perhaps in the harshest of circumstances. But, not all attachment relationships are the same, largely because of the different ways mothers care for their children. Care that is reliably and predictably sensitive to children's needs and interests is important for children to feel safe and secure in their mother's presence. Children who receive such care know that they can return to their mother for comfort and protection if necessary. The security that these trust-building experiences engender instills in children the confidence to explore (and, thus, learn from) their environment and in their ability to master the physical and social world. It also heightens children's willingness to learn from their mothers (Laible and Thompson 2007), setting the groundwork for children's prosocial tendencies in early childhood and beyond (Newton et al. 2016; Beier et al. 2018).

Children who develop secure attachment relationships tend to have mothers who act in kind and caring ways. They learn, as a result, to expect others to act this way towards them and to respond in kind (see Davidov et al. 2016; Newton et al. 2016; Shaver et al. 2016; Gross et al. 2017; Beier et al. 2018 for a more detailed consideration of these claims). This research on children's attachment suggests that young children's care experiences with just one person, their mother, are preeminently influential. A mother's role as her child's primary socializing agent has the potential to influence this child's view of self and others as trustworthy and worthy of kind and caring acts; tendency to act in a prosocial manner; and relationship with mother and others. While the importance of mothers is undeniable, the near-exclusive focus on their caregiving limits our understanding of prosocial development in ecosocially and culturally diverse societies. We turn to the question of why mothers, alone, tend to be privileged in this literature.

Privileging mothers in children's attachments

Research on young children's attachment, now and in the past, mostly focuses on a child's attachment to his or her mother (Cassidy and Shaver 2016). There are exceptions to the theory's near-exclusive focus on mothers, but such research takes place on the edge of theoretical interest (e.g., Lewis and Lamb 2003). The struggle to fully integrate children's attachments to others besides mothers into theory and research is not new (e.g., Mesman et al. 2015) and usually echoes the uneasy relation Bowlby, who theoretically formulated the study of attachment, had towards the idea. Bowlby acknowledged that infants may have more than one attachment figure based on who in the household cares for them (Bowlby 1969). However, he argued that, over time, infants selectively direct their attachment behaviors to the people who "act in motherly ways" towards them and that mothers are likely better at behaving in these ways. Bowlby left open the possibility that infants form multiple attachments, yet he was quite ardent in his view that infants develop a hierarchy of preferences, in which mothers are normally the most preferred. This preferred, primary attachment is expected to be unique among children's relationships, and a foundation from which other social and emotional processes develop (Cui et al. 2018, topical collection on "The development of primate sociality"). Such appears to be case for other primates (Maestripieri 2018, topical collection on "The development of primate sociality").

Bowlby's preference for mothers (and the mother–child dyad) was based partly on the opinion of child care and guidance workers in Western Europe and the US with whom he consulted (LeVine 2014). In these locales, nuclear families with middle-class incomes were prevalent and on the rise, and, in many of them, women stayed at home to care for their children (Coontz 1992). This point was not missed by Bowlby, who wrote "In Western communities today it is the tradition that 'normal home life' is provided by the child's mother and father" (Bowlby and World Health Organization 1952, p. 73). Such family life fit well with his view of attachment as he noted that the "mother-love" a child needs—that is, "constant attention day and night, seven days a week and 365 in the year"—is easily provided in the [nuclear] family, not outside of it (p. 67).

Ainsworth similarly paid attention to mothers and children living in nuclear, middle-class families in the research she launched on maternal contribution to individual differences in children's attachment security (Ainsworth et al. 1978). Her research set the pace for attachment research for decades to come, which may be one reason why interest in this population carried forward. The upshot is that much of what we

know about children's attachments is based on the study of mother–child attachment in specific types of families.

An ecocultural perspective extends our understanding of children's care and prosocial development beyond the current literature. It refocuses our attention on connections between a community's ecosocial context, their way of life, and caregiving goals and practices related to children's development.

Ecocultural model of development

The special role of mothers in the lives of their young children is undeniable. As Keller and Chaudhary (2017) note, no one can match a mother's investment in her child, and all cultures recognize the central role a mother plays in the life of her child. But, mothers worldwide are likely to share the care of their children with others, sometimes extensively (e.g., Bentley and Mace 2009). When this is the case, mothers "may play a special role among caregivers, equal to others, or may not be a special caregiver at all" (Keller and Chaudhary 2017, p. 121).

There are a many reasons why mothers assume near-exclusive responsibility for their children's care in some communities but share this responsibility in other communities. Keller and Kärtner's (2013) ecocultural model of development provides a framework for understanding such variation by attending to the complex interplay of environmental, ecosocial, and cultural contexts in which families are embedded. Ecosocial contexts represent sociodemographic characteristics that cluster together, such as family type, size, and composition; level of formal education; and economic activities. For example, high levels of formal education typically co-occur with middle-class incomes. Sociodemographic clusters correspond in systematic ways to a child's care related to what people want for children (goals), how best to achieve this (ethnotheories), and what they actually do (practices). These ecosocial and cultural features of a community are responsive to affordances and constraints of the physical environment, and their dynamic interplay makes it possible for families to adapt to this environment and to changes in the circumstances of their lives.

Keller and Kärtner (2013) identify several "prototypical" sociodemographic clusters. One is made up of urban-dwelling families in post-industrial societies, who live in nuclear households with few children and who are well-educated and financially secure (i.e., middle- to upper-class incomes). Mothers in these families, living "Western" lifestyles, often provide most of their young children's care. The care is intensive and child-centered, consistent with standards dominant in scientific discourse and shown to relate to children's prosocial tendencies. It is what mothers are advised and aspire to do (Rosabal-Coto et al. 2017); and mothers often have the resources (e.g., financial) and opportunity (e.g., few children) to do so. In fact, the amount of time mothers spend caring for their children is on the rise in the US and in Western European countries (Dotti and Treas 2016). The rise from 1965 to 2012 was especially steep for educated mothers with middle-class incomes, which Dotti and Treas (2016) attribute to mothers' cultural views on the relation between intensive parenting practices and their children's healthy development. Although only a small portion of the world's families live "Western" lifestyles, this portion contributes overwhelmingly to views on good child care and healthy child development.

More typical globally is this second prototypical cluster made up of rural dwelling families in subsistence economies, with little or no formal education, living in extended or multigenerational households, often with more than a few children. It is usual for families in these communities, with these types of rural subsistence lifestyles, to share in the care of children. How this care is shared differs from one community to the next related to environmental, ecosocial, and cultural contexts. Help with care may take place early in a child's life (beginning at birth) or later and with one or a few people doing most everything with/for the child, many people doing most everything with/for the child, or something in-between. Care may be shared with a child's relative, especially siblings; with neighborhood children; with family friends; or with paid professionals (e.g., Quinn and Mageo 2013; Otto and Keller 2014; Keller and Bard 2017).

Examples of such variation are extensive. Marine foraging Murik mothers of Papua New Guinea usually share completely in the care of children in a child's first six months (Barlow 2013). In contrast, subsistence farming Makassar mothers of Indonesia are typically their children's primary caregiver for the first four to six weeks of a child's life, after which most mothers, who must return to field work, rely on members of the extended family to take over for them. Makassar mothers may return from the field only to breastfeed their child, but it is not unusual for another woman to take on this responsibility (Röttger-Rössler 2014). Bara pastoralist mothers of Madagascar may alternate with other people as a child's primary caregiver, and, in a child's second year of life, the child will spend most of their time in the company of peers (Scheidecker 2017).

Children's care networks

Young children's care by people other than their mothers depends on who is available, able, and willing to care for them. This hinges, in part, on a child's social network, which is made up of people who know the child personally, and of people who know people who know the child in different ways and to varying degrees (see Smith and Christakis 2008 for a discussion of social networks). A child's network is partly determined by family residence patterns (who lives with or near the family) and structure (who lives in the family). As

such, children with Western lifestyles are likely to have small networks of primarily nuclear family members, whereas children with rural subsistence lifestyles are likely to have larger and more diverse social networks (Child Trends 2015; Scott et al. 2015).

