Childhood

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Abstract

Childhood refers to the period of growth and development bracketed by weaning and puberty, roughly ages 3–10. During this important life history stage, the brain rapidly grows and achieves the majority of its adult size, the first permanent molars erupt, and the digestive tract matures. Socially, communication skills are rapidly acquired during childhood, gender identities are established, cooperative norms of behavior develop, and self-reflection and emotional regulation mature. Cognitively, increasing independence exposes children to a high frequency of new experiences, perpetual learning, experimentation, and change. Childhood development has captured the attention of scholars from diverse disciplines. This review highlights foundational and new research in biological, social, cognitive, and economic aspects of child development. Attention is paid to how childhood is distinct compared to juvenility in other closely related species and the remarkable changes that have occurred during human evolution. This review focuses on childhood in traditional societies where children grow up under energetic, demographic, and social conditions that more closely reflect the selective pressures that shaped childhood.

INTRODUCTION

Comparison with other primates has been a useful approach to distinguish those human characteristics that are shared and have deep ancestry from those that are uniquely human and evolved over the past several million years. A number of unusual biological features of childhood stand out. (i) Childhood is broadly similar to juvenility in other large mammals, although early childhood (weaning to age 6) often is differentiated from middle childhood (age 6 to onset of puberty). Early childhood is a uniquely human life history phase of quiescent growth when young still depend on others for their survival, but are independent of mother's milk (Bogin, 1999). (ii) While nonhuman primates grow more slowly by an order of magnitude compared to other mammals of similar body size, humans grow even more slowly (Walker, Burger, Wagner, & vonRueden, 2006). This is significant because humans spend considerably more time in an immature state than do other great apes, which affects both demands for parental investment

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and children's survivorship. (iii) For most primates, parental support ends at weaning. For a great ape, weaning occurs between the ages of 3–6 (Blurton Jones, Hawkes, & O'Connell, 1999). Once fully weaned, juveniles are self-sufficient in supplying the calories needed to survive and grow. In contrast, human children are weaned much younger (ages 2–3) than other great apes (Kennedy, 2005), but are fed, given shelter, and provided many other resources often throughout the next two decades of their growth and development. (iv) Postweaning support is an important factor in the much improved probability of child survivorship. A chimpanzee juvenile has about a 40% chance of surviving from weaning to sexual maturity, while a human juvenile has about a 90% chance, even when they grow up in the absence of modern medicine, health care, and sanitation (Gurven & Kaplan, 2007). The high morbidity and mortality risks associated with infancy and weaning are greatly diminished, as susceptibility to communicable disease and risk of injury reach their lowest during childhood (Konner, 2010; Worthman, 2010).

FOUNDATIONAL RESEARCH

A human child's distinct *ontogeny* (growth and development) has far-reaching social implications. Because children are weaned early, birth intervals are 2–3 times shorter in human natural fertility populations compared to wild chimpanzee populations, and birth rates are twice that predicted from body size. A fast reproductive pace combined with post-weaning dependence and a high probability of survival commit human mothers to concurrently raise multiple offspring of various ages. This is unprecedented in other primates and affects many aspects of a child's social environment. Growing up with siblings of different ages provides opportunities for cooperative behaviors as well as for competition over scarce parental resources.

Infants in many cultures receive focused maternal care. However, weaned children seldom enjoy a one-on-one relationship with their mothers for very long. Because mothers raise multiple dependents at the same time, children often must compete with both older and younger siblings for their mother's favor. Because human children have to work hard to solicit their mother attention, Hrdy (2009) and others have suggested that they should have well-developed behaviors and psychological structures to be adept at negotiating these early-life social complexities.

Human children are cared for, but also become cooperators at a young age. In many preindustrial societies, children are key childcare providers and participate in a range of domestic and economic activities that benefit themselves as well as other family members. Depending on ecology and society, children

may spend considerable time collecting fruits, berries, nuts, hunting for small game and fish, tending animals, or working in gardens. For example, among the Hadza, hunter-gatherers living in sub-Saharan Africa, by age 5 children supply about 50% of their own calories during some seasons (Blurton Jones, 1989). Maya boys produce 50% of what they consume by the age of 7 and girls by the age of 6 (Kramer, 2005). This twofold nature of childhood, that children are both dependents and helpers, is a defining feature of human childhood that likely has strong selection implications to children's cognitive and social development.

