

Culture and Cognitive Development

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Abstract

Human beings are biologically adapted for culture in ways that other primates are not. The difference can be clearly seen when the social learning skills of humans and their nearest primate relatives are systematically compared. The human adaptation for culture begins to make itself manifest in human ontogeny at around 1 year of age as human infants come to understand other persons as intentional agents like the self and so engage in joint attentional interactions with them. This understanding then enables young children (a) to employ some uniquely powerful forms of cultural learning to acquire the accumulated wisdom of their cultures, especially as embodied in language, and also (b) to comprehend their worlds in some uniquely powerful ways involving perspectively based symbolic representations.

Keywords

culture; cognition; human evolution; language; joint attention

Until fairly recently, the study of children's cognitive development was dominated by the theory of Jean Piaget. Piaget's theory was detailed, elaborate, comprehensive, and, in many important respects, wrong. In attempting to fill the theoretical vacuum created by Piaget's demise, developmental psychologists have sorted themselves into two main groups. In the first group are those theorists who

emphasize biology. These neo-nativists believe that organic evolution has provided human beings with some specific domains of knowledge of the world and its workings and that this knowledge is best characterized as "innate." Such domains include, for example, mathematics, language, biology, and psychology.

In the other group are theorists who have focused on the cultural dimension of human cognitive development. These cultural psychologists begin with the fact that human children grow into cognitively competent adults in the context of a structured social world full of material and symbolic artifacts such as tools and language, structured social interactions such as rituals and games, and cultural institutions such as families and religions. The claim is that the cultural context is not just a facilitator or motivator for cognitive development, but rather a unique "ontogenetic niche" (i.e., a unique context for development) that actually structures human cognition in fundamental ways.

There are many thoughtful scientists in each of these theoretical camps. This suggests the possibility that each has identified some aspects of the overall theory that will be needed to go beyond Piaget and incorporate adequately both the cultural and the biological dimensions of human cognitive development. What is needed to achieve this aim, in my opinion, is (a) an evolutionary approach to the human capacity for culture and (b) an ontogenetic approach to human cognitive development in the context of culture.

CHIMPANZEE AND HUMAN CULTURE

It is widely agreed among behavioral biologists that the best examples of animal culture come from chimpanzees. For example, different chimpanzee communities have been documented to have different tool-use traditions, such as termite-fishing, ant-fishing, ant-dipping, nut-cracking, and leaf-sponging (Tomasello & Call, 1997). Some of these community differences are due to the different local ecologies of different groups of chimpanzees. The individuals of each group learn to solve the problems presented by their local environment using the resources available in that environment.

But experimental studies have shown that there is more to it than this; chimpanzees can learn things from observing others using tools. What they learn, however, is less than might be expected. They learn the effects on the environment that can be produced with a particular tool; they do not actually learn to copy another chimpanzee's behavioral strategies. For example, in one study, chimpanzees were presented with a rakelike tool and an out-of-reach object. The tool could be used in either of two ways to obtain the object. One group of chimpanzees observed one way of using the tool, and another group observed the other way. However, the demonstration observed had no effect on which method or methods the chimpanzees used to obtain the object. This kind of learning is called emulation learning. In contrast, when human children were given this same task, they much more often imitatively learned the precise technique demonstrated for them (see Tomasello, 1996, for a review). Studies of chimpanzee gestural communication have found similar results. Young chimpanzees ritualize sig-

nals with group mates over repeated encounters in which they essentially shape one another's behavior. They do not learn the signals of group mates via imitation (Tomasello et al., 1997).

Chimpanzees and other nonhuman animals may thus engage in some forms of cultural transmission, defined very broadly as the nongenetic transfer of information, but they do not do this by means of imitative learning if this is defined more narrowly as the reproduction of another individual's actual behavioral strategy toward a goal. In contrast, human beings learn from conspecifics by perceiving their goals and then attempting to reproduce the strategies the other persons use in attempting to achieve those goals—truly cultural learning, as opposed to merely social learning (Tomasello, Kruger, & Ratner, 1993).