Children's social networks, which extend beyond the people with whom they are directly involved, set in motion social and relational opportunities that figure importantly in the resources children are likely to receive (physical, social, and psychological) (e.g., Dyble et al. 2016) and, related to this, children's trust-building experiences with others (e.g., Levitt 2005). For example, a caregiver's ability to give away resources to children may depend on their ability to secure resources from others in the social network. Children may witness this and additional ways others are kind and caring. By watching others, children learn about and from them, and based on their experiences, may be more likely to risk new associations and engagements with those observed as generous and trustworthy.

Children's social networks speak to all aspects of their lives, from the people who care for them, to who they trust, the resources they receive, and the relationships they develop. All of this is significant to children's learning and development. Such experiences may be limited to just a few people, as is likely in families living Western lifestyles, or to many people, as is likely in families living rural subsistence lifestyles.

Children's care and prosociality

Family lifestyles also have major implications for the way children are cared for related to aspirations families have for children. Families with Western and those with rural subsistence lifestyles value self- versus other-regarding relational orientations to different degrees and, thus, practice care that differently sensitizes children to attend to their own needs or to the needs of others in relationships. For example, it is important in families with Western lifestyles for children to experience themselves as separate and distinct individuals with needs and desires of their own and to act based on what they think and believe. Children who are cared for in ways that reflect such aspirations—for example, who are praised often or who are offered a chance to make decisions independently—develop a self-regarding relational orientation (e.g., Rothbaum et al. 2011; Keller and Kärtner 2013).

For families living rural subsistence lifestyles, in contrast, it is important for children to experience themselves as socially interdependent and socially obligated; to see themselves as other people do; and to put the needs and interest of others ahead of their own (e.g., Markus et al. 1997; Cohen et al. 2007; LeVine and LeVine 2016). The practice of other-oriented care—for example, to anticipate a child's needs, to speak for a child, or to physically orient a child to others—intensifies children's social connections and increases the likelihood that children will act in ways that maintain them (Morelli et al. 2017). This facilitates the development of other-regarding relational orientations that enable, for example, socially coordinated acts, such as cooperation, that are important to meeting socially shared goals, critical to living in socially cohesive groups. This orientation is adaptive to prototypical environmental and ecosocial contexts of rural subsistence lifestyles (Keller and Kärtner 2013).

It stands to reason that children's relational orientation is related to their prosociality. Research suggests that children with other-regarding orientations are more likely than children with self-regarding orientations to engage in other-regarding prosocial acts. One of the first sets of studies to investigate this was the Six Culture study by Whiting and Whiting (1975). They noted that children (ranging in age from 3 to 11) in "simple societies" (e.g., rural subsistence lifestyles) scored high on measures of nurturance and responsibility unlike children in "complex societies" (e.g., Western lifestyles). Other studies largely confirm these findings for different prosocial acts (e.g., helping with chores and child care; sharing; cooperating) by children of different ages (see de Guzman et al. 2014).

Children learn other-regarding prosocial ways of acting in rural subsistence communities by participating in activities expected of them. Older children, for example, are generally expected to care for younger children, often siblings. This allows mothers, frequently with high workloads, to farm or tend to other household matters unencumbered by children. In one study, Gusii mothers (Kenya) in traditional communities preferred to leave their young ones at home in the care of 6- to 11-year-old children when working in the field—about 4–5 h a day. Mothers expected child-caregivers to provide care in ways similar to them: to protect young ones from harm, to respond rapidly to their distress, and to feed and clean them (LeVine et al. 1994). Along similar lines, children are commonly expected to meet social obligations by sharing food. Subsistence farmers in a Bisayan Filipino village in Panay expect peaceful sharing by children, particularly during mealtimes when exchanges are highly regulated by parents (Jocano 1969). In this group, children as young as one year of age are expected to share food with their older siblings, although the pressure is greatest for older children to share with younger siblings. These types of expectations, and children's networks and activities related to them, provide children with varied opportunities to learn community-based, other-regarding prosocial norms and practices in rural subsistence communities.

Using the ecocultural model to frame our consideration of children's care, relational orientation, and prosociality, we turn now to a discussion of the care of young Efe forager children of the Democratic Republic of Congo (DR Congo). Efe mothers, similar to mothers in other forager communities

(Konner 2010), share the care of their children with others, extensively so, beginning in the first hours and days of a child's life (Tronick et al. 1987, 1992). We understand this care as reflecting the interplay of environmental threats to nutritional and social resources; ecosocial factors related to subsistence practices, camp mobility, and residential patterns; and an ethos of other-oriented ways of being.

Care of Efe forager children

The Efe foragers of DR Congo live a lifestyle similar to that of other tropical foragers who subsist primarily by hunting and gathering forest foods (for examples, see reviews by Hewlett and Lamb 2005; Hrdy 2009; Konner 2010). They reside in camps in small groups of 3–50 people made up primarily of shallow patriclans, with brothers, male relatives, and the families of both. Camps are peppered with leaf huts nestled around an open communal area where most daily in-camp activities and conversations take place in full view of others. Efe move about the camp at will, as do young children who are also able to move in and out of huts with few, if any, restrictions. Adults sometimes take advantage of children's camp access to gather information on a neighbor, such as their "private" stash of food.

The Efe rarely synchronize their daily activities. Usually, people prepare food at different times of the day and children warm up leftover food when they are hungry. Adults eat by the hearths in front of their huts. Children may eat with them, but often only for brief periods, instead roaming the camp with food in hand. Men may hunt several times a week in groups or individually; women forage daily in small groups. This pattern of activity continues even as people who reside in camp change. The greatest change takes place when camps move in search of seasonal foods. For example, during the short rainy season when honey is plentiful, camp size increases as camps merge. By comparison, during the dry season when food is scarce, camp size decreases as camps fracture in search of more dispersed, less productive sources of food. So, while there is a plethora of flux in who lives in camp, there are almost always a few Efe in camp on any one day to care for children if mothers do not want their children to accompany them on out of camp trips (Ivey 2000).

The Efe way of life reflects their experience of an unpredictable nutritional environment characterized by high day-to-day and seasonal variability in access to game and fruiting trees. At times, they trade forest goods or seasonal garden work for farm produce. It is notable, however, that the Lese Dese farmers with whom they trade are poor subsistence farmers (Bailey and Peacock 1988). As such, the Efe do not rely on trade as a consistent food source. On any one day, one, several, or many Efe may not have food to eat. The social ties Efe enjoy with people in camp, especially with people they trust and with whom they hold exchange relationships, help them deal with this uncertainty as the successful capture of resources by a few in their social network is likely to be shared widely within the network. The stability of their exchange networks, however, is anything but a given because they experience substantial social uncertainty as well. In addition to seasonal changes in residency patterns, Efe often become ill from parasites, infectious diseases, and injury, and many die (Dietz et al. 1989). Others leave to visit families far away or in search of better prospects, often with the expectation of returning sometime in the future. What this means is that the people on whom Efe depend may suddenly be gone or unavailable. For a mother, this may include some of the caregivers on whom she relies for help; and, for her child, people who are known and trusted.

This kind of social uncertainty, we expect, means that the Efe must be able to identify and manage acceptable, opportunistic patterns of exchange within broader relational networks in order to respond rapidly to changing social conditions, or risk losing access to unpredictable but necessary resources. To do this, Efe must be able to maintain varying favorable relationships and minimize unfavorable ones; develop new relationships with people they may not know very well but who seem promising as exchange partners; and renew relationships with people who have been away for some time. Succeeding at these maneuvers involves a complex set of social skills that Efe children must learn. In what follows, we examine how Efe children's social networks support the social nimbleness needed to adapt to the uncertainties they experience on a regular basis.

Social network experiences of Efe infants and young children

Starting early in life, Efe infants spend a substantial amount of time with many different people. In their first month, they spend about 50% of their time on the laps and in the arms of about 9 different people other than their mothers. By 12 to 24 months of age, this rises to about 60% and 14 different people (Tronick et al. 1992). Given the frequency of on-demand nursing in the first months of life, mothers largely determine the character of their babies' social connections. Yet, they do not determine the full extent of the early connections infants develop, and, once toddling (about 9 to 10 months of age), children are better able to contact people on their own. People delight in this and solicit young children to join them as they sit or to play with them (Morelli et al. 2014).