Developmental psychology recognizes childhood as a phase of increased independence, cognitive development, and emotional regulation. By the end of weaning, the primary attachment to the mother becomes more diffuse as children broaden their sphere of social interactions. By early childhood, children can walk and talk, and in many societies often have great liberty to explore to their environment and roam through their villages, running errands, passing messages, and carrying out simple domestic tasks. In traditional societies, young children often are unaccompanied by an adult, but are rarely alone, spending time in the company of mixed-age groups of siblings, cousins, and peers. The social independence of middle childhood, which is associated with economic participation in traditional societies, is marked by school attendance in developed societies. Children who grow up in developed societies are formally educated and trained before they become economic contributors. In traditional societies, little time set is aside for formal training or active instruction. Instead, children learn adult skills by imitating adult activities during play, watching older children, and directly participating in economic activities.

While play often is thought of as idle pastime, it develops physical coordination and social relationships, and is an important mechanism in cultural transmission and learning adult tasks. Piaget (1951) referred to play as a "natural curriculum" for children. Language acquisition is a universal process across human cultures and a unique tool for information transfer (Hauser, Chomsky, & Fitch, 2002). By the age of 3, children can speak in simple, grammatical sentences. During early childhood, children acquire new words at a rate of about 10 per day and learn most of the grammatical rules used in their native language.

Most researchers agree that extended childhood has significant implications to human cognition and sociality. However, the reasons why this unusual life history evolved are debated. Many explanations emphasize that human children require more time to acquire the knowledge, skills, and learning needed to successfully navigate the complex human economic environment and social landscape (Kaplan, Hill, Lancaster, & Hurtado,

2000). Other explanations stress that slow growth is related to encephalization. About 50% of the calories a child consumes is allocated to brain growth, which is greatest during the first years of life (Bogin, 1999). Because brains are highly sensitive to developmental delays, allocation trade-offs favored slowing somatic growth and ensuring sufficient energy for brain development. Other explanations focus on the mechanisms that shaped the changes in human growth and development. Unlike other great apes, human subsistence and parenting are based on pooled energy, food sharing, and labor cooperation, which underlie the capacity for the rapid human reproductive pace. Slow growing children grow up to be fast reproducers, suggesting that a life history organized around maintaining short birth intervals had a greater fitness payoff than maturing earlier.

CUTTING-EDGE RESEARCH

Evolution of Childhood

The uniqueness of many childhood features has generated considerable interest in the evolution of an extended childhood, particularly the insertion of early childhood because of its implications to weaning age and reproductive pace. However, juvenile fossils are rare, and the fossil record is incomplete and does not represent a biological population. Consequently, scientists have been challenged to settle on the timing of these changes. Recent advances, particularly in tooth formation research, give new insights into the evolution of these traits. The current consensus among most researchers is that australopithecines have an ape-like pattern of juvenile development, growing almost twice as quickly as modern humans (Thompson, Krovitz, & Nelson, 2003). In *Homo erectus*, both tooth and bone maturation rates and postnatal brain growth appear intermediate between living apes and modern humans. This is generally interpreted to indicate that early *Homo* had faster ontogenies than living humans and extended childhood is not as ancient as previously thought (Smith *et al*., 2010). Using dental development to estimate weaning age in fossil infants suggests that early childhood may emerge only in the most recent *Homo erectus*-grade human species. While details are debated, it seems clear that the development of an extended childhood is a protracted process that takes millions of years of selective pressure to establish in its modern form.

Cognitive and Social Development During Childhood

Much of our success as a species derives from our well-developed *prosocial* (behaviors such as sharing, helping, donating, and volunteering that benefit another) and cooperative nature. Although numerous observations have

been made about sharing behavior in children, until recently most experimental and systematic research was focused on adults. New research on the ontogenetic basis for prosociality and cooperation has uncovered two main pathways: shared intentionality and inequity aversion. Findings generally point to the young age at which human children exhibit cooperative behaviors and accompanying skills and cognitive infrastructures.