This small difference in learning process leads to a huge difference in cultural evolution; specifically, only cultural learning leads to cumulative cultural evolution in which the culture produces artifacts—both material artifacts, such as tools, and symbolic artifacts, such as language and Arabic numerals—that accumulate modifications over historical time. Thus, one person invents something, other persons learn it and then modify and improve it, and then this new and improved version is learned by a new generation—and so on across generations. Imitative learning is a key to this process because it enables individuals to acquire the uses of artifacts and other practices of their social groups relatively faithfully, and this relatively exact learning then serves as a kind of ratchet—keeping the practice in place in the social group (perhaps for many generations) until some creative innovation comes along. Each human child, in using these artifacts to mediate its interactions with the world, thus grows up in

the context of something like the accumulated wisdom of its entire social group, past and present.

HUMAN CULTURAL LEARNING

The human adaptation for cultural learning is best seen ontogenetically and in the context of infants' other social and cognitive activities. The key transition occurs at 9 to 12 months of age, as infants begin to engage in interactions that are triadic in the sense that they involve the referential triangle of child, adult, and some outside entity to which they are both attending. Thus, infants at this age begin to flexibly and reliably look where adults are looking (gaze following), use adults as emotional reference points (social referencing), and act on objects in the way adults are acting on them (imitative learning)—in short, 1-year-olds begin to "tune in" to the attention and behavior of adults toward outside entities. At this same age, infants also begin to use communicative gestures to direct adult attention and behavior to outside entities in which *they* are interested—in short, to get the adult to "tune in" to them. Most often, the term joint attention has been used to characterize this whole complex of triadic social skills and interactions, and it represents a revolution in the way infants understand other persons. There is evidence that infants can begin to engage in joint attentional interactions only when they understand other persons as intentional agents like themselves, that is, as persons who have behavioral and perceptual goals and make active choices among the means for attaining those goals (Carpenter, Nagell, & Tomasello, 1998). (I understand attention to be intentional focusing on one aspect of experience to the exclusion of others.)

This social-cognitive revolution at 1 year of age sets the stage for the 2nd year of life, in which infants begin to imitatively learn the use of all kinds of tools, artifacts, and symbols. For example, in a study by Meltzoff (1988), 14-month-old children observed an adult bend at the waist and touch his head to a panel, thus turning on a light. They followed suit. Infants engaged in this unusual and awkward behavior even though it would have been easier and more natural for them simply to push the panel with their hand. One interpretation of this behavior is that the infants understood that (a) the adult had the goal of illuminating the light and then chose one means for doing so, from among other possible means, and (b) if they had the same goal, they could choose the same means. Cultural learning of this type thus relies fundamentally on infants' tendency to identify with adults, and on their ability to distinguish in the actions of others the underlying goal and the different means that might be used to achieve it. This interpretation is supported by Meltzoff's (1995) more recent finding that 18-month-old children also imitatively learn actions that an adult intends to perform, even if she is unsuccessful in doing so. Similarly, my colleagues and I (Carpenter, Akhtar, & Tomasello, 1998) found that 16-month-old infants imitatively learned from a complex behavioral sequence only those behaviors that appeared intentional, ignoring those that appeared accidental. Young children do not just mimic the limb movements of other persons; rather, they attempt to reproduce other persons' intended, goal-directed actions in the world.

Although it is not obvious at first glance, something like this same imitative learning process must happen if children are to learn the symbolic conventions of their native language. In some re-

cent experiments, we have found that children learn words in situations in which they must work fairly hard to discern the adult's communicative intentions. For example, one study involved an adult playing a "finding game" with children. The adult had each child find four different objects in four different hiding places, one of which was a very distinctive toy barn. Once the child had learned which objects went with which places, the adult announced her intention to "find the gazzer." She then went to the toy barn, but it turned out to be "locked." She then frowned at the barn and proceeded to extract other objects from the other hiding places. Later, the children demonstrated that they had learned "gazzer" as the name of the object locked in the barn. What is significant about this finding is that the children knew which one was the gazzer even though they never saw the target object after they heard the new word; they had to infer from the adult's behavior (trying to get into the barn and frowning when it was impossible) which object she wanted, without even seeing the object (see Tomasello, in press, for a review).