Efe children's social networks are also punctuated by changes in social partners. Morelli et al. (2014) found that Efe 4- to 18-month-olds changed social partners moment-to-moment—about once every three minutes in a two-hour period. This was underscored by a surprisingly high turnover in social partners over time. For example, 70% of the people who

interacted with a child (other than a child's mother) changed from one age period (4–6 months) to the next (7–11 months). Yet, even with this flux, Efe children's social partners behaved solicitously. Efe child distress was consistently brief, suggesting responsive and patient caregivers. Further, Efe children got what they ask for most of the time (e.g., help walking, attention, pick-up, transfer to another person, and comfort), and most of what they did not get was either not ready to be given or not safe for them (e.g., uncooked food).

Overall, this work suggests that Efe children's fast-paced and fluid social environment brings them into contact with many people who act in kind and caring ways. Children's networks provide them with many opportunities to learn to manage a changing social scene of partners with diverse characteristics, permanency, and interests. Such social maneuvering may sensitize children to the needs of others and heighten the likelihood that children will behave cooperatively towards others in ways reflective of social expectations—strengthening children's other-regarding relational orientation and prosocial tendencies (e.g., Jaeggi et al. 2010).

Children's prosocial experiences with different people lay the groundwork for the affiliative, affectionate, and cooperative relationships they develop. These relationships will often be the mainstay of their lives. Cooperative relationships, in particular, tend to cluster in networks based on need (Dyble et al. 2016), and higher variation in individual access to food is a critical challenge that most forager groups share in common (Kaplan et al. 2009). As a result, food sharing may be the most prevalent form of cooperative prosocial acts among humans.

Sharing food in past and present forager societies

Food sharing most likely traces back to the Paleolithic era based on studies of contemporary foragers (Jaeggi et al. 2010). Evidence suggests that during this time, divergent evolutionary processes shifted human life history from an ancestral hominid pattern towards more consistent resource sharing between sexes, families, and residential partners and directed to multi-age dependent young. This resulted in more socially complex groups, with intensive learning- and skill-based patterns of development and resource access (Kaplan et al. 2009), and related to this, the reliance on patterns of exchange with partners beyond the immediate family (Hill et al. 2011). The increased size of exchange networks helped humans to better cope with the uncertainties of daily living by smoothing over day-to-day fluctuation in food and other resources (Gurven 2004; Alvard 2009; Kaplan et al. 2012).

Today's foragers give us the most realistic models of the nutritional challenges our ancestors faced and the adaptations that likely evolved to address them (Kelly 1995; Marlowe 2005). What we have learned is that forager mothers, alone, are not consistently able to supply enough food to keep themselves and their nutritionally dependent children healthy. Instead, mothers require the help of others to manage the habitual uncertainty of access to food and other resources, which is the case for most foraging societies (Hrdy 2005; Kramer and Ellison 2010; Crittenden and Marlowe 2013). When mothers receive help with child care, both they and their children are likely to benefit (Ivey 2000; Kramer 2010; Meehan et al. 2014).

However, because of its importance, food is not shared indiscriminately. For example, a person may give food to another if they are a relative, a friend, live nearby, or have a prior history of sharing with this person (e.g., Gurven et al. 2000; Nolin 2010). And, while food sharing may be culturally expected, its practice is not a given. People hide food, especially in times of extreme hardship, to avoid sharing away limited supplies. This also allows them to evade requests for food that they "do not have" (Peterson 1993).

In sum, food sharing among modern day forager groups constitutes a risk-reduction strategy that is an essential part of a child's care regardless of whether food is shared directly or indirectly with a child. The reasons for sharing food, however, are also socially and psychologically significant. By giving food to a child, a person may signal his or her altruistic intent (Gurven and Jaeggi 2015), trustworthiness (Bird and Power 2015), or commitment to a social relationship (Smith and Bird 2000). The signal may be intended for the child as well as for others observing the act. Witnesses may look kindly on people who share food, which is important for foragers who are particularly concerned with reputation (Santos et al. 2016). Among the Murik foragers, according to Barlow (2013), "giving and receiving food are symbolic representations of maternal care. Food is the quintessential expression of relatedness, caring, and belonging" (p. 177). Food sharing binds people together (Aspelin 1979) and figures importantly in people's relational lives.

Young forager and subsistence farming children learning to share food

It follows that young children's learning to share food is immensely important to people in small-scale subsistence societies (e.g., rural subsistence lifestyles). Unfortunately, there is a dearth of information on food sharing in these societies (Crittenden and Zes 2015). Much of what we know is based on accounts of young children in families with Western lifestyles (House et al. 2013). For them, not surprisingly, mothers play a significant and primary role. This near-exclusive role is less likely for mothers who share the care of their children with others, as observed in families with rural subsistence lifestyles.

To expand the present base of knowledge on young children's food-sharing experiences in such families, and to enrich evolutionary models of prosocial cooperative acts, we return to research on the Efe. Here, we focus on children's prosocial act of cooperation with their earliest non-maternal food exchange partners. These early food events are a likely opening to food exchange partnerships and social networks that support children as they grow into adolescence and adulthood.

For this inquiry, we compare Efe children's food-sharing experiences with those of children living in a different kind of small-scale society—a farming subsistence community, where, similar to other such communities, the household is the basic unit of production and consumption. Importantly, the Lese Dese (referred to subsequently as Lese) dwell in the same locale as the Efe, and, thus, cope with similar environmental hazards that threaten Efe well-being. But, the Lese do so in a way consistent with their specific horticultural lifestyle. The ecosocial variation suggested by these different lifestyles allows us to clarify processes that influence children's social networks and, by implication, their care and exchange partner networks.

Lese subsistence farming lifestyle

The Lese live in villages of 15 to 100 people composed of small homesteads of patrilocal clans scattered along a forest road. Villages rarely change location, although people may relocate within them, and the composition of a village is usually the same across seasons and years with births, deaths, and marriages largely accounting for shifts in membership. Typically, a mother, father, and their children occupy a homestead, and the homesteads of the father's family are nearby. When in the village, women spend most of their time in the kitchen area of their homesteads, and young children are not far away. The ability of women to readily interact with people beyond the family varies greatly because of the spatial arrangements of homesteads. Homesteads are separated at a distance, and the cooking area is often situated out of view of other homesteads. When women are not in the village, they are typically in the fields tending to their family's farm. With the exception of clearing gardens, a woman is responsible for almost all of her family's horticultural activity, and this work stretches over a good portion of the year. Women find it difficult to visit with one another in the fields during this time because there is little leeway in the timing of certain farm activities. Women do the same work at the same time in fields that are often at a distance from one another. Lese women, however, do not always labor alone. They are joined, on occasion, by other villagers and by Efe women and adolescent girls who provide intermittent work for food, primarily during the seasonal planting and harvesting of rice and peanuts.

The Lese often do not produce enough food to last the year. Lese farms are cleared in fallow forests that are about 10–15 years old (Wilkie et al. 1998; Gurven 2004). The soil in these forests is nutrient-poor, worsened by the practice of burning fields to clear them, and, as a result, crop productivity is low (Filho et al. 2013). This is compounded by field size, which, for most families, is small. Fields are as large as a family is able to cultivate and protect from predators but small enough to mitigate requests that press a family to share away food or seed crop. They are smaller yet when rains come early or are particularly heavy (Wilkie et al. 1999). The times when food is most uncertain are in-between harvests, and, during these times, many Lese suffer severe food shortages for as many as six to eight weeks (Jenike 1988). Even so, compared to the Efe, the Lese have lower variation and more predictability in access to food.

Lese families, by and large, go it alone when they have little to eat. Food is a family possession that tends to be narrowly shared between family members. Its consumption is also a family affair. Meals are prepared at a family's cooking fire (in the village or field), and mothers and children usually eat together around the fire. Women, but sometimes older girls, decide on how much food each family member gets, and all eat from a separate plate except children who are expected to eat from the same plate—an early lesson in sharing. Leftover food is stored in the family's homestead. Still, food may be shared. On occasion, a woman may share a small amount of food with a friend. This is done discreetly, perhaps so as not to advertise sharing beyond families, and/or communicate that a family has food to share. Women speak about this as a very good custom.