Shared intentionality is the ability and motivation to engage with others in collaborative and cooperative activities with joint goals and intentions. While it has been difficult to find evidence for understanding the intentions of others in nonhuman primates, human children develop a capacity for coordinated activity and cooperative communication often before language acquisition (Tomasello, Carpenter, Call, Behne, & Moll, 2005; Tomasello & Vaish, 2013). Experiments show that children as young as 19 months will assist others to achieve their goals in a range of situations (Tomasello & Vaish, 2013; Warneken & Tomasello, 2006). Shared intentionality is likely developmentally associated with the unique mother–child rearing environment (Hrdy, 2009) and mother–juvenile foraging coordination (Kramer, 2011).

The development of fairness, as a means to assess the reward to cooperate, appears critical to maintain broad-scale adult cooperation. Experimental research into *inequity aversion* (dislike for unequal outcomes and a tendency to prevent and correct unfair outcomes) consistently demonstrates that prosociality is a process, but is well established at a surprisingly young age. In one experiment, children decided whether to accept or reject unequal offers presented to them and another child (Blake & McAuliffe, 2011). Children aged 4–7 have a general sense of fairness, but are more self-interested than older children. While 4- to 7-year-olds reject offers that put themselves at a disadvantage, by age 8 children also sacrifice rewards that unfairly advantage themselves. Another study showed that children aged 5–6 are aware of adult norms of fairness, although they may not act accordingly (Kogut, 2012). By age 7–8, children's behavior is consistent with these norms, and by 9–10 they are happy about acting fairly. Thus, while young children adhere to norms of fairness behavior, the emotional reinforcement happiness in being fair takes longer to mature.

One candidate for the mechanism underlying equity behaviors is the development of self-regulation of negative emotions such as envy and gloating. Researchers find that even young children compare themselves to others. Individual differences in the expressions of envy and gloating predict whether children make spiteful or equity decisions in resource sharing (Steinbeis & Singer, 2013). Children who expressed strong negative emotions made spiteful decisions. In contrast, those with weak expressions made inequity adverse decisions. Further, the decline in envy, gloating, and spite with age is causally associated with an increase in inequity aversion

decisions (Fehr, Bernhard, & Rockenbach, 2008). To date, new studies consistently show that young children are more cognitively sophisticated and sensitive to others than previously thought. By middle childhood, the proclivity for equity trumps the urge to maximize rewards for one's self. Evidence is mixed and the idea is debated whether these propensities occur in other cooperative primates, and have similar ontogenetic origins.

FUTURE RESEARCH

Childhood has been approached from many perspectives and disciplines. Wide-ranging interest on the topic of children is both an advantage and a handicap to developing an integrated and progressively informed view of childhood. Many fields are exploring new avenues of empirical inquiry, developing innovative experiment, clinical, field, and statistical methods, and questioning traditional ideas. One challenge going forward is to generate dialogue across disciplines and assimilate new findings into current explanations of childhood. While a weighty charge, some suggested steps follow.

Integrating Biocultural Mechanisms that Mediate Childhood Development

Research focused on specifically on ontogeny came relatively late to biology and science generally. It is well appreciated now, however, that modifications in growth and development have strong evolutionary implications and set the stage for adult phenotypes (Konner, 2010). Current scientific inquiry has led the understanding of childhood in seemingly disparate, but connected directions. The biomedical and social sciences are uncovering determinants (genetic, endocrine, and neurological structures) of ontogeny, as well as interactive effects (epigenetics, gene–environment interaction; maternal influences) that shape variation in physiological, cognitive, and psychosocial development. Childhood growth, for example, is not only polygenetic and mediated by gene–environment interaction but it is also notably shaped by endocrine and neurological systems as well as the maternal environment. Although these are fruitful scientific times, these points emphasize the imperative for interdisciplinary exchange.