This kind of learning can be referred to as cultural learning because the child is not just learning things *from* other persons but is learning things *through* them—in the sense that he or she must know something of the adult's perspective on a situation in order to learn the same intentionally communicative act (Tomasello et al., 1993). The adult in the study just described is not just moving and picking up objects randomly, she is searching for an object, and the child must know this in order to make enough sense of her behavior to connect the new word to its intended referent. An organism can engage in cultural learning of this type only when it understands others as intentional agents like the self who have a per-

spective on the world that can be entered into, directed, and shared. Indeed, a strong argument can be made that children can understand a symbolic convention in the first place only if they understand their communicative partner as an intentional agent with whom one may share attention—because a linguistic symbol is nothing other than a marker for an intersubjectively shared understanding of a situation (Tomasello, in press). Thus, children with autism do not understand other persons as intentional agents, or they do so to only an imperfect degree, and so (a) they are very poor at the imitative learning of intentional actions in general, (b) only half of them ever learn any language at all, and (c) those who do learn some language are very poor in word-learning situations such as those just described (Hobson, 1993).

It is important to emphasize as well that when children learn linguistic symbols, what they are learning is a whole panoply of ways to manipulate the attention of other persons, sometimes on a single entity, on the basis of such things as

- generality (*thing, furniture, chair, desk chair*),
- perspective (*chase-flee, buy-sell, come-go, borrow-lend*), and
- function (*father, lawyer, man, American; coast, shore, beach*).

And there are many other perspectives that arise in grammatical combinations of various sorts (*She smashed the vase vs. The vase was smashed*). Consequently, as children internalize a linguistic symbol—as they learn the human perspective embodied in that symbol—they not only cognitively represent the perceptual or motoric aspects of a situation, but also cognitively represent one way, among other ways of which they are also aware, that the current situation

may be attentionally construed by "us," the users of the symbol. The perspectival nature of linguistic symbols thus represents a clear break with straightforward perceptual or sensory-motor cognitive representations, and indeed this perspectivity is what gives linguistic symbols their awesome cognitive power (Tomasello, 1999). It even allows children to learn linguistic means for conceptualizing objects as actions (*He porched the newspaper*), actions as objects (*Skiing is fun*), and many other metaphorical construals (*Love is a journey*).

CULTURAL COGNITION

The biological origin of human culture is an adaptation that occurred at some point in human evolution—probably quite recently, in the past 150,000 years, with the rise of modern humans. It was not an everyday adaptation, however, because it did not just change one relatively isolated characteristic, it changed the process of human evolution. It did this most immediately by changing the nature of human social cognition, which in turn changed the nature of human cultural transmission, which in turn led to a series of cascading sociological and psychological events in historical and ontogenetic time. The new form of social cognition that started the entire process was the understanding of other persons as intentional agents like the self, and the new process of cultural transmission was the various forms of cultural learning, the first and most important of which was imitative learning (the others are instructed learning and collaborative learning). These new forms of cultural learning created the possibility of a kind of ratchet effect in which human beings not only pooled their cogni-

tive resources contemporaneously, but also built on one another's cognitive inventions over time. This new form of cultural evolution thus created artifacts and social practices with a "history." The most important artifact in this connection is language, the acquisition of which leads to some new forms of perspectively based (i.e., symbolic) cognitive representation. Modern human cognition is thus a result not just of processes of biological evolution, but also of cultural processes that human biological evolution made possible in both cultural-historical time and ontogenetic time.

Recommended Reading

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Note

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