Lese women's social networks are small, constrained by their work, and fairly stable day-to-day and month-to-month. They are largely limited to a handful of women and children in their own village or neighboring villages. Men (and adolescent boys) are less likely to be a part of these networks because, by and large, they do not take part in the social or work life of women. Customarily, men relax, eat, and socialize in spaces separate from women and children; do not care for young children; and do not help with the bulk of daily household- and farm-related work. As a result, there is a short list of people who are able to help with the care of young children, and many are relatively young children themselves. This help is most needed when women are in the fields. Women often have little choice but to bring their young children and child caretakers with them to work. Sometimes, women cache children in a shady place. This is where children spend most of the day, visited occasionally by other women taking a break from their labors.

We propose that young Lese children's social networks mirror those of their mothers in terms of size and stability, but with a strong representation of children, many of whom are siblings (e.g., Whiting and Whiting 1975; Weisner et al. 1977). Thus, we hypothesize that compared to young Efe children, Lese children's food exchange networks are small;

exchange partners, beside mothers, are mostly siblings; and food exchange events are limited. This speaks to the different ways that Efe and Lese deal with similar environmental threats related to unpredictable nutritional environment. Their different approaches relate to differences in opportunities and constraints afforded by their ecosocial contexts, such as subsistence activities, residential and demographic patterns, and by their cultural contexts, such as the roles and responsibilities of men and women, and food-sharing practices. These differences play out in opportunities children have to develop relationships based on experiences with trustworthy others.

Food sharing is the real mainstay of the Efe and Lese and of other small-scale societies. Yet, we know little about how children in such societies learn this critical prosocial act of cooperation. To redress this, we observed young Efe and Lese children's early food-sharing events. This is a key period to observe these children's earliest experiences with food sharing that extend *beyond* their mothers, and thus, to observe their prosocial learning (Warneken and Tomasello 2013; Brownell 2016).

Methods

Behavioral observations of young Efe and Lese children

All available one- to three-year-old Efe and Lese children in the population area of about 750 km^2 were included in this study. We selected this age range because by 12 months of age all children were walking, allowing them to widen their food exchange network with people not in close proximity to their caregivers; and by 39 months of age, all children were weaned, and so their reliance on mothers and others to provision them with food had become fairly well-established. We obtained permission from elders of each village and each camp to observe village and camp members; after this, we obtained permission from each child's guardian to observe that child. All elders and all guardians granted permission, and 45 children were observed. The use of focal subject sampling meant that it was not possible to record or analyze data blind. Of these children, 23 were Efe (12 girls and 11 boys; X_{age} 26 months, SD = 10.1) and 22 were Lese (11 girls and 11 boys; X_{age} 24 months, SD = 9.6). Twenty Efe and 20 Lese children had 1–2 (14, 4) or 3 or more siblings (7, 15). All children's mothers and fathers, and most of their siblings, lived in the camp or village at the time of observation.

Each child was observed when he or she was awake for 6 one-hour sessions, except one Efe child who was observed for 5. Sessions were evenly distributed over the daylight period to obtain a representative sample of children's daily food-sharing events (2 h in each of three time periods from 6 a.m. to 10 a.m., 10 a.m. to 2 p.m., and 2 p.m. to 6 p.m.). The identity of people within view of a child (i.e., "proximal people") was noted five minutes before and five minutes after each session. Observations were spread out such that they did not take place in consecutive time periods on any given day. Observations were completed within 30 days of the first data collection period for each child. This study on Efe and Lese children's food sharing was part of a larger study conducted by the first author (GM) documenting the daily lives of these children.

Measures and analytic approach

We explored children's experience of food sharing by coding several characteristics of food exchange events and networks (see subsequent texts). Children's scores for these measures reflect the sum of their experiences over the full 6 h of observation. (We accounted for the missing hour of data for one child by adding this child's hourly mean to the child's scores.) Individuals in proximity to focal children or who participated in food events with them were grouped into one of four mutually exclusive social categories: mother, siblings, children/adolescents (referred to as children), and adults (i.e., anyone married, with children, or 18 years of age and older).

- The number of proximal people (i.e., people within view of the child)—total, and by social category. This measure provides an index of children's social opportunities.
- The number of food exchange events in total, and by type of event—offers of food *to* and *from* the child, and asks for food *by* and *to* the child. We relied on verbal and nonverbal cues (e.g., a child saying I am hungry to an adult eating food; an outstretched hand) to identify instances of offers of and requests for food. The two most common exchange events—offers *to* and asks *from* children—became the focus of subsequent analyses. Hereafter, offers of food to a child by others are usually referred to as *offers of*; and asks (or requests) for food to others by a child are usually referred to as *asks (or requests) for*.
- The number of offers of and asks for events by social category of partner.
- The number of *unique* food exchange partners involved in offers of and asks for events in total, and by social category of partner. That is, the number of individual partners engaged in food exchange events, *independent of the frequency of their exchanges*. This measure captures the breadth of children's food exchange networks.

We used parametric analyses (ANOVA and t-tests) to test differences in frequency measures of food exchange events, except in cases where homogeneity of variance was violated at $p \leq 0.05$ as determined by Levene's test. In these few instances, we used the non-parametric Mann–Whitney *U* test to examine group differences. To correct for multiple pairwise comparisons, we used the Benjamini–Hochberg procedure

(Benjamini and Hochberg 1995). This method is more appropriate for this study than are procedures that attempt to control familywise error rates, which can dramatically lower statistical power and increase the probability of type II errors, especially when sample size is small (Streiner 2015). To these points, our study groups were small even though they were population-based. In addition, naturalistic studies on young children's food sharing in forager and farming societies are rare, and, thus, overlooking potentially significant findings at this juncture does little to advance our understanding of the role of non-maternal partners in the ontogeny of this critical prosocial act or to enrich evolutionary models of them.

The Benjamini–Hochberg's method improves power and reduces chances of false negatives by controlling the false discovery rate FDR (Benjamini and Hochberg 2000). We took into account the advice of McDonald (2014) and Slavich (2018) and set our FDR at 0.1. This rate is appropriate when the costs of false negatives are high, but it is also acceptable under usual study conditions. Study group sizes, group means, and test statistics are included in the tables. Results of univariate and non-parametric analyses are reported as statistically significant using the Benjamini and Hochberg procedure; with FDR at 0.1; p values ≤ 0.047 were significant.

We explored, as well, whether mothers' food sharing with her child was sensitive to food contributions from others (Savage et al. 2015). We reasoned that maternal food sharing may be impacted by the number of unique partners involved in all food exchanges, such that a child's access to more partners would improve their likelihood of obtaining food from others, reducing the food-sharing burden of mothers. To test this, we combined the frequency of offers of food from mother to child and the child's successful asks for food from mother to index maternal food contributions. We then ran bivariate correlations between maternal food contributions and number of unique partners, which represents the relative size of the network of people from whom a child is likely to secure resources.

Results

Efe children had within proximity significantly more people than did Lese children (Fig. 1, Table 1), and, of them, significantly more children and adults (Fig. 2, Table 1). In contrast, Efe and Lese children's mothers (Table 1) and siblings were as likely to be in sight of them (Fig. 2, Table 1). Even though some of the people in a child's view may not have been available to interact with him or her, the child would still be able to learn from them by watching what they do and listening to what they say.

Efe children took part in significantly more food exchange events and had more unique partners than did Lese children (Fig. 3, Table 2). The two most common events for Efe and

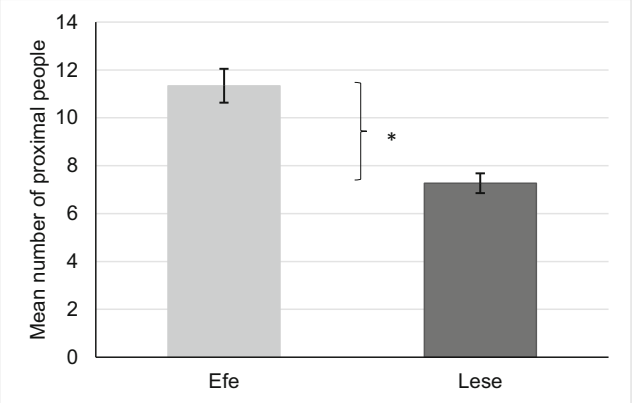

Fig. 1 Proximal people. This bar graph displays the mean number of people in view of each focal child for the Efe and the Lese. Efe are represented in light gray, and Lese are represented in dark gray. Error bars represent standard errors. Significant differences between Efe and Lese children with a FDR of 0.1 are displayed using an asterisk (*)

Lese children were offers of food by others and asks for food to others (Fig. 4, Table 3), with offers occurring more frequently than asks for both Efe and Lese children (Table 4). However, Efe children received significantly more offers of food than did Lese children (Fig. 4, Table 3). On the other hand, Efe and Lese children were similar in the frequency with which they asked others for food.