Emphasizing Cross-Cultural Research and Sources of Variation

While there is a rich cross-cultural anthropological literature and quantitative data on children's behavior in traditional societies, most cognitive and psychological studies are centered in postindustrial societies where children grow up in small families, in relatively good health, and are

formally educated before they become economic participants. If cognitive and psychological development has a genetic and biological basis, we would expect that ontogenetic propensities and processes were established under very different conditions. Today's children are the legacy of generations of children who survived and reproduced in epidemiologically challenging environments and successfully learned subsistence and social skills in the context of large, extended families and communities composed of related individuals.

While children represent less than 15% of the population in our society, they are the majority age class in traditional societies (more than 50% is not uncommon). Lancy (2008) refers to the former as a child-supported society in which childhood is managed by adults, and the latter as a child-centered society. In child-centered societies, children grow up in a world that is both dominated by other children and in families that are constantly changing in their social dynamics. As they get older, new siblings are born, some may die, and older siblings leave home to marry. Children no doubt are equipped with powerful tools to navigate and learn in this dynamic social landscape. Do we expect shared intentionality and inequity aversion to develop in similar ways among children growing up in a world dominated by adults? Do children growing up in small nuclear families, who spend much of their time in day care and school with children of the same age, face different challenges? Have developmental processes changed in step? Or are our study subjects, children who are scrambling, as it were, to developmentally adjust to novel conditions? Because children enter childhood with generations of underlying adaptations, the answers to these questions, which can be addressed through focused cross-culture research, impact how we study development and identify potential sources of variation.

Unpacking Rates of Development

A human child's path to maturity has been characterized as long and sinuous. This refers to age-specific growth rates, which are high neonatally, plummet during the first few years of life, reach their lowest during childhood and increase again during adolescence. *Rates* (gains over time) also are used to describe many other age-specific developmental processes that may fluctuate across childhood. However, age lumping and cross-sectional data can obscure or diminish this variation. While often there are logistical constraints to longitudinal study designs, cross-sectional data are limited because rates can only be projected and estimated, not observed. The value of longitudinal research is that individual variation can be observed and predictor (and confounding) variables more readily identified.

Putting the picture together, the brain grows quickly, but the body disproportionately slowly. We behave in accordance with adult norms of cooperation remarkably early. Some emotional responses such as deception, envy, and greed develop early and then appear to recede as fairness concerns take hold. These systems come on line and mature at different times during childhood, punctuating the point that interdisciplinary dialogue is critical to develop an integrated picture of childhood. While evolutionary anthropologists have emphasized the benefits of a long childhood, as more longitudinal data become available a more nuanced analysis of maturation rates will render greater insight into this critical and complex life history stage.

Taking an Adaptionist View of Childhood

One point worth considering, or revisiting, is that human children may not simply be preparing for adulthood. Nor are they blank slates. Rather, childhood itself may be adaptive. Selection may have shaped childhood to be as successful as possible for the 3- to 10-year-old, not just for the would-be adult. This is a subtle point, but changes how the function and consequences of different developmental traits are viewed.

Other researchers are pushing to unlock a mother-centric view of childhood. Traditionally, young children have been perceived as naive and reflexive of maternal behaviors. However, this is at odds with what we would expect from an evolutionary perspective. Because other great ape juveniles and mothers are independent foragers, ancestral human juveniles most likely were self-sufficient as well. While the evolutionary trend has been toward prolonged dependence and lower levels of self-provisioning, juveniles have a heritage of independence and we should expect them to have advanced cognitive and learning structures in place. In fact, recent research demonstrates that infants and young children do have intuitive and sophisticated theories about the world, and learn in ways analogous to scientific induction (Gopnik, 2012).

REFERENCES

Blurton Jones, N. (1989). The cost of children and the adaptive scheduling of births: towards a sociobiological perspective on demography. In A. E. Rasa, C. Vogel & E. Voland (Eds.), *The sociobiology of sexual and reproductive strategies* (pp. 265–282). London, England: Chapman and Hall.

Blurton Jones, N., Hawkes, K., & O'Connell, J. (1999). Some current ideas about the evolution of human life history. In P. C. Lee (Ed.), *Comparative primate socioecology* (pp. 140–166). Cambridge, England: Cambridge University Press.