As offer and ask events characterized Efe and Lese children's food exchange experiences, we examined children's partners in these events. First, Efe children's offers of food came from significantly more *unique* (i.e., different) partners than did Lese children, though Efe and Lese children did not differ in the frequency of asks to unique partners (Fig. 5, Table 5).

Second, Efe children were involved in significantly more offer and ask events with adult partners as a group than Lese children (Fig. 6, Table 6). Further, as indicated by analysis of unique adult partners (Fig. 7, Table 7), this preponderance of adults in offer events was not driven by a small number of adults. That is, Efe children were offered food by significantly more *unique* adult partners than were Lese children. In short, Efe children had more adults in their food-sharing networks than did Lese children, and received food from these adults with greater frequency as well.

Third, Efe and Lese children did not differ in the frequency of offers of food by, or asks to, siblings or child partners (Fig. 6, Table 6). Yet, interestingly, differences were noted in the number of unique child and sibling partners involved in these two food events. Efe children received offers of food from significantly more unique child partners, and Lese children were significantly more likely to ask unique sibling partners for food (Fig. 7, Table 7).

Lastly, Efe and Lese children were similar in the frequency with which their mothers offered food to them and with which they asked their mothers for food (Fig. 6, Table 6). Efe and

Table 1 Univariate ANOVA results comparing the mean number of people in view of each focal child (total, and by social category) between Efe and Lese. Also displayed are results of the Benjamini and Hochberg procedure and of Levene's test of homogeneity of variance. When homogeneity of variance was violated at ≤ 0.05, Mann–Whitney test results are displayed

	Efe $N = 23$ Mean (SD)	Lese $N = 22$ Mean (SD)	Levene's test F [p]	ANOVA F [p]	Mann–Whitney test U [p]
Total proximal individuals	11.34 (3.39)	7.27 (1.95)	6.6 [0.01]	24.1 [0.00]	86.0* [0.00]
Proximal siblings[a]	1.28 (0.94)	1.80 (1.04)	0.7 [0.40]	2.8 [0.10]	–
Proximal children	3.94 (1.54)	1.65 (1.18)	1.7 [0.20]	31.1* [0.00]	–
Proximal adults	5.54 (2.44)	3.14 (1.34)	12.1 [0.00]	16.3 [0.00]	105.0* [0.00]
Mother is proximal	0.75 (0.18)	0.84 (0.17)	0.1 [0.72]	3.1 [0.87]	–

* Indicates significant differences with FDR of 0.1; in brackets, uncorrected p values

[a] For sibling analysis, test included children with siblings ($n = 20$ for Efe, $n = 20$ for Lese)

Lese mothers' food contributions to their young children appeared to be responsive to the number of unique partners involved in food exchange events, with mothers contributing less food when the number of unique partners in their child's network was higher (Fig. 8).

Discussion

Ecosocial and cultural contexts of Efe and Lese children's food exchange partnerships

Food sharing is one of the most important prosocial acts of cooperation that Efe (Fig. 9) and Lese children learn. Sharing is a nutritional and social necessity that knits people together in social networks that likely extend beyond food sharing. We identified similarities in Efe and Lese children's food-sharing experiences that reflect the high and recurring risks posed by environmental threats of food uncertainty. Efe and Lese children were similar in the relative infrequency with which they asked for food. This suggests that these children may not need to make requests for food when it is available because food-sharing partners are so solicitous. Efe and Lese children, as a result, may rarely experience long stretches of hunger, even though variability in forest and garden foods may substantially limit the size of portions they receive. We reason that this relatively consistent social responsiveness to children's nutritional needs is an important way they are buffered from recurring risks associated with both food and social uncertainties. This is in line with the position put forth by LeVine (1974) that a foremost concern of caregivers is to safeguard children from stressors that may harm them, and young children are especially vulnerable to poor health due to low food supply. For

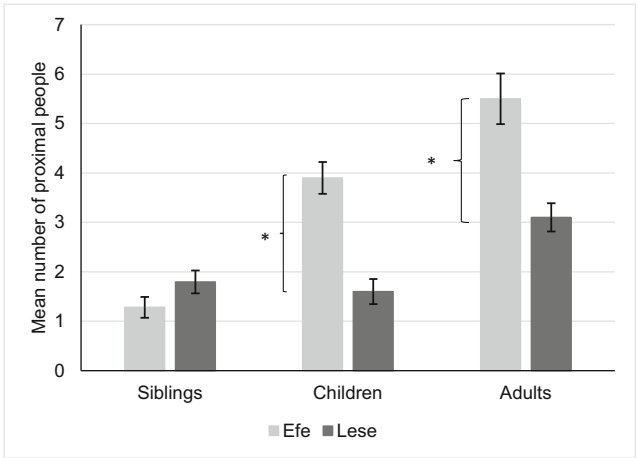

Fig. 2 Proximal people by social category. This bar graph displays the mean number of people in view of each focal child for the Efe and the Lese, grouped by social category. Efe are represented in light gray, and Lese are represented in dark gray. Error bars represent standard errors. Significant differences between Efe and Lese children with a FDR of 0.1 are displayed using an asterisk (*)

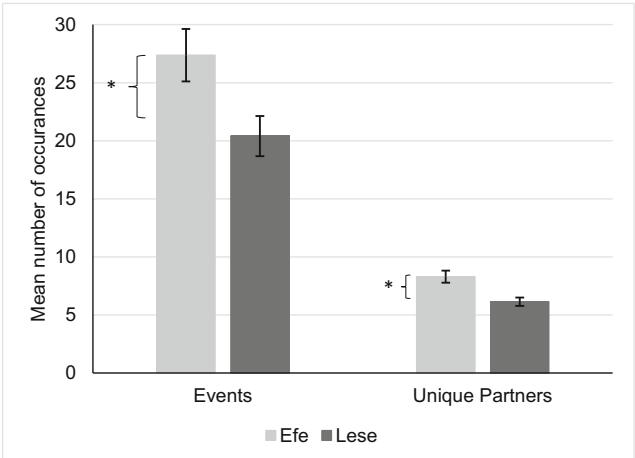

Fig. 3 Number of food exchange events and mean number of unique partners in food exchange events. This bar graph displays the mean number of food events and mean number of unique partners in food exchange events with children for the Efe and the Lese. Efe are represented in light gray, and Lese are represented in dark gray. Error bars represent standard errors. Significant differences between Efe and Lese children with a FDR of 0.1 are displayed using an asterisk (*)

Table 2 Univariate ANOVA results comparing the mean number of food exchange events and the mean number of unique partners who engage in food exchange events with focal child between Efe and Lese. Also displayed are results of the Benjamini and Hochberg procedure and of Levene's test of homogeneity of variance. When homogeneity of variance was violated at ≤ 0.05, Mann–Whitney test results are displayed

	Efe $N = 23$ Mean (SD)	Lese $N = 22$ Mean (SD)	Levene's test F [p]	ANOVA F [p]	Mann–Whitney test
Number of food events	27.37 (10.84)	20.41 (8.12)	0.62 [0.44]	5.91* [0.02]	–
Number of unique partners	8.30 (2.58)	6.14 (1.70)	3.53 [0.07]	11.08* [0.00]	–

* Indicates significant differences with FDR of 0.1; in brackets, uncorrected p values

instance, both Efe and Lese mothers and others are quick to respond to young children's distress. Mothers oftentimes allow young children to nurse when they want to and do not engage in strict weaning practices; and families give youngest children priority access to food.

Efe and Lese children also differed in their food-sharing experiences related to their respective lifestyles (e.g., Spielmann 1994). Here, we speak to those differences that particularly distinguished Efe and Lese children's food exchange partnerships. This does not imply that an aspect of food sharing which distinguishes one group of children is not important to the other group. For young Efe children, the presence of adults in their food-sharing networks was one primary difference. Not only did Efe children engage more often with adults than did Lese children, they also engaged with more unique adults who offered them food. These first experiences with food sharing present young Efe children with a relatively generous view of adults. Such experiences may heighten Efe children's awareness of food offers as an important quality of relationship. The strong representation of offer events by unique child partners no doubt adds to this developing social awareness. The other-regarding prosocial acts accentuated by sharing food may help to prepare young children for a life of food exchange partnerships where they are expected to offer as well as to be offered.

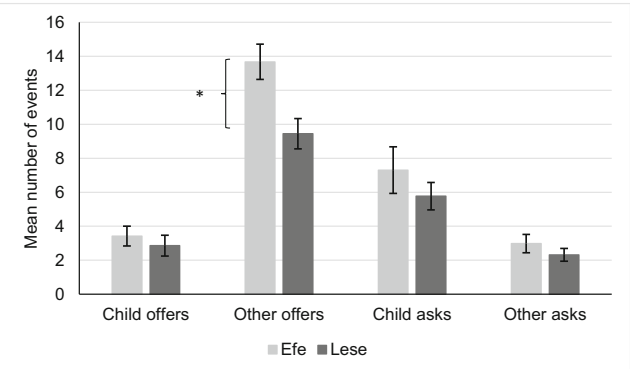

Fig. 4 Types of food exchange events. This bar graph displays the mean number of different types of food exchange events for the Efe and the Lese, including focal child offers to others, other offers to focal child, focal child asks to other, and other asks to focal child. Efe are represented in light gray, and Lese are represented in dark gray. Error bars represent standard errors. Significant differences between Efe and Lese children with a FDR of 0.1 are displayed using an asterisk (*)

Adult food partnerships among young Efe children correspond with ecosocial conditions. Efe children are in view of many adults—men and women—and have full access to them. Some or many of these adults may change with shifts in residency patterns, thereby diversifying children's contact with them. Children move about camp at will and adults enjoy sharing bits of food with them as they pass by. Adults in camps may be incentivized to share with young Efe children because of the potential for reputational gains from signaling prosocial intent. It is easy for adults and children to witness such acts given the very public nature of their lives, and such acts are likely to elicit generosity from others in different circumstances (e.g., cooperative foraging, food, and information sharing). It may be particularly important for adults who recently joined or returned to the camp to establish cooperative relationships in such a way.

The involvement of adults in food offer events relative to children and siblings was, however, notable for both Efe and Lese children. This may be because younger partners can generally only share food that was shared with them (i.e. from adults). Children among the Efe and Lese do not procure enough food to provide for themselves until adulthood. Efe adolescents develop more capacity and skill to capture food on their own, but continue to remain dependent on others. Lese are typically married with their own farms before providing fully for themselves. Therefore, the generosity of child partners even into adolescence may well be tested, as there are no assurances, in the moment, of getting more food if they give away what they have; nor, at a later time, of reciprocation.

By comparison, the presence of siblings as partners in young Lese children's food-sharing networks differentiated them from Efe children. Specifically, focal Lese children asked for food from more unique sibling partners than did Efe children. We suspect this had to do with several aspects of Lese children's ecosocial contexts: Lese children tend to have a larger number of siblings and Lese mothers often rely on a child's siblings for help with care. These features are typical of subsistence farmers (e.g., Whiting and Edwards 1988). However, the frequency with which children exchanged food with siblings was modest. Lese family food

Table 3 Univariate ANOVA results comparing the mean number of different types of food exchange events between the Efe and the Lese, including focal child offers to others, other offers to focal child, focal child asks to other, and other asks to focal child. Also displayed are results of the Benjamini and Hochberg procedure and of Levene's test of homogeneity of variance. When homogeneity of variance was violated at ≤ 0.05, Mann–Whitney test results are displayed

	Efe $N = 23$ Mean (SD)	Lese $N = 23$ Mean (SD)	Levene's test F [p]	ANOVA F [p]	Mann–Whitney test U [p]
Child offers to other	3.42 (2.80)	2.86 (2.08)	1.22 [0.28]	5.63 [0.46]	–
Other offers to child	13.68 (4.97)	9.45 (4.19)	0.24 [0.63]	9.45* [0.00]	–
Child asks other	7.30 (6.57)	5.77 (3.79)	4.99* [0.03]	66.00 [0.35]	239.50 [0.76]
Other asks child	2.97 (2.58)	2.32 (1.76)	1.20 [0.28]	0.99 [0.33]	–

* Indicates significant differences with FDR of 0.1; in brackets, uncorrected p values

customs may help to explain this finding. It is usual for Lese mothers and children to eat together at their hearths at meal times. Usually, mothers plate the food and their children are given one plate from which to eat. In this context, there is less of a need to offer or ask siblings for food as food is there for the taking. Lese children are expected to modulate what they eat in order to make sure that all children are able to eat their fair share, putting primacy on children's demonstration of obedience and self-control when eating with others. To do as expected, children have to attend to the behavior of others and to adjust their own behavior accordingly, as is important for developing other-regarding relational orientations. Lese mothers are intentional in the opportunities they provide children to learn to eat and share properly. Yet, mothers are forgiving of young children when they take more than what they should and expect older children to be as tolerant. This aspect of pacing is an important part of food socialization, but, as far as we know, it has not been systematically studied.

Efe and Lese mothers

Efe and Lese mothers are the single most important people involved in their young children's food-sharing experiences. Their social involvement is well embedded in their child's food-sharing networks, as many of a child's exchange partners are likely to be his or her mother's exchange partners. This helps steady a child's entry into new relationships and strengthens possible longer term relationships that are built on positive experiences such as prosocial acts of food sharing.

These data underscore that while food sharing is an integral part of a young child's relationship with his or her mother, this experience is not contained as a unit. For both Efe and Lese, children's food sharing is part of many other social relationships even in the first years of life. Our findings provide support for this notion, suggesting that when others feed a child, they may reduce the burden of provisioning by mothers. This is likely to impact a mother's relationship with both her own network of cooperative others and with her child by reducing the stress that comes with procuring and processing food in a resource scarce environment while simultaneously managing household, subsistence, and child care activities. In these social networks, both mother and child develop a broader and deeper sense of affiliation to others. And, as children grow more capable, they, too, will increasingly participate as reciprocal sharers in these social networks, thereby supporting the health and development of young and the health, reproduction and parenting efforts of mothers.

Table 4 t test results comparing the mean number of other offers to focal child and focal child asks to others food exchange events for the Efe and the Lese, separately

		Other offers Mean (SD)	Child asks Mean (SD)	t test t
Efe	$N = 23$	13.68 (4.97)	7.30 (6.57)	3.82* [0.00]
Lese	$N = 22$	9.45 (4.19)	5.77 (3.79)	3.28* [0.00]

*Indicates significant differences with FDR of 0.1; in brackets, uncorrected p values

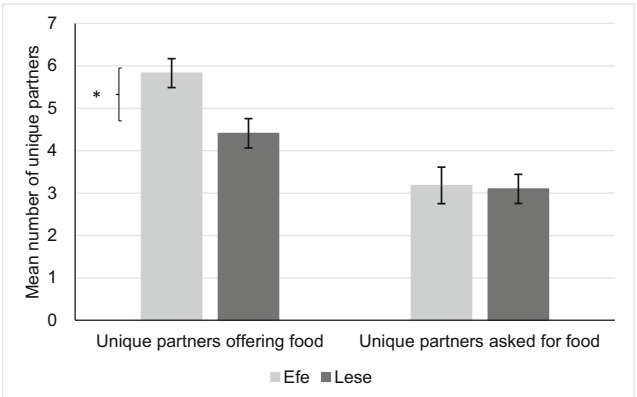

Fig. 5 Number of unique partners offering or asked for food. This bar graph displays the mean number of unique partners offering food to focal child and of unique partners being asked for food by focal child between the Efe and the Lese. Efe are represented in light gray, and Lese are represented in dark gray. Error bars represent standard errors. Significant differences between Efe and Lese children with a FDR of 0.1 are displayed using an asterisk (*)