Fehr, E., Bernhard, H., & Rockenbach, B. (2008). Eqalitarianism in young children. *Nature*, *454*, 1079–1083.

Gopnik, A. (2012). Scientific thinking in young children: Theoretical advances, empirical research and policy implications. *Science*, *337*, 1623–1627.

Gurven, M., & Kaplan, H. (2007). Longevity among hunter-gatherers: a cross-cultural examination. *Population and Development Review*, *33*(2), 321–365.

Hauser, M. D., Chomsky, N., & Fitch, F. T. (2002). The faculty of language: what is it, who has it and how did it evolve? *Science*, *298*, 1569–1579.

Kaplan, H., Hill, K., Lancaster, J., & Hurtado, A. M. (2000). A theory of human life history evolution: Diet, intelligence, and longevity. *Evolutionary Anthropology*, *9*(4), 156–185.

Kennedy, G. E. (2005). From the ape's dilemma to the weanling's dilemma: Early weaning and its evolutionary context. *Journal of Human Evolution*, *48*, 123–145.

Piaget, J. (1951). *Play, dreams and imitation in childhood*. London, England: Routledge and Keegan Paul.

Smith, T. M., Tafforeau, P., Reid D. J., Pouech, J., Lazzari, V., Zermeno, J. P., … Hublin, J.-J. (2010). Dental evidence for ontogenetic differences between modern humans and Neanderthal. *Proceedings of the National Academy of Science*, *107*, 20923–20928.

Steinbeis, N., & Singer, T. (2013). The effects of social comparison on social emotions and behavior during childhood: The ontogeny of envy and Schadenfreude predicts developmental changes in equity-related decisions. *Journal of Experimental Child Psychology*, *115*, 198–209 (available online Jan 9, 2013).

Thompson, J. L., Krovitz, G. E., & Nelson, A. J. (2003). *Patterns of growth and development in the genus Homo*. Cambridge, England: Cambridge University Press.

Tomasello, M., & Vaish, A. (2013). Origins of human cooperation and morality. *Annual Review of Psychology*, *64*, 631–255.

Walker, R., Burger, O., Wagner, J., & von Rueden, C. (2006). Evolution of brain size and juvenile periods in primates. *Journal of Human Evolution*, *51*, 480–489.

Warneken, F., & Tomasello, M. (2006). Altruistic helping in human infants and young chimpanzees. *Science*, *311*, 1301–1303.

Worthman, C. M. (2010). Survival and health. In M. Bornstein (Ed.), *Handbook of cross-cultural development science* (pp. 39–60). New York, NY: Psychology Press.

FURTHER READING

Blake, P., & McAuliffe, K. (2011). "I had so much it didn't seem fair": Eight-year olds reject two forms of inequity. *Cognition*, *120*, 215–224.

Bogin, B. (1999). *Patterns of human growth*. Cambridge, England: Cambridge University Press.

Hrdy, S. B. (2009). *Mothers and others: The evolutionary origins of mutual understanding*. Cambridge, MA: Harvard University Press.

Kogut, T. (2012). Knowing what I should, doing what I want: From selfishness to inequity aversion in young children's sharing behavior. *Journal of Economic Psychology*, *33*, 226–236.

Konner, M. J. (2010). *The evolution of childhood*. Cambridge, MA: Belknap Press of Harvard University Press.
Kramer, K. L. (2005). *Maya children: Helpers at the farm*. Cambridge, MA: Harvard University Press.
Kramer, K. L. (2011). The evolution of human parental care and recruitment of juvenile help. *Trends in Ecology and Evolution*, *26*(10), 533–540.
Lancy, D. F. (2008). *The anthropology of childhood*. Cambridge, England: Cambridge University Press.
Gopnik, A. (2012). Scientific thinking in young children: Theoretical advances, empirical research and policy implications. *Science*, *337*, 1623–1627.
Tomasello, M., Carpenter, M., Call, J., Behne, T., & Moll, H. (2005). Understanding and sharing intention: the origins of cultural cognition. *Behavioral and Brain Sciences*, *28*, 675–735.

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