Table 5 Univariate ANOVA results comparing the mean number of unique partners offering food to focal child and unique partners being asked for food by focal child between the Efe and the Lese. Also displayed are results of the Benjamini and Hochberg procedure and of Levene's test of homogeneity of variance. When homogeneity of variance was violated at ≤ 0.05, Mann–Whitney test results are displayed

	Efe $N = 23$ Mean (SD)	Lese $N = 22$ Mean (SD)	Levene's test F [p]	ANOVA F [p]	Mann–Whitney test U [p]
Unique partners offering food	5.83 (1.64)	4.41 (1.62)	0.00 [0.98]	8.47* [0.01]	–
Unique partners asked for food[a]	3.18 (2.01)	3.10 (1.58)	0.60 [0.44]	0.02 [0.88]	–

*Indicates significant differences with FDR of 0.1; in brackets, uncorrected p values

[a] For analysis of asks, test included children who asked for food ($n = 22$ for Efe and $n = 21$ for Lese)

Recasting classic views of attachment relationships and prosociality

Young children's social experiences, and the relationships that develop from them, are foundational to children learning what is expected of them and what to expect from others. Essential to this is children's learning to act in prosocial ways. A child's prosocial proclivities relate to her or his social integration and the benefits that accompany this, especially access to needed resources—physical, social, and psychological.

An ecocultural framework suggests that the social and relational experiences that support children's prosocial learning, and, thus, children's prosociality, are culturally organized, ecosocially situated, and environmentally sensitive. Mothers are central to this learning, but their role relative to others varies in systematic ways across communities related to variation in ecosocial (i.e., family lifestyles) and cultural contexts. What also varies are the people available to a child from whom this child can learn and with whom this child can develop relationships.

Mothers in small-scale societies share in the care of their children. To illustrate this, we considered Efe foragers of DR Congo because they practice shared care extensively from birth through childhood. Shared care reduces risks related to habitual nutritional and social uncertainty by providing young children with opportunities to develop social networks and the critical skills to secure needed resources. These trust-building experiences lay the groundwork for children's social relationships and later attachment relationships.

The idea that a young child is able to develop multiple, simultaneous attachment relationships with a strong preference for many of their attachment figures is situated at the edge of theoretical interest (Mesman et al. 2016). However, research supports this view. Aka babies (tropical forest foragers of Central African Republic) are cared for by many different people in the early years of life and they develop multiple affectionate (attachment) relationships to many of them (Meehan and Hawks 2013). We add that Efe children are unlikely to experience their attachment relationships as a collection of single attachments but rather as an integrated

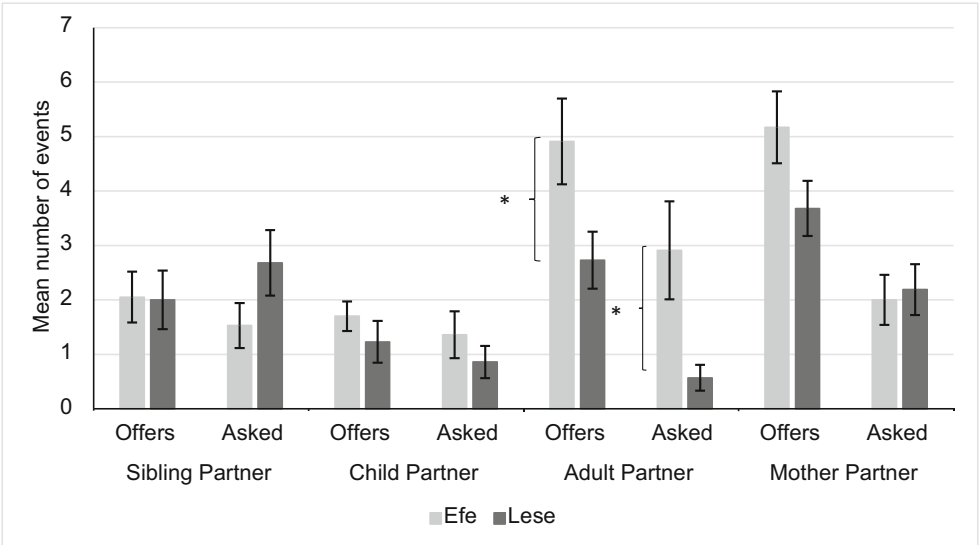

Fig. 6 Number of offer and ask events by social category. This bar graph displays the mean number of other offers to focal child and focal child asks to others between the Efe and the Lese, grouped by the social category of the partner. Partners were one of four mutually exclusive categories: siblings, children, adults, or mother. Efe are represented in light gray, and Lese are represented in dark gray. Error bars represent standard errors. Significant differences between Efe and Lese children with a FDR of 0.1 are displayed using an asterisk (*)

Table 6 Univariate ANOVA results comparing the mean number of other offers to focal child and focal child asks food exchange events between the Efe and the Lese, grouped by the social category of the partner. Also displayed are results of the Benjamini and Hochberg procedure and of Levene's test of homogeneity of variance. When homogeneity of variance was violated at ≤ 0.05, Mann–Whitney test results are displayed

	Efe $N = 23$[a] Mean (SD)	Lese $N = 22$[a] Mean (SD)	Levene's test	ANOVA	Mann–Whitney test
			F [p]	F [p]	U [p]
Sibling offers[b]	2.05 (2.09)	2.00 (2.41)	0.31 [0.58]	0.01 [0.94]	–
Sibling is asked[b]	1.53 (1.81)	2.68 (2.63)	1.48 [0.23]	2.51 [0.12]	–
Child offers	1.70 (1.30)	1.23 (1.80)	1.73 [0.20]	1.01 [0.32]	–
Child is asked	1.36 (2.01)	0.86 (1.35)	1.19 [0.28]	0.93 [0.34]	–
Adult offers	4.91 (3.78)	2.73 (2.45)	0.44 [0.51]	5.25* [0.03]	–
Adult is asked	2.91 (4.23)	0.57 (1.08)	14.57 [0.00]	6.03 [0.02]	144.00* [0.02]
Mother offers	5.17 (3.17)	3.68 (3.28)	2.17 [0.15]	3.17 [0.82]	–
Mother is asked	2.00 (2.16)	2.19 (2.14)	0.14 [0.71]	0.08 [0.77]	–

* Indicates significant differences with FDR of 0.1; in brackets, uncorrected p values

[a] For analysis of asks, test included children who asked for food ($n = 22$ for Efe and $n = 21$ for Lese)

[b] For sibling analyses, test included children with siblings who asked for food ($n = 19$ for Efe and $n = 19$ for Lese)

system of relationships (Morelli et al. 2017), and, with this, Efe children's trust may extend to the group as a whole (Mesman et al. 2015). Such experiences heighten the socializing influences of people other than mothers, which, again, is contrary to classic views. Efe children, as a result, are likely more willing to learn from many others, more responsive to their overtures, and more cooperative in their involvement. This sets the groundwork for children's tendencies to act in prosocial ways, often, and towards many.

One of the more important prosocial acts that children in small-scale societies must learn is to share food, which is an essential part of securing critical but variable resources. We chose to examine this early learning by describing Efe forager and Lese subsistence farmer children's entry into food exchange partnerships. We observed that food sharing is deeply ingrained in these children's daily lives in ways that reflect their unique ecosocial and cultural contexts, particularly variation in subsistence activities, residency patterns, and social and food-sharing norms. Efe children's food sharing is best described as a camp affair, with all of the trappings of the socially complex and ever changing nature of camp life. Most notable was the frequency of offers of food to young Efe children and the prominence of adults in these exchanges. These patterns attest to the generosity of camp members, gently easing children into broader food partnerships. Engaging with a diverse set of adult and child food partners may increase Efe children's chances of getting food on any one day. It may also increase their chances of developing trusting relationships with adults both in tandem with and independently of their mothers. These distinctive relationships may accentuate the relational importance of prosocial acts of cooperation.

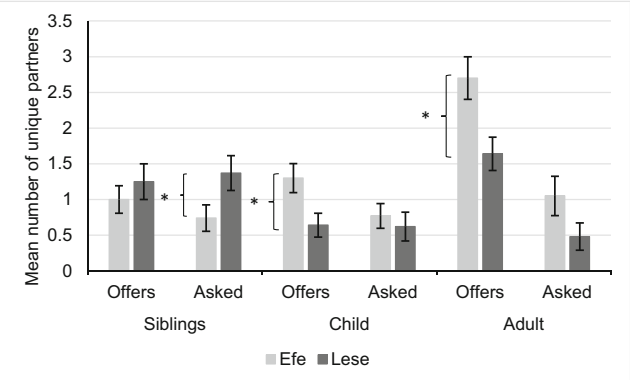

Fig. 7 Number of unique partners offering or asked for food by social category. This bar graph displays the mean number of unique partners offering food to focal child or being asked for food by focal child between the Efe and the Lese, grouped by social category of the partner. Unique partners were one of four mutually exclusive categories: siblings, children, adults, or mother (not displayed). Efe are represented in light gray, and Lese are represented in dark gray. Error bars represent standard errors. Significant differences between Efe and Lese children with a FDR of 0.1 are displayed using an asterisk (*)

Young Lese children's food-sharing experiences, in contrast, are best described as a family affair. This is in keeping with the household as the hub of village and field activities, and with Lese views of food as a family possession and private matter. Children's food partnerships affirm and strengthen household ties. We wonder if, as a result, children learn to feel less obligated to share food outside of the household and, thus, are better able to avoid sharing away food and other possessions. The diminution of scarce stored resources is something that deeply concerns the Lese as the time between harvests may be months and hunger often becomes widespread (Jenike 1988). We speculate that an important way Lese children learn to share food is to make sure that they do not take more than

Table 7 Univariate ANOVA results comparing the mean number of unique partners offering food to focal child or being asked for food by focal child between the Efe and the Lese, grouped by social category. Also displayed are results of the Benjamini and Hochberg procedure and of Levene's test of homogeneity of variance. When homogeneity of variance was violated at ≤ 0.05, Mann–Whitney test results are displayed

	Efe $N = 23$[a] Mean (SD)	Lese $N = 22$[a] Mean (SD)	Levene's test F [p]	ANOVA F [p]	Mann–Whitney test U [p]
Unique siblings offering food[b]	1.00 (0.86)	1.25 (1.12)	1.48 [0.23]	0.63 [0.43]	–
Unique siblings asked for food[b]	0.74 (0.81)	1.37 (1.07)	2.45 [0.13]	4.25* [0.05]	–
Unique children offering food	1.30 (0.97)	0.64 (0.79)	0.12 [0.73]	6.35* [0.02]	–
Unique children asked for food	0.77 (0.81)	0.62 (0.92)	0.24 [0.63]	0.34 [0.56]	–
Unique adults offering food	2.70 (1.43)	1.64 (1.09)	2.70 [0.11]	7.76* [0.01]	–
Unique adults asked for food	1.05 (1.29)	0.48 (0.87)	0.83 [0.37]	2.84 [0.10]	–

* Indicates significant differences with FDR of 0.1; in brackets, uncorrected p values

[a] For analysis of asks, test included children who asked for food ($n = 22$ for Efe and $n = 21$ for Lese)

[b] For sibling analyses, test included children with siblings (for offers, $n = 20$ for Efe, $n = 20$ for Lese; for asks, $n = 19$ for Efe, $n = 19$ for Lese)

their "fair share" from the communal plate from which siblings, and sometimes, mothers eat. If we are correct, this is another way the household figures centrally in children's food-sharing experiences. This view has not entered the discourse on food sharing as best as we can tell, but research on this subject could lead to valuable insights about children's food sharing in horticultural, and, perhaps forager communities.

Efe and Lese children's care and food-sharing experiences orient them to others, build trust, and stress social interdependencies. In these interpersonal contexts, children are likely to develop other-regarding relational orientations and, relatedly, strong prosocial proclivities. Efe and Lese children, however, will act prosocially in different ways, to different degrees, and with different people (e.g., Amici 2015).

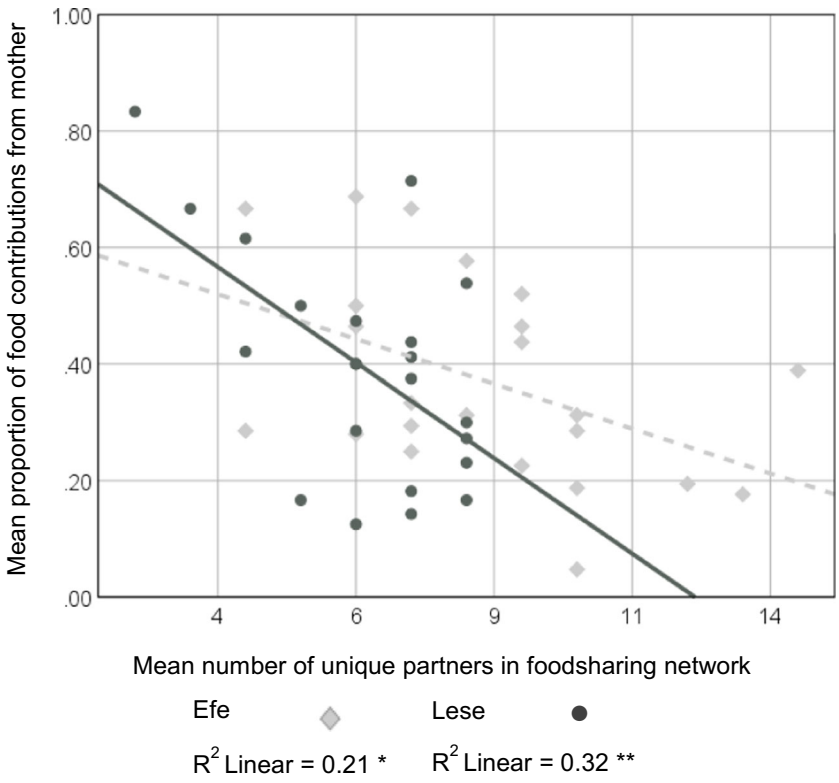

Fig. 8 Relationship between children's food event network size and maternal food contributions to her child. This scatterplot displays the mean number of unique partners in the child's food network against the mean proportion of food contributions (offers to focal child and successful asks from focal child) provided by the mother for the Efe and the Lese. Regression lines represent the proportion of mothers' food contributions accounted for by food-sharing network size for Efe and Lese. Efe are represented in light gray with a dashed regression line, and Lese are represented in dark gray with a solid regression line. For each group, R^2 values are presented. Significant effects are marked using asterisks: ** = $p < 0.01$; * = $p < 0.05$

Fig. 9 Efe children are encouraged to share food from an early age. A one-year-old Efe child offers food to a younger infant. Photo: P. Ivey Henry

We conclude by returning to a theme that has been a constant in our analysis of children's prosociality: that children's care, attachments, and prosociality vary related to environmental, ecosocial, and cultural contexts of families living in specific communities. In line with Keller and Kärtner's (2013) ecocultural model, the near exclusive and primary role of mothers in children's care and development is characteristic of those living Western lifestyles from which dominant theories and assumptions of developmental psychology are derived. In contrast, mothers living in small-scale subsistence societies are more likely to share this role with others. We explored the variation in the prosocial food-sharing experiences of young Efe forager and Lese subsistence farmer children in neighboring communities that share uncertainty and periodic scarcity in rainforest and cultivated food supplies. We identified meaningful variations in the nature of prosocial learning, corresponding with differences in Efe and Lese lifestyles that affect the role of mothers and others in children's access to critical resources from an early age. Such comparisons can provide a wealth of knowledge on how systematic variation between ecosocial and cultural contexts influences developmental experiences and everyday lives. We hope this work contributes to a small but growing discourse on globally relevant approaches to understanding children's prosociality, attachments, and care.

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Data availability The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Permission from guardians was obtained to photograph the children in Fig. 9 and to use the photograph for research-related purposes.

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